

General visitors

FEBRUARY 194

National Safety News

PLAINTIFF'S EXHIBIT

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NATIONAL SAFETY NEWS



Published Monthly by the
National Safety Council

FEBRUARY, 1948

Vol. 57, No. 2

ARTICLES

THE COVER: To remind employees that the office has its hazards, too, the Wisconsin Power and Light Company, Madison, Wis., staged this scene. The victim of the "accident" is Miss Margaret Kelly, receptionist, in the company's Sales Department.

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CARMAN FISH, Editor

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NORVAL BURCH, Associate Editor

RALPH MOSES, Art Director

BILL ANDREWS, Editorial Director

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In This Issue . . .

Many a poster idea can be blown up into a life-size, animated display — one that people simply can't ignore. Here are some excellent examples that are outstanding because the cleverness of the idea hasn't obscured the safety message. (Page 18).

Fume and dust exposures are problems in many industries. This article discusses some of the more common exposures with an appraisal of the hazards. (Page 20).

Placement tests, like all procedures involving the human element, are not infallible but they do prevent many occupational misfits, some of whom would be serious hazards in certain jobs. Here is a summary of recent developments in this field by a well-known authority. (Page 22).

Fatigue may result from one or more of a vast number of causes, concerning both the individual and his environment. Here are some new angles to the subject presented from the medical point of view. (Page 26).

More problems confront the hero of our safety engineer's diary as an unsympathetic boss reminds him that the deadline for showing results is getting closer. (Page 29).

Improvised fire-fighting equipment, supplementing standard apparatus, gave a good account of itself in the forest fires in Maine last October. The idea is applicable to many locations. (Page 30).

Rewarding employees for safe work is sometimes considered in the same class as paying a youngster to be good. But in both cases incentives can be used to advantage, and recognition means more than the cash value of the reward. The Industrial Safety Panel discusses this old and controversial subject. (Page 34).

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New York 17. Western Office—
111 Sutter Street, San Francisco

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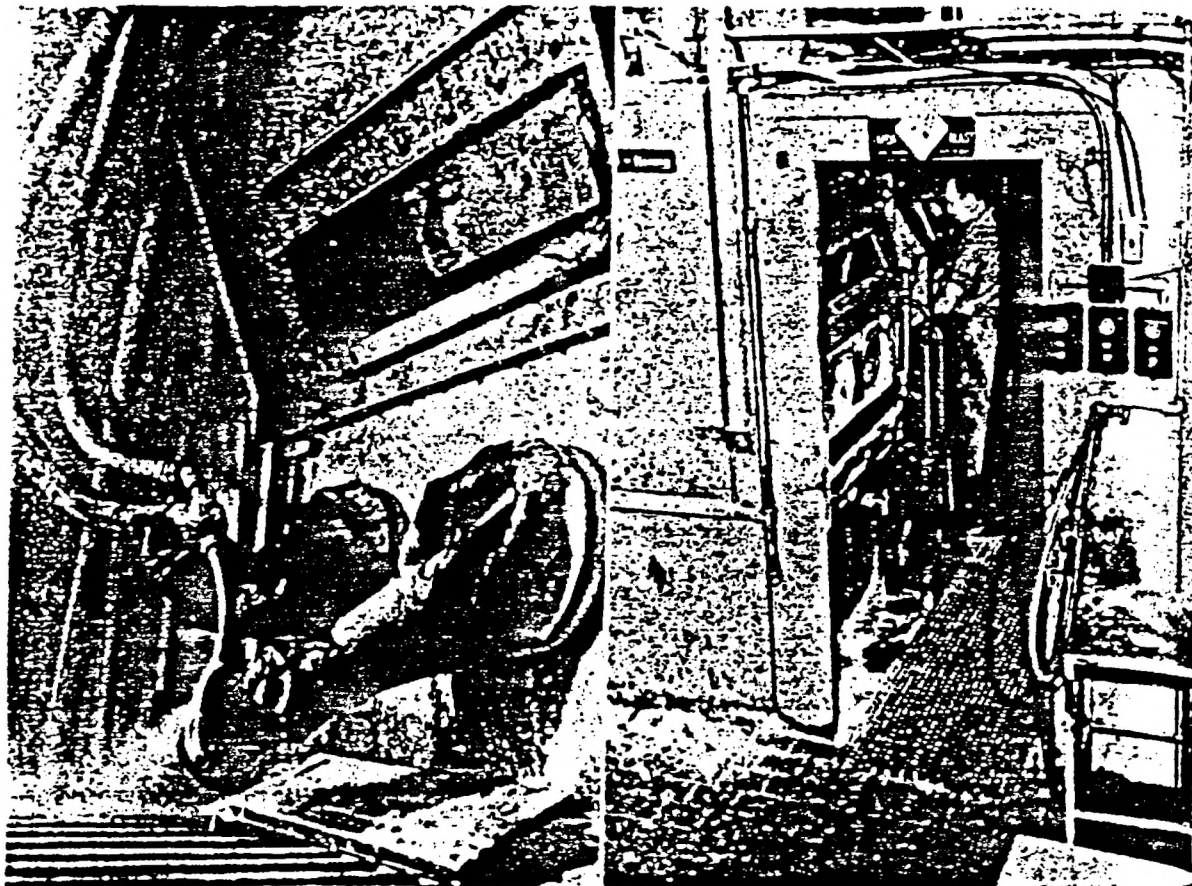
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Recognition and Control of

