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safetybrief



A breath of life —

Mouth-to-mouth resuscitation was applied to power-line worker by a co-worker. The victim brushed against a live wire during routine line-work, and was knocked unconscious. He had stopped breathing. Quick thinking by co-worker was credited to saving a life. Seconds after photo was taken, the shout,

"He's breathing," reassured on-lookers. Besides an unforgettable experience, the only ill effects suffered by the victim were minor burns on the hand and arm.

(Photo: Courtesy United Press International.)

Have a heart — Heart and circulation diseases are listed as the third highest handicapping illness in the U.S.A. Yes, it is true. Heart disease scares the victim, but in some cases, it frightens the boss even more! If you are wondering just how much of a problem it is to hire a heart case, a new booklet will be of interest—*Workmen's Compensation and the Cardiac*. It shows how labor, management, and the medical profession cooperate to employ and rehabilitate cardiac patients. It is available from Chicago Heart Association, 22 W. Madison, Chicago, 60602.

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Asbestos dust and cigarets pose cancer risk — According to a recent study by three New York medical researchers (and reported in the June 6 issue of the *Wall Street Journal*) asbestos workers who smoke cigarets have a ninetyfold greater risk of dying from lung cancer than persons who neither smoke nor work around asbestos.

The researchers noted that microscopic asbestos fibers, once inhaled, remain permanently in the lung tissues. Asbestos workers who don't smoke cigarets should never begin. Those who do, should stop now.

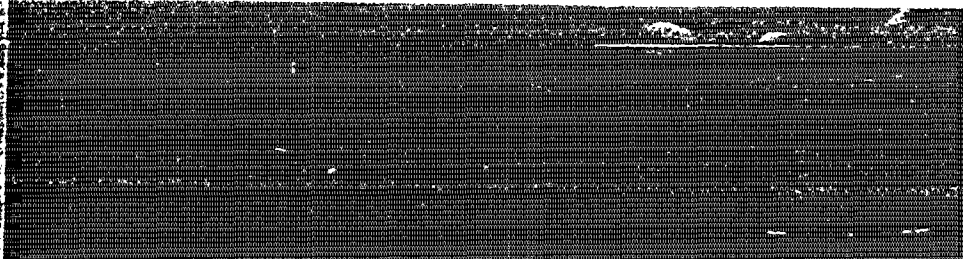
Comprehensive airport plan — The Federal Aviation Agency has introduced a new national airport plan to accommodate massive U. S. airport needs. If our airports are to be capable of safely handling the impending all-jet and supersonic fleets of the next decade, aviation interests and progressive communities must make known to their senators and representatives the need for adequate federal funds to augment local financing. The current plan includes recommendations for constructing new landing facilities at existing airports.

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Challenging inner space — An artist's concept shows a phantom, cut-away view of Lockheed Missiles & Space Company's research submarine Deep Quest with a diver support module. Lockheed studies show that such a support system could help move divers and equipment safely from the surface to underwater sites. The support module would enable man to increase the amount of useful work he can perform at depths of 600 feet, and it might eventually help him surpass the 1,000-foot diving record.



As a result of the intense interest in oceanographic exploration, the American Bureau of Shipping is in the process of formulating guidelines for the certification of deep submergence vehicles and other submersibles. These guidelines, when promulgated, will aid insurers who must currently determine seaworthiness of vessels (such as the Deep Quest) on the basis of their own engineering studies. Marine Office of America is the insurer of the Deep Quest.


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Seat belt enforcer — An inexpensive electronic system has been developed to insure and enforce occupants of motor vehicles to comply with keeping their seat belts fastened at all times. The system works through the ignition and starter solenoid of the vehicle.

Offshore drilling safeguards — An inter-industry agreement on a comprehensive pattern of shipping fairways and anchorage areas throughout the oil fields in U. S. coastal waters from Florida to the Rio Grande provides a major step toward safeguarding life and property in the offshore oil drilling area of the Gulf of Mexico. The objective, according to the American Merchant Marine Institute, Inc., is to eliminate interference among operations and to reduce the hazard of collision between ships and fixed drilling structures. — End.

Threshold Limit Values For 1967

Threshold Limit Value is a phrase that is often used in industrial health and equally as often misunderstood or misinterpreted. The recommended and intended values, adopted at the 29th Annual Meeting of the American Conference of Governmental Industrial Hygienists, Chicago, May 1-2, 1967, are reprinted here as a guide for the safety engineer.

The Threshold Limit Values refer to air-borne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect. Because of wide variation in individual susceptibility, exposure of an occasional individual at or even below the threshold limit may not prevent discomfort, aggravation of a pre-existing condition, or occupational illness.

