

cleaning procedures and other precautions.

Small tanks and drums should be cleaned and steamed in an open-faced building with ample roof ventilation. It is even preferable to clean them in an outside area free from ignition sources. Pipes and nozzles should be electrically bonded to containers being steamed.

Covers, plugs, and valves should first be removed and the tank or drum permitted to drain into a container. The inside should be examined for rags, waste, or other debris that might interfere with draining and retain flammable vapors. Only lights approved for use in the *National Electrical Code* Class I, Division I, Group D hazardous locations should be used for this inspection; see explanation in the previous chapter. Mirrors can sometimes be used to reflect daylight inside for this purpose.

**Steaming.** Steaming, hot chemical wash, water filling, and use of inert gas are among the common methods for cleaning and vapor-freeing small tanks and drums. If the inside of the container is clean and steam is available, the easiest method is to steam it. (See American Welding Society, *Safe Practices for Welding and Cutting Containers That Have Held Combustibles*. Also see NFPA Standard 327, *Cleaning or Safeguarding Small Tanks and Containers*.)

The tank or drum, placed on a steam rack or over a steam connection with the outlet holes at the lowest point, should be allowed to drain. The tank or drum should rest against a steam pipe or should be bonded. An ample supply of live steam should then be applied for a period of not less than ten minutes.

The inside of the drum should be washed with hot water and, after being cooled, tested with a combustible gas indicator. If the drum tests vapor free, hot work repairs can then proceed. If not, it should be cleaned and steamed further. It is sometimes advisable to mark the drum to signify that it is vapor free.

If steaming will not clean the tank or drum, a cleansing compound of sodium silicate or trisodium phosphate (washing powder) dissolved in hot water and kept at a temperature of 170 to 190 F should be used. Hot water should be added to overflow the con-

tainer until no appreciable amount of volatile liquid, scum, or sludge appears.

Exceedingly dirty containers may require a caustic soda solution (except aluminum and zinc coated drums in which caustic soda may generate hydrogen), agitated enough to ensure that interior surfaces are thoroughly cleaned. They can then be drained, washed, and steamed.

If steam is not available to heat the water, a cold water solution with an increased amount of cleansing compound can be used. The solution should be agitated to ensure cleaning.

To guard against burns, especially when they are using steam, hot water, and caustic soda, workmen should be protected with suitable clothing, such as boots, gloves, face shields, and rubber aprons.

Because of its low ignition temperature, drums that have contained carbon disulfide should not be steamed. They should be made vapor free with a cleansing compound, and then gas tested.

Small tanks can be made safe by means of an inert gas, but this method is not generally considered as safe as steaming.

Portable inert gas generators are available for special jobs, but they should be used only by well qualified men who can produce proper atmosphere and safeguard against fire or explosion.

Carbon dioxide and nitrogen are sometimes used to make small tanks and drums that have contained flammable liquids safe for hot work repairs.

When an inert gas like carbon dioxide or nitrogen is used, the tank or vessel is washed as free as possible of flammable liquids and flushed thoroughly, so that the vessel overflows. As much water as the repair work will permit should be left in the tank, and carbon dioxide should be introduced to produce a concentration of not less than 50 per cent by volume, except that if the tank has contained hydrogen or carbon monoxide, 80 per cent concentration is required.

Nitrogen concentrations should be 60 per cent or higher, depending on the previous contents of the container.

#### **Abandonment of tanks**

Tanks to be *permanently* abandoned should be thoroughly washed out and made safe.