Fume and Dust Exposure

By V. J. CASTROP

RESPONSIBILITY for employee health is delegated by management to the medical director, while the safety director is charged with accident prevention activities. For the smooth functioning of either department, it is necessary that these individuals work in harmony.

The safety engineer spends much of his time in the plant and usually is well informed about working conditions. The doctor, on the other hand, must spend most of his time tending to the medical needs of the employee

and to the administrative work of his department. As a result, he has insufficient time for plant surveys. This is particularly true in plants where the doctor is employed on a part-time basis.

A safety engineer who is capable of recognizing conditions which may be detrimental to health is an excellent team mate for the doctor in a health maintenance program. The safety engineer need not be capable of actually sampling air in the environment or designing a ventilation system for the control of toxic materials. He should, however, have knowledge of the materials which have been proved harmful, and should have some understanding of basic control measures.

The safety engineer, as well as the

doctor, should be informed as to where he can obtain the technical personnel to do the sampling and detailed study of the environment and engineering personnel to render assistance in the control of exposure. Such assistance may be obtained from the industrial hygiene divisions of either the health or labor departments of many states. Some city governments likewise have industrial hygiene bureaus.

In addition to these governmental agencies, many insurance carriers have on their staffs men who are capable of sampling and rendering engineering assistance. Private consultants are also available, or you may find that an industrial hygienist is employed by your own organization.

V. J. Castrop is Assistant Head, Industrial Hygiene Department, Research Laboratories Division, General Motors Corp., Detroit, Mich. This article has been condensed from a paper presented at the Automotive and Machine Shop Section, 35th National Safety Congress.

Inside and outside views of vapor blasting equipment. Fine silica and water under pressure are used. Cabinets must be maintained so that leakage of mist does not occur.

Local exhaust ventilation of soldering operations.

This discussion will be limited to basic principles of industrial hygiene as they relate to fume and dust exposures, to indicate what control measures are available or used to protect the employee's health, and to call attention to operations and materials which are commonly used in industry, at the same time indicating generally accepted opinion as to their effect on health.

Many conditions are improved for reasons other than their effect upon health. Better products, better employee relationship, reduction in maintenance of equipment may be cited as justification for management's decisions for such correction.

Definitions

Laymen frequently designate as "fume" any vapor, fog, gas, etc., they may encounter. In industry, the plating mist over a chrome tank, the vapor or gases, at a metal-cleaning operation or the exhaust gases from a truck are frequently referred to as "fumes." To the industrial hygienist, the term has a more definite mean-

ing. For this discussion, fume may be considered to be particulate matter formed by the condensation of a vapor. A molten bath of lead at a high temperature causes the metal to volatilize and form a vapor. Upon contact with the cooler surrounding atmosphere condensation occurs and the physical state changes from vapor to a solid metallic particle.

While dust is also a solid particle, it is formed by the disintegration of solid materials by grinding, crushing, abrasion, or similar action.

