

Principles of Materials Handling and Storing

walk beneath them, drip pans should be installed and provided with drainage to a safe disposal or recovery location

Tanks should be provided with permanent stairs or ladders and walkways with standard guardrails and toeboards. Tanks should be emptied, cleaned, and inspected for structural weaknesses at regular intervals, and records kept of each inspection.

Tanks for holding volatile materials should be bonded and grounded, and provided with emergency venting devices. Venting should be in accordance with provisions of the *Flammable and Combustible Liquids Code*, NFPA Standard No. 30. If tanks are inside buildings, vents should discharge outside the building at a location free from any ignition source. Be sure to consider the effects of corrosion on venting devices for tanks that will contain corrosive liquids.

Connections for filling and emptying tanks are preferably made through the top to minimize liquid loss and the possibility of injury from a broken fitting. Fill lines should be plainly labeled and be equipped with a drain. Use of compressed air is not permitted for the transfer of flammable or corrosive liquids, according to NFPA Standard No. 30, paragraph 8331.

Cleaning tanks is an exceedingly dangerous operation. An exact and specific procedure should be set up, preferably in written form, and strictly adhered to. Specifications for tank-cleaning procedure are set forth in NFPA Standard No. 327, and API publications RP 2015 (see "References").

The procedure should be modified for toxic compounds only to the extent that more complete protective equipment may be required. Liquid aromatic nitro-compounds and amines are solvents for rubber and are absorbed through it gradually as well as through the skin. For such exposures, personal protective equipment should be made of one of the inert synthetic rubbers or plastics. (This includes gloves, aprons, boots, respiratory- and eye-protective equipment.)

The handling of phenolic compounds such as carbolic acid, cresylic acid, and the cresols requires precautions against skin absorption, although these compounds are not such effective rubber solvents as the nitro and amino compounds.

To prevent pumps from being primed with

dangerous liquids where connection is made through the top of a tank, self-priming pumps or pumps that generate enough suction to lift the liquid from the bottom of the tank should be used.

Pipelines for carrying chemicals are preferably installed in trenches or tunnels. If they must be installed overhead, they should be isolated so that they will not drip on men working underneath. Pipelines for carrying flammables should not be installed in tunnels.

There are three major sources of chemical injury in pipeline work:

- **FAILURE OF PACKING IN VALVE STEMS OR OF GASKETS IN BOLTED FLANGES** To minimize injuries from valve packing failure, the valve stem can be surrounded by a sheet metal box or hood which will deflect spray away from the man operating the valve. So far as possible, packing should be renewed without pressure on the valve.

- **OPENING THE WRONG VALVE** To prevent injuries and accidents from this source, pipelines and valves should be identified by tags, lettered markings and distinctive colors. (See the next section, "Identification of piping.") It is also desirable to have valves well separated and the immediate area well lighted to assure quick and easy identification.

- **FAILURE TO ASSURE THAT VALVES ARE CLOSED AND LOCKED AND THE LINES DRAINED BEFORE TENSION IS RELEASED ON FLANGE BOLTS** The opening between the faces of the flange may be temporarily covered with a piece of sheet lead while the flange bolts are being loosened and the faces separated.

The bolts farthest away should be loosened first so that drainage will tend to go away from the workman. Blinds should be inserted in the flanges as soon as they are opened.

For lines which are opened often, blinds permanently pivoted on a flange bolt, one end acting as a gasket and the other as a blind, can be used.

At the conclusion of a job on a pipeline containing corrosive chemicals, tools and personal protective equipment should be thoroughly washed with a reagent which will