

**COUNTY OF RIVERSIDE
STANDARD SAFETY OPERATIONS MANUAL**

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SUBJECT:	General Information On Industrial Hygiene	EFFECTIVE DATE:	02/15/94
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PURPOSE: To provide each department with an overview of industrial hygiene. A knowledge of industrial hygiene principals is an invaluable reference and will provide a rich reference source for all departments as they comply with all federal, state and local regulations, and maintain safe and healthy workplaces in their departments.

POLICY: To provide general industrial hygiene information to all Department/Agency Supervisors and Managers to assist them in understanding and dealing with industrial hygiene problems that affect the health and safety of their employees.

OBJECTIVE: To assist departments in recognizing, handling and abating industrial hygiene problems should they occur.

SCOPE: All levels of management and supervision.

REFERENCE: CCR Title 8, GISO Articles 9, 102, 105, 107, 109 & 110

I. FUNDAMENTAL CONCEPTS OF INDUSTRIAL HYGIENE

The focus of industrial hygiene is the identification, study and control of environmental health hazards that arise out of or during the course of employment.

Initially, safety professionals were primarily interested in preventing bodily physical damage and injuries. Now, they are also concerned with insidious hazards and diseases that affect the organs of the body, e.g. the lungs, skin, kidneys, liver and brain.

Environmental health hazards are workplace conditions that adversely affect the health of employees. Exposure to these hazards may result in loss of time from work, loss of productivity or cause a legally compensable illness. Loss of time and/or productivity due to unfavorable working conditions is preventable. Should any adverse conditions be identified, it is the responsibility of management to rectify the work environment and provide safe working conditions.

Industrial hygiene is recognized as the science devoted to the recognition, identification, evaluation and control of those environmental factors or stresses of a chemical, physical, biological or ergonomic nature that may be responsible for acute, chronic or debilitating illness, impaired health or significant discomfort to employees or residents of the community.

II. SCOPE OF WORK

A. Recognition of environmental factors, i.e. stress, that negatively influences health, requires that the industrial hygienist be familiar with work operations and processes. The categories of stresses that interest the industrial hygienist are:

1. Chemical: Liquid, dust, fumes, mist, vapor or gas.
2. Physical: Electromagnetic and ionizing radiation, noise, vibration and extremes of temperature and pressure.

**GENERAL INFORMATION ON INDUSTRIAL HYGIENE
DOCUMENT NUMBER: 2008**

II. SCOPE OF WORK - continued

3. Biological: Arthropods (insects, mites), fungi (molds, yeasts), vermin (mice, rats), bacteria and viruses.
4. Ergonomic: Body position in relation to task, monotony, boredom, repetitive motion, worry, work pressure and fatigue.

The industrial hygienist recognizes that stresses may immediately endanger life and health, accelerate the aging process or cause significant discomfort and inefficiency.

- B. Evaluation of the magnitude of the environmental factors and stresses arising in or from the workplace is performed by the industrial hygienist. Aided by training, experience and quantitative measurement of the chemical, physical, biological or ergonomic stresses, expert opinion as to the general healthfulness of the environment, either for short periods or for a lifetime of exposure may then be given.
- C. Prescription of corrective procedures when necessary to protect health is based upon the industrial hygienist's experience and knowledge and on the quantitative data obtained. The hygienist may prescribe control measures such as isolation of a work process, substitution of less harmful material or other options depending upon the situation.

III. FUNCTION

The industrial hygienist:

- A. Directs the industrial hygiene program under the auspices of the County Safety Office Industrial Hygienist in conjunction with the County Health Department.
- B. Examines the workplace environment.
 1. Studies work operations and processes to get full details of the true nature of the work, materials and equipment user, products and by-products, number of and vital statistics of employees and hours of work.
 2. Measures the magnitude of exposure by Threshold Limit Values (TLV's) to workers and the public. In doing so, the hygienist must:
 - a. Select or devise methods for and utilize instrumentation specific to such measurements.
 - b. Personally or through others under the hygienist's direct supervision, conduct the appropriate measurements.
 - c. Study and test materials associated with the work operation.
- C. Interprets results of the examination of the workplace environment in terms of ability to impair health, nature of health impairment, worker's efficiency and community nuisance and/or damage.
- D. Present specific conclusions to appropriate interested parties such as management and health officials.

GENERAL INFORMATION ON INDUSTRIAL HYGIENE
DOCUMENT NUMBER: 2008

III. FUNCTION - continued

- E. Determines the need for or effectiveness of control measures and when necessary, recommends procedures which will be suitable and effective for the environment.
- F. Prepares rules, regulations, standards and procedures for the healthful conduct of work and the prevention of nuisance in the community.
- G. Prepares expert testimony before courts of law, hearing boards, worker's compensation commissions, and regulatory agencies and legally appointed investigative bodies covering all matters pertaining to industrial hygiene.
- H. Prepares appropriate text for labels and precautionary information, i.e. material safety data sheets (MSDS), for materials and products to be used by workers and the public.
- I. Conducts programs for the education of workers and the public in the prevention of occupational disease and community nuisance.
- J. Directs epidemiological studies among workers and industries to discover possibilities of the presence of occupational disease and establishes or improves TLV's of standards as guidelines for the maintenance of health and efficiency.
- K. Conducts research to advance knowledge of the effects of occupation upon health and the subsequent means of preventing occupational health impairment, community air pollution, noise, nuisance and related problems and conditions.