Clinical tests are becoming available that permit detection of those individuals who will hyperreact upon exposure to certain industrial substances. Being predictive in character, they may be applied as screening tests in the preplacement job examination. Requests for further details of these tests should be directed to the Chairman of the Committee.

Threshold limits should be used as guides in the control of health hazards and should not be regarded as fine lines between safe and dangerous concentrations. Exceptions are the substances given in Appendix A and certain of the substances given a "C" listing. The values

not given a "C" listing refer to time-weighted average concentrations for a conventional 7 or 8 hour workday.

Time-weighted average concentrations permit excursions above the limit, provided they are compensated by equivalent excursions below the limit during the work day. The degree of permissible excursion is pegged to the threshold limit value of the particular substance as given in table in Appendix C under "Test TLV Factor." Hence, it is not considered appropriate to interpret air concentration values as exceeding time-weighted average limits, if such values lie within the permissible excursions. (See section on Legislative Code.)

The amount by which these concentrations may be exceeded for short periods without injury to health depends upon a number of factors such as the nature of the contaminant, whether very high concentrations even for short periods produce acute poisoning, whether the effects are cumulative, the frequency with which high concentrations occur, and the duration of such periods. All must be taken into consideration in arriving at a decision as to whether a hazardous situation exists. Enlightened industrial hygiene practice inclines toward controlling exposures below the limit rather than maintenance at the limit.

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Threshold limits are based on the best available information from industrial experience, from experimental human and animal studies, and when possible, from a combination of the three. The basis on which the values are established may differ from substance to substance; protection against impairment of health may be the guiding factor for some, whereas reasonable freedom from irritation, narcosis, nuisance or other forms of stress may dominate the basis for others. The Committee holds to the opinion that limits based on physical irritation should be considered no less binding than those based on physical impairment; growing bodies of evidence indicate that physical irritation may promote and accelerate physical impairment.

These limits are intended for use in the field of industrial hygiene and should be interpreted and applied only by persons trained in this field. They are not intended for use, or for modification for use, 1) as a relative index of toxicity, by making a ratio of two limits, 2) in the evaluation or control of community air pollution or air pollution nuisances, 3) in estimating the toxic potential of continuous uninterrupted exposures, 4) as proof or disproof of an existing di-

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sease or physical condition, or 5) for adoption by countries whose working conditions differ from those in the United States of America and where substances and processes differ.

Documentation of Threshold Limit Values. A separate companion piece to the TLVs is issued by ACGIH under this title. This publication gives the pertinent scientific information and data with reference to literature sources that were used to base each limit. Each documentation also contains a statement defining the type of response against which the limit is safeguarding the worker. For a better understanding of the TLVs it is essential that the Documentation be consulted when the TLVs are being used.

Ceiling vs. Time-Weighted Average Limits. Although the time-weighted average concentration provides the most satisfactory, practical way of monitoring air-borne agents for compliance with the limits, there are certain substances for which it is inappropriate. In the latter group are substances which are predominantly fast acting and whose threshold limit is more appropriately based on this particular response. Substances with this type of response are best controlled by a ceiling "C" limit that should not be exceeded. It is implicit in these definitions that the manner of sampling to determine compliance with the limits for each group must differ, a single brief sample, that is applicable to a "C" limit, is not appropriate to the time-weighted limit: here, a sufficient number of samples are needed to permit a time-weighted average concentration throughout a complete cycle of operations or throughout the work shift.

Whereas the ceiling limit places a definite boundary which concentrations

Mixtures. Special consideration should be given also to the application of these values in assessing the health hazard which may be associated with exposure to mixtures of two or more substances. A brief discussion of basic considerations involved in developing threshold limit values for mixtures, and methods for their development, amplified by specific examples are given in Appendix B.

"Inert" or Nuisance Particulates. A number of dusts or particulates that occur in the working environment ordinarily produce no specific effects upon prolonged inhalation. Some insoluble substances are classed as inert (e.g., iron and steel dusts, cement, silicon carbide, titanium dioxide, cellulose); others may be soluble (starch, soluble oils, calcium carbonate) but are of such a low order of activity that in concentrations ordinarily encountered do not cause physiologic impairment; still others may be rapidly eliminated or destroyed by the body (vegetable oils, glycerine, sucrose). In the case of the insoluble substances, there may be some accumulation in the respiratory passages. In the case of the soluble substances, this accumulation will ordinarily be temporary but may interfere to some extent with respiratory processes. Hence, it is desirable to control the concentrations of such particulates in the air breathed by any individual, in keeping with good industrial hygiene practice.