Fume particles are generally small in diameter, with the size dependent upon the type of fume, the extent of flocculation, and other factors. Dust particles of hygienic significance are those between one and ten microns

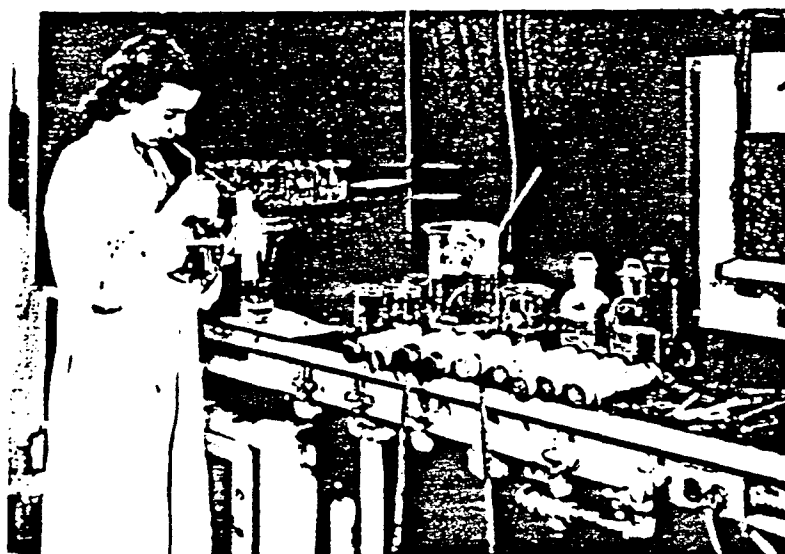
in size. (25,000 microns are equivalent to one inch).

Generally speaking, there are two means of entrance of toxic compounds into the human body—by ingestion or via the respiratory tract through inhalation of fumes, dusts, mists or gases. Ingestion is of importance if toxic materials which have a systemic effect are used and adequate washing facilities are not provided, or, where the employees are slovenly in personal habits.

Inhalation is considered the most important portal of entry of fumes or dusts and the particle size, therefore, becomes significant in evaluating exposure. The particles which cause the physiological changes are those which are small enough to remain suspended in the air and not those which immediately fall to the floor. Flying particles, which may cause eye injuries are not of hygienic significance since they are not of respirable size. To judge the seriousness of an exposure by the quantity of detritus adjacent to an operation is often misleading. This is especially true where mechanical ventilation removes the fine material but is inadequate to trap or convey the larger particles.

In evaluating an exposure it is necessary to consider the toxicity of the material, the duration of the exposure, the average concentration of the contaminant with special attention being paid to those operations which produce high concentrations at some phase of an operating cycle, and the measures which have been provided

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Fume and Dust Exposure

—From page 21

to control the exposure. Medical records of the individuals subjected to the exposure may be of value if the examinations are thorough and frequent and not of a cursory type. It must be remembered that occupational diseases are slow in development and in some instances lasting in effect. Slow changes may not be detected, and the mere fact that cases have not occurred does not mean that exposures to known toxic materials may be ignored.

Determination of the concentration of the toxic material in the air is important in evaluating the exposure. Tests of this type are indicative not only of the degree of contamination but also, in some instances, which operation is the major offender.

The apparatus used in collecting the contaminant and the method used in estimating the amount present in the atmosphere vary with the type of material. Tests of this type are specialized in nature and are beset with many pitfalls which can lead to erroneous conclusions if done by inexperienced personnel.

Permissible Limits

In a discussion pertaining to toxic materials it is generally necessary to quote permissible concentrations, or as it is sometimes expressed—maximum allowable concentrations—permissible limits, or threshold limits. These terms are used extensively by industrial hygienists to indicate concentrations of a substance in the air which are considered compatible with good health. The limit usually applies to exposures of eight hours duration for a prolonged period.

The limits are, for the most part, advisory standards or bench marks which are practical to meet. In general, these limits are derived from three types of evidence all of which have value and limitations.

1. Animals have been exposed at different concentrations and the effects noted.
2. A few experiments have been made on human subjects for short periods of time.
3. Safe limits have been arrived at by measuring the concentrations of substance in the workroom air and correlating this information with results of medical examinations of workmen.