IV. CONTROL

The type and extent of controls may depend upon the physical, chemical and toxic properties of the contaminant, the evaluation made of the exposure and the operation that disperses the contaminant, the evaluation made of the exposure and the operation that disperses the contaminant, e.g. the extensive controls needed for lead oxide dust would not be needed for limestone dust since greater quantities of limestone dust can be tolerated.

General methods of controlling harmful environmental factors or stresses include:

1. Substitution of a material that is dangerous to health with one that is less harmful or preferably not harmful at all.
2. Modification of a process to minimize worker exposure.
3. Isolation or enclosure of a process or work operation to reduce exposure.
4. Isolation, enclosure or encapsulation of identified hazardous materials in conjunction with an operations and maintenance plan (OMP).
5. Wet methods to reduce generation of dust in operations such as mining and quarrying.
6. Local exhaust at the point of generation and dispersion of contaminants.
7. General or dilution ventilation with "clean air" to provide a safe atmosphere.

GENERAL INFORMATION ON INDUSTRIAL HYGIENE
DOCUMENT NUMBER: 2008

IV. CONTROL - continued

8. Personal protective equipment (PPE) such as special clothing, eye, hearing and respiratory protection.
9. Good housekeeping including cleanliness of the workplace, waste disposal, adequate washing and eating facilities, potable water and control of insects and rodents.
10. Special control methods for specific hazards such as reduction of exposure time, film badges and similar monitoring devices, continuous sampling with preset alarms and medical monitoring/surveillance programs to detect intake of toxic materials.
11. Training and education to supplement engineering controls.

V. THRESHOLD LIMIT VALUES (TLV'S)

- A. Whenever there is a potential problem involving hazardous elements that may affect health and life, industrial hygiene is utilized to observe and determine whether or not an area is safe for workers. One way this is done is by quantifying samples of the potential irritants and comparing the measured amounts against established TLV's.
- B. TLV's refer to time-weighted average (TWA) exposures, to contaminants and physical agents for an eight hour work day and 40 hour work week. TLV's are published by the American Congress of Governmental Industrial Hygienists (ACGIH), annually. TLV's should be regarded as guidelines in the control of health hazards and should not be used as fine lines between safe and dangerous concentrations. Exceptions are any substances specified in the appendices of the ACGIH TLV publication and those substances designated with a C or "Ceiling Value". The legal limits are listed as permissible exposure limits (PEL) by Federal and Cal/OSHA.
- C. TWA's allow exposure to contaminants above the TLV provided the exposure is compensated by an offsetting exposure below the TLV during the work day. In some instances it may be permissible to calculate the average concentration for a work week rather than for a work day. The degree of permissible exposure is related to the magnitude of the TLV of a particular substance. The relationship between threshold limit and permissible exposure is a rule of thumb and in certain cases, may not apply. The amount by which threshold limits may be exceeded for short periods without injury to health depends upon a number of factors. Examples are 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 factors must be taken into consideration in arriving at a decision as to whether a hazardous condition exists.
- D. The data for establishing TLV's is a result of animal studies, human studies and industrial experience. The TLV may be selected for several reasons. It may be based on the fact that a substance is very irritating to the majority of people exposed or other substances may be asphyxiants. Still other reasons for establishing a TLV include the fact that certain chemical compounds can be an anesthetic or allergen, be fibrogenic or cause malignancies. Some additional TLV's have been established because exposure above a certain concentration is considered a nuisance.

**GENERAL INFORMATION ON INDUSTRIAL HYGIENE
DOCUMENT NUMBER: 2008**

V. THRESHOLD LIMIT VALUES (TLV'S) - continued

- E. The amount and nature of the information available for establishing a TLV varies from substance to substance. Consequently, the precision of the estimated TLV continues to be subject to revision. Therefore, the latest documentation for that substance should be consulted.
- F. The ACGIH periodically publishes and copyrights documentation of TLV's that give the data and information upon which TLV's are based.
- G. Three categories of TLV's are:
 - 1. Time Weighted Average – TLV-TWA is the time weighted average concentration for a normal eight hour work day or 40 hour work week, to which workers may be repeatedly exposed, day after day, without adverse effects.
 - 2. Short-Term Exposure Limit (STEL) – TLV-STEL is the maximum concentration to which workers may be exposed for a period of up to 15 minutes continuously without suffering from irritation, chronic or irreversible tissue change or narcosis of sufficient degree to increase accident proneness, impair self rescue or materially reduce work efficiency. The STEL should be considered a maximum allowable concentration, or absolute ceiling not to be exceeded at any time during the 15 minute excursion period. No more than four 15-minute exposure periods per day are permitted, with at least 60 minutes between exposure periods, provided that the daily TWA-STEL is not exceeded.
 - 3. Ceiling – TLVC – is the exposure concentration that should not be exceeded.