A threshold limit of $15\text{mg}/\text{m}^3$, or 50 mppcf, whichever is less, is recommended for substances in these categories and for which no specific threshold limits have been assigned. This limit, for a normal work day, does not apply to brief exposures at higher concentrations. Neither does it apply to those substances which may cause physiologic impairment at lower concentrations but for which a threshold limit has not yet been adopted. Some "inert" particulates are given in

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Whereas the ceiling limit places a definite boundary which concentrations should not be permitted to exceed, the time-weighted average limit requires an explicit limit to the excursions that are permissible above the listed values. The magnitude of these excursions may be pegged to the magnitude of the threshold limit by an appropriate factor shown in Appendix G. It should be noted that the same factors are used by the Committee in making a judgment whether to include or exclude a substance for a "C" listing.

"Skin" Notation. Listed substances followed by the designation "Skin" refer to the potential contribution to the overall exposure by the cutaneous route including mucous membranes and eye, either by air-borne, or more particularly, by direct contact with the substance. Vehicles can alter skin absorption. This attention-calling designation is intended to suggest appropriate measures for the prevention of cutaneous absorption so that the threshold limit is not invalidated.

These values are reviewed annually by the Committee on Threshold Limits for revision or additions, as further information becomes available.

Soluble substances, and substances which ordinarily be temporary but may interfere to some extent with respiratory processes. Hence, it is desirable to control the concentrations of such particulates in the air breathed by any individual, in keeping with good industrial hygiene practice.

A threshold limit of $15\text{mg}/\text{m}^3$, or 50 mppcf, whichever is less, is recommended for substances in these categories and for which no specific threshold limits have been assigned. This limit, for a normal work day, does not apply to brief exposures at higher concentrations. Neither does it apply to those substances which may cause physiologic impairment at lower concentrations but for which a threshold limit has not yet been adopted. Some "inert" particulates are given in Appendix D.

Simple Asphyxiants—"Inert" Gases or Vapors. A number of gases and vapors, when present in high concentrations in air, act primarily as simple asphyxiants without other significant physiologic effects. A TLV may not be recommended for each simple asphyxiant because the limiting factor is the available oxygen. The minimal oxygen content should be 18 per cent by volume under normal atmospheric pressure (equivalent to a partial pressure, pO_2 , of 135 mm Hg). Atmospheres deficient in O_2 do not provide adequate warning and most simple asphyxiants are odorless. Several asphyxiants are listed in Appendix E. Some asphyxiants present an explosion hazard. Account should be taken of this factor in limiting the concentration of the asphyxiant.

Physical Factors. It is recognized that such physical factors as heat, ultraviolet and ionizing radiation, humidity, abnormal pressure and the like may pl added stress on the body so that the effects from exposure at a threshold

limit may be altered. Most of these stresses act adversely to increase the toxic response of a substance. Although most threshold limits have built-in safety factors to guard against adverse effects of moderate deviations from normal environments, the safety factors of most substances are not of such a magnitude as to take care of gross deviations. For example, continuous work at temperatures above 90F or over-time, extending the work-week more than 50 per cent, might be considered gross deviations. In such instances judgment must be exercised in the proper adjustments of the threshold limit values.

"Notice of Intent." At the beginning of each year, proposed actions of the Committee for the forthcoming year are issued in the form of a "Notice of Intent." This Notice provides not only an opportunity for comment, but solicits suggestions of substances to be added to the list. The suggestions should be accompanied by substantiating evidence.

As Legislative Code. The Conference does not consider the Threshold Limit Values appropriate matter for adoption in legislative codes and regulations and recommends against such use. If, however, the list is so used, the intent of the concepts contained in the Preface should be maintained and provisions should be made to keep the list current.

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The TLV Committee includes the following industrial hygienists: Herbert E. Stokinger, Ph.D., chairman; E. J. Baier, H. B. Elkins, Ph. D.; W. W. Fredrick, Ph. D.; B. Grabis, P.E.; P. Gross, M.D.; W. J. Hayes, Jr., M.D.; F. T. McDermott; E. Mastromatteo, M.D.; W. W. Melvin, M.D.; R. G. Smith, Ph.D.; M. R. Zavon, M.D., and H. N. MacFarland, Ph.D., who acted as a consultant.

Copies and price schedule may be obtained by writing to Mr. A. D. Hosey, Secretary-treasurer, ACGIH, 1014 Broadway, Cincinnati, Ohio 45202.

The second edition of the *Documentation of Threshold Limit Values*, rewritten and greatly enlarged to include the approximately 400 substances in the list, is available and may be purchased from ACGIH. Cost: \$4.50.

Related publications, also available from ACGIH are: *Air Pollution Control Process Flow Sheets*; *Air Sampling Instruments Manual*; and *Analytical Methods Manual*.