The mere fact that these limits are exceeded does not necessarily mean that someone will become definitely ill. But there is a good probability that someone will suffer ill effects if the limit is greatly exceeded for a considerable period. There remains much to be learned regarding the toxicity of many substances used in industry.

So much for the general picture. Now let's look at some specific operations.

Welding

Welding processes most commonly used can be divided into three types, arc, gas, and resistance. The safety measures pertaining to clothing, goggles, and helmets are of common knowledge and will not be considered here.

Arc welding when performed on uncoated steel does not produce a condition considered harmful to the welder, provided it is done in a comparatively large open area. The fumes which result from welding consist essentially of the oxides of iron and oxides of metals which may comprise the steel or coating of the welding rod. Some investigators have found characteristic markings on chest x-rays of men who have welded under severe conditions for long periods of time. These markings are presumably due to the deposition of iron fumes within the lungs, but it has not been demonstrated that such fumes have caused physical impairment.

A frequently suggested limit for welding fume is 15 milligrams of iron oxide per cubic meter of air. Concentrations of this magnitude existing in the workroom would materially reduce visibility and thereby become a nuisance or an unsafe condition requiring correction.

Welding within confined areas such as tanks, inside machinery or equipment, or in small rooms presents a condition which can be of concern. The concentration of fume is materially higher under these conditions as there is little opportunity for dilution by natural air currents normally present in a large shop. Nitrogen oxides formed by the electric arc when inhaled in sufficient quantities causes fluids to form in the lung—edema—

with resultant failure of the respiratory system. While welding in large open areas these toxic gases are normally not present in sufficient quantities to cause harmful effects. However, when welding is done in confined areas, the nitrogen oxides may reach a concentration which will be harmful.

Gas welding generally is not productive of harmful fumes. There are, however, in brazing two potentially harmful exposures. While boric acid or borates generally are used in brazing fluxes, some metals require fluxes containing significant quantities of fluoride compounds and fumes from these fluxes have been known to produce significant nasal irritation. Fluorides in general are looked upon with suspicion since they may produce harmful effects upon the bone structure. A limit of 2.5 mg. per cubic meter has been suggested for fluorides, but no standard has been agreed upon. Most industrial hygienists attempt to keep them as low as practicable.

Silver solder is one of the more common alloys used in brazing. Solders of this type vary in composition and may in some instances contain cadmium which, if volatilized in sufficient quantities, is considered harmful. At present the suggested limit for cadmium fume in air is 1 milligram per 10 cubic meters of air.

Resistance, spot, or butt welding of plain steel is of no concern from the physiological standpoint. The fumes arising from such operations generally are caused by the volatilized oil which has come upon the metal stock during previous operations or has been placed upon the metal as a rust preventive.

The preceding discussion of welding operations has been based upon the assumption that the metals being welded are of plain steel. The performance of welding operations, either arc, gas, or resistance, upon metals which have been coated with such toxic materials as lead, cadmium, or mercury may cause harmful exposures. The heat of the flame or of the arc causes volatilization of these metals. Welding or cutting of terne plate or other metals containing significant quantities of lead can result in the volatilization of lead fume which if inhaled for a sufficient period of time, may result in lead absorp

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Burlington Mills Corp.

Bristol Weaving Co., Bristol, Tenn.
—January 19, 1940, to date; 360 employees; 6,218,430 man-hours as of December 17, 1947. A plaque and flag are awarded for each million man-hours without a disabling injury. (Rayon weaving).

The Firestone Tire and Rubber Co.

Akron Mechanical Shop—November 12, 1946, to date; 2,000,000 man-hours as of December 22, 1947.

New Orleans Public Service Inc.

New Orleans, La.,—Mechanical Operation Section, Power Division, Electric Department—May 17, 1944, to date; 51 employees; 500,000 man-hours as of December 31, 1947.

Fume and Dust

—From page 52

tion and ultimate poisoning. The cutting or welding of surfaces which have been coated with paint containing lead has caused lead poisoning.

