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Statement on Welding and Cutting Containers

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Abstract (verso)

Abstract: This statement is intended to help prevent accidents that may occur when welding or cutting on containers. Definitions are presented, followed by determination of hazardous substances, and preparation (a step-by-step procedure). Annex 1 outlines cleaning and inerting methods, and Annex 2 is a flow chart.

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Statement on Welding and Cutting on Containers

1 Scope

Explosions, fires and health hazards may result if welding, cutting or other hot work is performed on containers that are not free of hazardous substances, such as combustible, reactive or toxic solids, liquids, vapors, dusts and gases. No container should be presumed to be clean or safe, but containers can be made safe for work, provided the recommendations prescribed herein are followed.

2 Definitions

2.1 Hazardous substances

Hazardous substances, as referred to herein, include but are not limited to those that are explosive, combustible, toxic or corrosive. They may be present in a container having previously held one of the following :

(1) Volatile liquid that can release potentially hazardous flammable or toxic vapors or any combination thereof.

(2) An acid or alkaline material that reacts with metals to produce hydrogen.

(3) A nonvolatile liquid or solid that at ordinary temperature will not release potentially hazardous vapors, but will do so if the container is heated. For example, combustible vapors or hazardous decomposition products may be generated by the heat of welding or cutting.

(4) A dust cloud or finely divided airborne particles that may still be present in an explosive concentration.

(5) A flammable or toxic gas.

2.2 Coatings

Containers with metal liners and internal and external coatings or plastic, refractory and other materials should be handled carefully. The coatings or liners themselves may release vapors or fumes when heated, or liquids may be trapped between the coating or liner and the container wall. Because of the possibility of hazardous products being released and of damage to the coating, hot work on such containers should only be performed under the supervision of persons with knowledge of the container contents and of the coating or liner.

3 Determination of hazardous substances

3.1 Characteristics of contents

Before any container is cleaned, the hazardous characteristics of the substance previously held by the container should be determined. The container label should not be solely relied upon to identify its contents. When in doubt, tests should be made to determine the identity. Applying an improper cleaning method might not remove the hazardous substance from the container, or it might cause a more hazardous substance to be produced. For example, arbitrary application of rinsing and cleaning with water may leave peroxides that may explode if heat, friction or impact were applied to the container.

3.2 Unknown substances

Cleaning and welding a container that has held unknown substances should not be done since this practice involves unknown risk. If the source and content of the material in the container cannot be determined and if chemical analysis cannot be performed, the container should be disposed of in an environmentally responsible manner according to the national regulations.

3.3 Qualified supervisory personnel

Qualified personnel should designate the cleaning procedure to assure that the cleaning can be carried out safely in an environmentally responsible manner and can render the container free of all hazardous materials.

3.4 Qualified operating personnel

Cleaning of containers that have held hazardous materials should be performed only by qualified personnel familiar with the hazardous characteristics of the contents and the proper method of cleaning.

4 Preparation for welding and cutting

This section presents guidelines for ensuring that the containers and work area are safe for welding and cutting. The guidelines are intended to protect personnel and equipment by ensuring that the hazards are understood and adequate precautions are properly t-aken. The individual responsible for the work done on the container should ensure that the guidelines are followed. The following steps should be taken to ensure that the work area and container are maintained safe for welding.

4.1 Area

The immediate area outside and inside the container should be cleared of all obstacles and hazardous materials. When repairing containers in place, care should be taken to prevent entry of hazardous substances released from the floor or soil beneath the container.

4.2 Equipment

The required personnel protection equipment and fire protection equipment should be available, serviceable and in position for immediate use.

4.3 Ventilation

Ventilation should be adequate for providing a safe work atmosphere prior to and during welding. It may be necessary to test for toxic or flammable vapors and to verify that the oxygen content of the atmosphere in the work area is maintained within accepted limits of respirable oxygen concentration for breathing and is neither deficient nor excessive. Where adequate ventilation is not available, an independent source of breathing air s-hould be provided.

4.4 Pressure relief

Provision should be made to prevent pressure buildup in the container during welding. Exhaust gases and other gases produced during welding should be discharged in a safe and environmentally acceptable manner.

4.5 Cleaning

Several methods for cleaning or inerting are described in annex 1.

4.6 Isolation

The container should be isolated from further entry of hazardous substance. When work is to be performed on piping in place, valves in that line should be closed and locked out. The pipe should be disconnected and drained. The open end of the pipe sections not being worked on should be blanked off (see § 4.1).

4.7 Procedure

The procedure to be followed before any welding or cutting operation on a container is described in annex 2.

Annex 1

Cleaning and inerting methods

1 Preparing the container for cleaning or inerting

Appropriate steps should be taken to protect personnel cleaning the container against exposure to hazardous substances that may be present during the cleaning operation. Safety equipment may include, but is not limited to, an air-line respirator, appropriate cartridge respirator, rubber apron, face shield, impervious gloves, impervious boots, rain suit and safety glasses.

1.1 Container location

The container should be moved outdoors, if practical. If the container is cleaned indoors, the room should be well ventilated so that hazardous vapors will not accumulate and will be carried away from the worker's breathing zone quickly and safely.

