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, gloves, aprons, boots, and other personal protective equipment should be made of one of the inert synthetic rubbers or plastics

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

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

I 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

II 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

III 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 neutralize or remove the corrosive material, and rinsed in clear water before the equipment is removed and the tools returned to storage

Identification of piping Distinctive colors for identifying piping have been standardized in American Standard A13 1, *Scheme for the Identification of Piping Systems*, and are described in Chapter 14, "Industrial Buildings and Plant Layout," in the section titled "Lighting and Use of Color"

Specific identification of piping should be provided by a lettered legend which names the material being piped, summarizes the hazards involved, and gives directions for safe use Stencils or decals may be used to apply legends

Legends should be in accordance with MCA Manual L-1,* be moisture-resistant, and contain pigments that are color-fast

Portable containers Where liquid chemicals are used in quantity, it is generally better to install pipelines and outside storage tanks than to use portable containers Spillage is then reduced and localized so that it is easier to take necessary precautions

Portable containers such as drums, barrels, and carboys should be correctly stored The minimum of liquid should be kept at the point of operation, only enough for one shift is a common rule The main stock should be stored in a safe, isolated place

If the liquid is corrosive or highly toxic, the storage area should be isolated from the

*Manufacturing Chemists' Association, 1825 Connecticut Ave NW, Washington, D C. *Guide to Precautionary Labeling of Hazardous Materials* Manual L-1