HAZARDOUS MATERIALS EVALUATION

INTRODUCTION

Most facilities handle some hazardous chemical substances. Even offices have materials like duplicating fluids or powders and cleaning supplies that have not traditionally been considered hazardous materials. It is important to have a program for identifying all hazardous materials, both common and exotic, and making employees aware of the hazards and the necessary precautions.

Chemical substances have various hazardous properties, such as flammability, radioactivity, toxicity and reactivity. The properties of a particular substance must be determined and evaluated before proper precautions can be established. In addition, government regulations at both the federal and state level affect the handling of many substances.

POSITION

Establish a hazardous materials evaluation program that incorporates:

- Assigning responsibility for determining the physical properties of each chemical substance handled at the facility.
- Evaluating the hazardous properties and determination of the relative hazard levels of each substance and any necessary handling precautions.
- Distributing hazard information and material handling precautions to the employees, the emergency response organization, the local fire department and others who may respond to an emergency.
- Establishing methods for developing process hazards evaluations. (See *OVERVIEW*, Section 13, Hazard Identification and Evaluation [PRC.1.13.0].)
- Determining what state and federal regulations affect the handling, storage, use and disposal of materials handled.

DISCUSSION

Traditionally, materials that were highly flammable, reactive or toxic have been recognized as hazardous materials. However, many materials that were not previously recognized as hazardous are now considered hazardous due to their long-term effects on health or the environment. The treatment of asbestos as a hazardous material is a prime example of this trend.

Public awareness of material properties has also increased. As a result, hazardous material evaluation has become important in all facilities. Government authorities in the U.S. have determined that the public and workers have a right to know about and be protected from hazardous materials.

Hazardous materials evaluation programs will vary widely in scope. All such programs must evaluate materials presently used or stored on site. The programs must also evaluate all new materials. This makes Management of Change (MOC) essential to good hazardous materials evaluation programs. See the second chapter of *OVERVIEW* (PRC.1.0.2) for further details. Facilities should be able to obtain necessary data about a substance from chemical manufacturers' safety data sheets or from other published sources.

Hazard information and physical property data for new materials or chemical substances generated by processes at a facility may not be available. In such cases, tests may have to be performed to measure the properties which are necessary for proper materials evaluation. Standardized test procedures should be followed so that results may be compared with materials whose properties are known.

When assembling hazardous materials information for a facility, start by reviewing purchasing records. This review will generally identify most of the materials brought into the facility. There may be some items, however, that were acquired without going through the purchasing department. A discussion with supervisors about the materials they handle is needed, and should include a review of the substances generated by the processes.

In addition, the person responsible for the program should review the sales department's records. This will provide a list of the finished goods the facility produces. Items in the purchasing and sales records form the basis of a literature search for materials' properties. It is important that this information be assembled and organized for rapid retrieval under emergency conditions because an accident may create an immediate need for facts. One way to record such data is on a Safety Data Sheet (often referred to as an "SDS"). Several versions of Safety Data Sheets have been developed for various purposes. In the U.S. the Occupational Safety and Health Administration (OSHA) requires SDS for all materials used at a facility. OSHA specifies the information that must be included in an SDS but not the exact format. Much of the data required is similar to and available from the manufacturers' safety data sheets mentioned above. The Safety Data Sheets can be readily filed, duplicated and disseminated to those persons requiring the information. However, if the facility involved is a chemical manufacturing facility or is operating complex chemical processes, more detailed technical information may be required than is normally included on a Safety Data Sheet.

It is also important to include outside contractors in hazardous materials evaluation programs, as it would otherwise be impossible to identify, evaluate or respond to hazardous materials brought on site by them.

When evaluating substances, one must decide which properties should be investigated. Testing to determine the properties of a material falls into five major categories: general information; flammability; radioactivity; toxicity; and reactivity.

Appendix A lists properties and tests. This list is not all-inclusive since special testing for unusual properties may be needed.

Once properties have been determined, evaluation may be relatively simple or complex. In some cases, the material is an article of commerce for which the relative hazard as determined by one of several systems has been published.

In addition to providing the information for use in process hazard evaluation, the information can be disseminated to other employees in several ways. One is to post identifying signs wherever the material is present using a system such as that described in NFPA 704.

Piping in the facility may be color-coded to identify the contents or the contents' hazards. Color coding will also reduce the potential for operations and maintenance errors. Color schemes can be found in ANSI A13.1, CFR29 Section 1910.144, and ISO R508.

Shipping containers and cylinders carrying hazardous materials will be marked with symbols mandated by the Department of Transportation or other government agencies. The meaning and limitations of these symbols should be explained to, and understood by, employees.

Because labels and signs are reminders of hazards and proper procedures, they must be regularly reviewed as a part of the employee training program. (See *OVERVIEW*, Section 4, Employee Training [PRC.1.4.0].)

LIST OF PROPERTIES OF MATERIALS AND TESTS

The following are properties and tests that are commonly used when evaluating the degree of hazard posed by a material. This list is not all-inclusive as special tests will be needed to determine unusual properties.

General Information

Corrosivity
Purity
Formula
Quantity of Material
Color
Hygroscopicity
Molecular Weight
Appearance
Odor
Physical State
Solubility
Viscosity

Flammability

Flash Point
Fire Point
Flammable Limits
Specific Gravity
Vapor Density
Vapor Pressure
Heat of Vaporization
Boiling Point
Ignition Temperature
Autoignition Temperature
Spontaneous Heating
Dielectric Constant
Melting Point
Flow Point
Percent Volatiles
Decomposition Products
Heat of Fusion

Radioactivity

Alpha Exposures
Beta Exposures
Gamma Exposures
Neutron Exposures

Reactivity

Differential Thermal Analysis
Impact Test
Thermal Stability
Detonation with Blasting Cap
Drop Weight Test
Thermal Decomposition Test
Lead Block Test
Influence Test
Self-Acceleration Decomposition Temperature
Card Gap Test
Thermal Stability
Critical Diameter
Limiting Oxygen Value
Hazardous Decomposition Products
Incompatibility
Self-Reactivity
Instability
Shock/Friction Sensitivity
Decomposition Temperature
Specific Heat
Gas Evolution
Adiabatic Temperature Rise
Heat of Reaction

Toxicity

Threshold Limit Values (TLV)
Time Weighted Average Exposures (TWA)
Lethal Concentration (LC_{50} Values)
Lethal Dose (LD_{50} Values)
Lowest Published Lethal Concentration (LCLo)
Lowest Published Lethal Dose (LDLo)
Lowest Published Toxic Concentration (TCLo)
Lowest Published Toxic Dose (TDLo)
Chronic Effects
Acute Effects
Cumulative Effects
Carcinogenicity
Mutagenicity
Teratogenicity
Neoplastic Effects