1.2 Container contents

The container should be emptied and drained thoroughly, including all internal piping, traps and standpipes. Sludge and sediment should be removed. All residue and used cleaning agents should be disposed of in an environmentally safe manner according to the national regulations.

1.3 Container connections

The same safe practices should be used on adjacent or interconnected container compartments regardless of which compartment is to be welded.

2 Methods of cleaning and guidelines for selection

The choice of cleaning method depends upon the characteristics of the substance previously held by the container. Common methods use water, hot chemical solutions and steam. If these methods are not satisfactory, other procedures may be used, some of which are described later in this section.

2.1 Water method of cleaning

Where the substance is known to be safely and readily soluble in water, the residue can be removed by completely filling the container with water and draining several times. For example, a water-soluble acid or alkaline material may be handled this way, thus eliminating the hazard of hydrogen produced by a reaction between the acid or alkaline material and metal. Care should be taken to ensure that the flushing is thorough so that all traces of the acid or alkaline material are removed because diluted acid frequently reacts with metal to produce hydrogen where concentrated acid may not. Examples of other water-soluble compounds are acetone and alcohol. When the substance originally in the container is not readily soluble in water, the container should be treated by one of the following methods.

2.2 The hot chemical solution method

This method generally uses trisodium phosphate (strong washing powder) or a commercial caustic cleaning compound dissolved in hot water. When cleaning by this method, care should be taken to guard against injury from vapors, gases or contact with the cleaning compounds. Suitable goggles, face shield, gloves and other personal protective equipment should be used and adequate ventilation should be provided.

2.3 The steam method of cleaning

This method generally uses low pressure steam and a hot soda or soda ash solution. Solution agitation is used to flush the inside surfaces, and steam is used to promote a good cleaning action. Care should be taken to avoid injury from vapors, steam and cleaning solution. Suitable goggles, face shield, gloves and other personal protection should be used, and adequate ventilation should be provided. Where spray nozzle devices are employed, the tank and nozzle should be grounded during steam cleaning to minimize the possibility of static charge buildup and spark discharge in an explosive atmosphere.

2.4 Mechanical cleaning

Mechanical cleaning is generally used when scaly, dry or insoluble residues are left on the surface. A disadvantage of mechanical cleaning is that access must be provided for the cleaning equipment, and all contaminated areas should be visually inspected either directly or by use of optics. Access to the interior can be provided by mechanically cutting the container in half or, for large containers, cutting and opening in the shell. A cutting method requiring the application of a flame or arc to the container should not be used, nor should a method that will create sparks or other sources of ignition be used before the container is cleaned. Excessive friction heat should be grounded to minimize the possibility of static charge buildup and spark discharges during mechanical cleaning. Where openings have been cut in rubber or plastic coated containers, suitable fire protection (including internal) should be provided during rewelding to prevent or immediately extinguish fire.

Mechanical cleaning may be performed by scraping, sand or grid blasting, high-pressure water washing, brushing, filling the container 1/4 full of clean dry sand and rolling it on the floor, or any method in which the contaminant can safely be dislodged. Following cleaning, the container should be inspected and recleaned as necessary.

2.5 Chemical cleaning

Chemical cleaning is generally used when the container holds deposits insoluble in water, or when it cannot be mechanically cleaned. Care should be used in selecting a chemical solvent ; some solvents may be as hazardous as the deposits they are intended to remove. If organic solvents are used, all residue should be removed before welding or cutting begins. When selecting chemical solvents, consultation with the manufacturer of the material to be removed would be helpful. Chemical manufacturers may recommend a solvent to use and detail a cleaning procedure. Refer to Material Safety Data Sheet for additional information. An advantage of chemical cleaning is that direct access to the contaminant does not have to be provided. Disadvantages are selecting and obtaining the correct chemical, and handling and disposing of contaminated chemicals.

2.6 Combination of methods

Occasionally, combinations of all the methods of cleaning prior to welding or cutting must be used. Care should be exercised when combining some of the cleaning methods to protect personnel and prevent hazardous reactions.

3 Methods of inerting

An alternate method to provide and maintain the container in a welding condition, free from flammable or explosive hazards, is to fill it with an inert medium such as water, inert gas or sand.

3.1 Water method

When the water-filled method is used, the container should be placed so that it can be kept filled to within a few inches (25 - 75 mm) of the point where welding is to be done. The space above the water level should be vented so the heated air can escape from the container.

3.2 Inert gas method

As an alternate to the water-filled treatment, the container can be filled with inert gas. When this method is used, the qualified individual should be informed of the percentage of inert gas that must be present and how to safely produce and maintain this percentage during welding, as well as be alert to suffocation hazards.

3.3 Sand Method

Sand can be used as an alternate to displace the hazardous atmosphere inside a container. The container should be completely filled with sand before welding.

3.4 Jacketed containers

These inerting guidelines are particularly suitable for use with metal-lined jacketed containers that might be difficult to clean thoroughly.

Annex 2

IIW INFORMATION SHEET

WELDING AND CUTTING ON CONTAINERS