Welding of cadmium plated material was attributed as the cause of illness and even death to a number of individuals during the war. The reported cases indicated that death occurred in a comparatively short time after the exposure.

Welding of galvanized metal causes the volatilization of the zinc coating. Temporary discomfort associated with metal fume fever may result from such exposure.

Where warranted, control of welding fumes is generally accomplished by providing a mechanical ventilation system. The type of ventilation used is dependent upon the nature of the welding. When the object to be welded is positioned in a fixture or jig it is possible to obtain effective control of the fumes by the use of a grill, side hood, or flexible duct near the source of fume. If the parts are large and it is necessary to weld more than a foot from a fixed point, it is difficult to obtain good control of the fume with reasonable air volumes through a system using flexible ducts.

Since the effective range of most flexible ducts is approximately eight inches from the dust opening, it is necessary for the welder to move the duct whenever the arc is outside this range. The practical result is that

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ELIMINATE THIS

ACCIDENT REPORT

Joe Smith, Lathe Dept., slipped on oil splash, tore knee ligaments—Compensation claimed.
Mary Rocco, scrub woman, fell on wet floor, dislocated hip—Compensation claimed.
Pat Ryan, Receiving Dept., slipped on wet platform, broke wrist—Compensation claimed.

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most ducts are normally not moved and the ventilation system does not remove the fumes. According to reports, this type of system has been effectively used in shipyards for the control of welding fumes in confined areas. In view of this experience it should therefore be a satisfactory means of control for welding fumes in tanks. However, supervision and education are necessary to make such systems effective.

Where the room volume per welder is large, natural ventilation within the plant is usually sufficient to prevent accumulation of excessive concentration of fumes from plain steel

welding. Circulating fans directed from the side help to dilute the fume which may be concentrated in the breathing zone of the welder.

Another means of control is the use of personal respiratory equipment. Air line respirators and fume respirators have been developed which will provide adequate protection. Some manufacturers have on the market welders' helmets with facilities for providing fresh air to the wearer. Use of this type of equipment has been limited. Since the welder is already burdened with helmet, goggles, and protective clothing he probably will not be receptive to

a respirator. It is sufficient in most welding for the employee to wear an ordinary helmet and to arrange the position of the work so as to prevent the concentrated fume from flowing under the helmet.

Dry Grinding

Dust resulting from the grinding of nontoxic metals which are free of sand is generally considered a nuisance and is not harmful *per se*. Despite this fact some state laws require grinding operations to be ventilated. This requirement has probably been a holdover from the days when sandstone wheels were prevalent and also to prevent the creation of a nuisance condition. Grinding wheels in use in industry have artificial abrasives, such as aluminum oxide or silicon carbide. Emery, a natural product composed essentially of aluminum and magnetic oxide of iron, may also be used. A permissible limit of 50 million particles per cubic foot of air for aluminum oxide and silicon carbide was recently accepted by the members of the American Conference of Governmental Industrial Hygienists. Such a limit is liberal and concentrations of such magnitude are normally not encountered.

When lead, silica, or some similar toxic material comes in contact with the grinding wheel the exposure to the abrasive matter may be ignored and the exposure evaluated on the basis of the toxic material. If this latter material is controlled, the nuisance will also be eliminated.

Ventilation systems for grinding wheels have been fairly well standardized and generally are satisfactory to prevent a nuisance. Hoods should enclose the wheel as completely as is practicable. Air volumes should be sufficient to cause an inward flow into the hood when using the smallest wheel. This is especially true where toxic materials are involved.

Wet Grinding

Baffles, hoods, and guards are generally located near wet grinding wheels to prevent dispersion of the liquid used as a coolant. These devices are usually sufficient to control the dust if it is nontoxic in nature. If the dust liberated is toxic, mechanical exhaust ventilation may be required.

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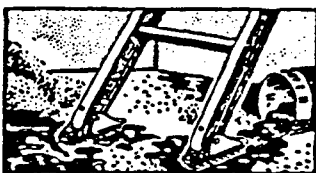
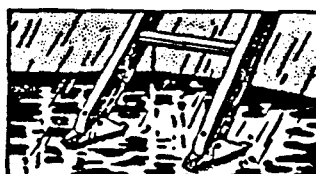
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