



ACCIDENT PREVENTION

MANUAL

FOR INDUSTRIAL OPERATIONS



PLAINTIFF'S
EXHIBIT
B&R-108

in suspected cases of poisoning from exposure to zinc, these other toxic elements should not be overlooked.

The only significant physiological effect of zinc appears to be metal fume fever. Although of transient character the fever, chills and sweating may be sufficiently severe to cause disability of one or two days' duration. The salts of this metal have an irritant effect on the skin.

Zirconium. No evidence of poisoning due to this metal has been reported. There are, however, certain fire and explosion hazards associated with the handling of the powdered metal and its hydride.

Industrial poisons (Radio-active elements)

Radium, thorium, uranium, radon, x-ray
(See section on radiation, Page 459.)

Industrial poisons (Metalloids)

Antimony. The action of antimony is similar to that of arsenic and lead, but not so severe. Antimony can be very irritating to the skin and mucous membranes. Systemically, it resembles lead in its gastro-intestinal effects, but it usually causes diarrhea instead of constipation. In suspicious cases both lead and arsenic must be ruled out.

Arsenic. A frequent industrial health hazard results from the arsenic sulfide contamination of the ores of heavy metals. Arsenic compounds also have wide application in a number of industries. Whenever contact with acid occurs, there is a possibility of arsine being formed.

Such formation is to be guarded against in the cleaning of tank cars which have contained concentrated hydrochloric or sulfuric acid. Arsine is extremely poisonous, completely destroying the red blood cells in a relatively short time.

Manganese. The most frequent source of manganese poisoning is in ore handling, especially in the dusty operations of separation and grinding. Disturbances of the central nervous system similar to those of paralysis agitans occur, progressing from general muscular weakness, tremors of the extremities, spasticity, emotional upsets, speech peculiarity, mask-like expression, and ultimately complete disability.

Phosphorus. Formerly frequent in the

figuring phosphorus poisoning is now seldom seen. It has been eliminated by change from the poisonous white form to the innocuous red phosphorus. The poisoning is always chronic.

Exposure to phosphine (phosphorus trihydride) may occur rarely in pickling operations and in the manufacture of ferrocon. This gas causes respiratory and gastro-intestinal disturbances, general weakness and, if the exposure is great, convulsions.

Selenium. Of increasing industrial application, selenium and its soluble compounds are systemic poisons and irritants to the skin and mucous membranes.

Tellurium is similar to selenium in effects and symptoms.

Industrial poisons (Non-metals)

Boron. Compounds of boron are toxic but no industrial poisoning has been reported.

Carbon disulfide, a widely used solvent is a strong nerve poison if absorbed continuously.

Chromium. *Chromic acid, chromate and dichromate salts* are extremely irritating to the skin, eyes and all mucous membranes.

Silicon. The dioxide, so-called "silica," is the cause of a fibrotic disease of the lungs which, if it progresses, will eventually limit the respiratory function.

Exposure for long periods (usually years) to excessive concentrations of finely divided dust containing high percentages of free silica are followed by the characteristic symptoms of this lung disease. Tuberculosis frequently follows. *Asbestos* causes a similar disability.

Sulphur is not a cause of industrial poisoning, but it may produce skin irritation. Some of its compounds, for example, *hydrogen sulfide*, are extremely toxic. It is not only irritating, especially to the eyes, but it has a marked systemic effect in producing paralysis of the respiratory center.

Hydrogen sulfide may be produced in many industries where sulphur-containing compounds, especially sulfides, come in contact with dilute acids. *Sulfur dioxide*, a common result of gas and coal combustion,

Titanium
these elements have been used to

Industrial (Gases)

Oxygen
oxygen but it is dangerous to the

Hydrogen
is of industrial nature. it may be carried

Nitrogen
as an inert gas. It is not very toxic. It is a simple asphyxiant. Nitrogen is not irritating.

The danger comes in during operations where the worker is not considered. The respiratory system may be affected. Nitrogen is not irritating.

Of the gases, carbon monoxide is the most dangerous. It is a simple asphyxiant. It is not very toxic. It is a simple asphyxiant. It is not very toxic. It is a simple asphyxiant.

Acid hydrogen dioxide
hydrogen dioxide has been reported

REDACTED

Substance	Flash point ° F.	Explosive limits % by volume		Ignition temperature ° F.	Probable safe concentration for 8-hr. exposure	Usual mode of entrance to body	Signs and symptoms of poisoning
		Lower	Upper				
antimony (salts)	metal and sulfides flammable				unknown, probably like arsenic	inhalation of dust, ingestion	<i>Acute:</i> vomiting, colic, diarrhea, irritation of mouth and throat. <i>Chronic:</i> indigestion, loss of weight and appetite, sometimes severe dermatitis.
arsenic					0.15 mg./cu.m. ^a	inhalation of dust, ingestion and direct action on skin and mucous membrane	Irritation of skin, loss of hair at nails, perforation of nasal septum, hoarse voice, cough, neuralgia, pains, diarrhea.
arsine					1 p.p.m. ^a	inhalation	Headache, nausea, vomiting, chill and shivering, jaundice, dark or bloody urine.
asbestos		non-flammable			5 million particles per cubic foot ^b	inhalation	<i>Chronic:</i> shortness of breath, as- bestos corns.
barium (compounds)	peroxide, chlorate, and nitrate produce violent combustion in flammable materials				none adopted	inhalation or ingestion of soluble salts, direct action on skin	Severe dermatitis from the caustic salts, vomiting, dyspnea, abdom- inal pain, cyanosis, paralysis.
benzene (benzol)	12	1.5	8	1000	100 p.p.m. ^a	inhalation	<i>Chronic:</i> weakness, fatigue, bleed- ing from the gums and nose, head- ache, dizziness. <i>Acute:</i> inebriation, convulsions, and loss of consciousness.
bromine					1 p.p.m. ^a	inhalation direct attack on skin and mu- cous membranes	Irritation of eyes and respiratory tract, irritation and corrosion of skin, probable lung irritation in acute cases.

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