None of the limits mentioned here, especially the TWA-STEL, should be used as engineering design criterion or considered as an emergency exposure level (EEL).

VI. POTENTIAL ENVIRONMENTAL (WORKPLACE) EXPOSURE

Hazards encountered in the workplace may consist of, but are not limited to:

- A. Chemical – workplace supplies such as inks, correction fluids, toners, solvents and cleaning solutions.
- B. Physical – tripping hazards, repetitive motion injuries (RMI), cuts, strains.
- C. Biologic – arthropods and vermin and their excrement, body parts and/or bodies, viruses, bacteria and fungi.
- D. Ergonomic – refer to General Information Document number 2005.

**GENERAL INFORMATION ON INDUSTRIAL HYGIENE
DOCUMENT NUMBER: 2008**

VII. REFERENCES

1. American Conference of Government Industrial Hygienists (ACGIH)
1330 Kemper Meadow Drive, Cincinnati, OH 45240
(513) 742-2020 mail@acgih.org www.acgih.org
2. American Industrial Hygiene Association (AIHA)
2700 Prosperity Ave., Suite 250, Fairfax, VA 22031
(703) 849-8888 infonet@aiha.org www.aiha.org
3. American National Standards Institute (ANSI)
1819 L Street, NW, 6th Floor, Washington, DC 20036
202 293-8020
Or
25 West 43rd Street, 4th Floor, New York, NY 10036
(212) 642-4900 info@ansi.org www.ansi.org
4. National Safety Council – San Francisco Chapter
303 Twin Dolphin Drive, Suite 520, Redwood City, CA 94065-1409
(800) 544-1030 or (650) 508-8787 sanfrancisco@nsc.org www.nsc.org
5. U.S. Department of Labor
Occupational Safety and Health Administration
200 Constitution Ave.
Washington, D.C. 20210
Or
Region IX
71 Stevenson Street, Room 420
San Francisco, CA 94105
415) 975-4310 www.osha.gov

VIII. GLOSSARY

Acute – acute health effects are those that are typically of a sudden onset and severe. Acute exposure is one of a short term.

Allergen - any substance capable of inducing an allergic response or specific hypersensitivity.

Anesthetic – any substance that promotes the loss of feeling or sensation.

Asphyxia – suffocation due to lack of oxygen in respired air.

Ceiling Limit (C) – the upper limit of an airborne toxic substance that should never be exceeded.

Chronic – persisting over a long period of time.

Debilitating – causing lack or loss of strength, making febrile, enervating

Disease – a degenerative process as a result of infection or environmental stress, affecting either part of or the entire body characterized symptomatically.

Dust – fine solid particles of matter resultant from physical manipulation of organic or inorganic materials.

GENERAL INFORMATION ON INDUSTRIAL HYGIENE
DOCUMENT NUMBER: 2008

VIII. GLOSSARY - continued

Epidemiology – the study of the relationship between disease and its causes, frequency and distribution.

Ergonomics – a.k.a. human engineering is a multidisciplinary science dealing with people and their surroundings. The purpose of ergonomics is to allow the person to interact with their environment in an efficient and non-stressful manner.

Fibrogenic – conducive to the development of fibers.

Fume – a suspension of airborne particulates typically less than one micron in diameter, formed as the result of the evaporation of solid materials.

Gas – one of the four states of matter distinguished by very low density and viscosity and unlimited expansion.

Insidious – having a gradual, subtle and often cumulative effect.

Ionizing Radiation – alpha, beta, gamma, neutron or x-rays.

Liquid – one of the four states of matter distinguished by non-compressibility, free flow of the constituent molecules without the tendency to separate and fluidic movement.

Malignancy – a tendency to progress in virulence.

Mist – airborne suspended liquid droplets.

Narcosis – a condition characterized by insensibility or stupor caused by a chemical agent.

Nuisance – a prolonged irritant.

Organ – a segregated collection of specialized tissues that performs a specific function or functions for the body.

Permissible Exposure Level (PEL) – an exposure limit established by OSHA for exposure to hazardous materials.

Qualitative – relating to quality or kind.

Quantitative – relating to the measurement of quantity or amount.

Short Term Exposure Level (STEL) – a 15-minute time-weighted average exposure that should not be exceeded at any time during the work day.

Stress – a biological, physical, mental or otherwise environmental factor that when subjected to a body, is manifested in a negative physiologic response.

Threshold Limit Value (TLV) – time-weighted exposure limits: TLV-TWA, TLV-STEL and TLV-C.

Time Weighted Average (TWA) – the exposure level to a hazardous material averaged out to an eight hour work day or a 40 hour work week.

Vapor – the gaseous state of a substance that is a solid or liquid under standard temperature and pressure.