

HOT WORKING OF METALS

maximal acceptable concentrations, and physiological effects of these materials. Also see Chapter 41, "Table of Chemical Hazards," for summaries of their physical properties.

Dust is generated in many foundry processes and presents a two-fold problem: cleaning to remove deposits and control at the point of origin to prevent further accumulation.

Some foundries have found water under pressure or mixed with steam to be a good cleaning agent. A combination water and compressed air hose with a special nozzle also does a good job. With this method, however, workers should wear approved respirators. In any case, water cleaning should not be done during or immediately before melting and pouring. These operations should be started only after all equipment has been allowed to dry thoroughly.

Vacuum cleaning is probably the most satisfactory method used for dust removal in foundries, and the special equipment needed is well worth the investment.

Once dust has been removed, further accumulation can be prevented by local exhaust systems (Fig. 27-1) which remove it at the point of origin. Installations which follow the recommendations of Chapter 28, "Local Exhaust Systems, General and Comfort Ventilation," will control dust effectively.

Solvents include many different substances, each of which must be evaluated on the basis of its chemical ingredients. Proper labeling, limitations on quantities in use, and other methods of control as detailed in Chapter 39, "Industrial Hygiene," can help minimize the toxic and flammable hazards involved in solvent use.

Acrolein occurs in foundry operations as a result of the thermal decomposition of core oil.

Aluminum is not usually a toxic hazard in casting processes, but does present a fire and explosion hazard in dust-collecting systems.

Antimony is usually an unimportant contaminant in foundry operations.

Beryllium may produce a typical pulmonary disease, such as reported in one plant casting a 1 per cent beryllium-copper alloy.

Carbon, as sea coal, is a common ingredient of molding sand used for facing. Carbon dust may cause anthracosis, which produces characteristic lung shadows in an X-ray, but is a relatively harmless condition.

Carbon monoxide is generated during some cycles in the operation of a cupola.

Chromium is encountered in stainless steel casting as the element or the oxide. Exposures occur during melting, gate and head burning, and grinding.

Fluorides, sometimes in the form of cryolite (sodium aluminum fluoride), are used in the manufacture of ductile iron and magnesium castings.

Iron oxide fumes and dust are created during melting, burning, pouring, grinding, welding, and machining of ferrous castings. Exposure may be particularly high where manganese steel castings or oxygen-lancing of the furnace is involved.

Lead is the greatest health hazard in non-ferrous foundries. It forms the oxide in melting, pouring, and welding operations. Elemental lead dust is produced in cleaning and machining operations.

Magnesium dust or chips create serious fire and explosion hazards. Physiological effects are confined to a form of "metal fume fever" from the inhalation of finely divided magnesium.

Manganese is usually associated with steel castings and bronze alloys in foundry work and presents no special control problem.

Phosphorus is used in the production of phosphor-copper. Acute cases of poisoning have not been reported and chronic cases are rare. The drying of phosphor-copper shot may produce phosphine gas.

Resins—phenol-formaldehyde and urea-formaldehyde—are used in shell molding and create several hazards. The phenol-formaldehyde type contain hexamethylenetetramine ("hex") which is a skin irritant and highly explosive. This type of resin also decomposes on heating to give a mixture of phenol and formaldehyde vapors. Urea decomposes to give ammonia and carbon dioxide. In practice, however, fumes from resins are a nuisance, because the concentrations needed to produce toxic effects cannot usually be tolerated by man.

Resin dust, especially "hex," is highly