

# **HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE MANUAL**

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**BRIAN GALLANT**

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**BRIAN GALLANT**

 **WILEY-  
INTERSCIENCE**

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# FOREWORD

The writing of this book was a major undertaking. It was a lifelong dream to author a text, but I had no idea of the number of hours involved and the sacrifices that many others had to endure to make this happen.

Several people assisted me with this endeavor and I wish to thank them for their encouragement, support, and patience. You all know who you are and, at the risk of leaving a name out, I am not going to list everyone. I hope you understand.

To my students, former and current, thank you all. I want each of you to know that I learned from you as well and there was rarely a class that went by that I didn't pick something up from you.

There is, however, one person that without her help this would not have been possible. Her understanding and love has been an inspiration to me. My wife, Heather, has been my sounding board, loudest critic, and biggest supporter. She always has some words of wisdom for me and has sacrificed more than I have during this process. For all of these things, I want to thank her from the bottom of my heart. Honey, you're the best! Without you, I could not have completed this task.

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# 1

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## **REGULATIONS, AGENCIES, AND RESOURCES**

### **INTRODUCTION—HISTORY OF EMPLOYEE HEALTH AND SAFETY REGULATIONS**

Employee health and safety regulations in place in today's work environment stem from the end of the 1800's and the mining industry. Due to the high fatality record among mine workers, a series of laws was established to address the issue in approximately 1870. After the Second World War, health and safety laws grew to encompass many other industries. It wasn't until 1970, when the United States Congress adopted the Occupational Safety and Health Act (OSHAct,) that specific laws were enacted to protect worker health and safety. Additionally, the Occupational Health and Safety Administration (OSHA) was created. OSHA has the authority to enforce these health and safety standards in the workplace.



**Figure 1.1** OSHA Logo

## **Regulations**

Prior to 1970, effective workplace safety and health regulations did not exist on either federal or state levels. The regulations that did exist were not enforced. Therefore, large numbers of workers experienced illness, injury, and death as a result of unsafe and unhealthy working conditions. In addition to occupational health and safety concerns, our country was struggling with environmental management of industrial chemical use, disposal, and pollution issues.

In 1970, Congress established the Occupational Safety and Health Administration to ensure safe and healthful work environments in the manufacturing and construction industries. At the same time, The Environmental Protection Agency (EPA) was instituted to oversee resource management. Today, OSHA is the primary guardian of worker's health and safety standards. EPA continues to protect the public's health, along with regulating the cleanliness and safety of our lands, air, and water.

All employees need to have a basic understanding of the laws and agencies that help regulate hazardous operations. Understanding the laws and rules that stipulate the requirements and restrictions for working in hazardous environments and/or conditions requires familiarity with the evolution and interface of the federal acts and agencies that contain the laws. Many other local, state, and federal entities play a key role, in addition to the EPA and OSHA, in writing and enforcing regulations that affect hazardous material operations, and, in particular, waste sites.

The following is a list of federal agencies that regulate the organizations that are engaged in hazardous waste operations:

- Environmental Protection Agency
- Department of Labor—Occupational Safety and Health Administration
- Department of Transportation

Workers should also keep in mind that state and local governments also have regulatory agencies that could have some jurisdiction over hazardous waste operations. If there are questions regarding who has the authority, you should consult your local authorities for further information.

## **THE ENVIRONMENTAL PROTECTION AGENCY**

The EPA governs the quality of our environment, including air, land, and water. In addition, EPA administers the regulations that manage hazardous waste. EPA played a vital role in spearheading the Hazardous Waste Operations and Emergency Response (HAZWOPER) regulations that are currently in existence for worker safety at hazardous waste sites.

These are a few of the parts of the EPA regulations noting where some significant environmental acts are incorporated into the regulations. EPA regulations are found in the Code of Federal Regulations (CFR) in 40 CFR:

- 40 CFR 50-99 Clean Air Act
- 40 CFR 100-140 and 400-470 Clean Water Act
- 40 CFR 240-271 Resource Conservation and Recovery Act (RCRA)
- 40 CFR 260-299 Hazardous Waste Management System
- 40 CFR 279 Used Oil Management Standards
- 40 CFR 700-799 Toxic Substance Control Act (TSCA)



Figure 1.2 EPA Logo

Hazardous wastes are identified by the EPA as described in 40 CFR 261. Listed wastes are known waste streams generated by specific processes. According to RCRA, if a waste is not listed, it must be tested to see if it exhibits one or more of the following characteristics. Wastes that exhibit these characteristics are called characteristic waste:

- Ignitable—waste having a flash point of < 140 degrees F, or an ignitable compressed gas, flammable liquid or solid, or oxidizer according to DOT
- Corrosivity—waste with a pH of <2.0 or >12.5
- Reactive—wastes that explode or react violently when exposed to water, or that generate toxic gases
- Toxic—waste analyzed using the Toxic Characteristic Leachate Procedure (TCLP) test to check for toxic constituents at levels greater than those specified in the applicable environmental regulations

### Hazardous Waste Numbers

A four digit number is given to different wastes by the EPA for identification purposes. They are:

- D001- Ignitable Wastes
- D002- Corrosive Wastes
- D003- Reactive Wastes

TABLE 1.1 Table 1.1 outlines some of the EPA levels.

Toxin	US EPA Limits
Arsenic	5.0 ppm
Cadmium	1.0 ppm
Chromium	5.0 ppm
Lead	5.0 ppm
Mercury	.02 ppm



Water Act regulates discharge of toxic and non-toxic pollutants into surface waters. The interim goal is to make surface waters usable for such activities as swimming and fishing, with the ultimate goal to eliminate all discharges into surface waters. EPA sets guidelines and individual states issue permits through the National Pollutant Discharge Elimination System (NPDES) specifying the types of control equipment and discharges for each facility.



**Figure 1.4** Army Corps of Engineers Logo

### **Clean Air Act**

The Clean Air Act (CAA), reauthorized in 1990, amended the Air Quality Act of 1967. The Clean Air Act is designed to enhance the quality of air resources by authorizing the EPA to set the criteria for our nation's air pollution control programs. The CAA mandates and enforces toxic emission standards for stationary sources (like power plants) and motor vehicles. Air quality standards are required to be achieved and maintained nationwide for six pollutants. Those six pollutants are:

- ozone
- nitrogen dioxide
- carbon monoxide
- sulfur dioxide
- total suspended particulates (TSP)
- lead

### **Resource Conservation and Recovery Act (RCRA)**

In the late 1960s and early 1970s, the Congressional Office of Technology Assessment estimated that between approximately 250 and 275 million metric tons of hazardous waste were produced each year in the United States. Air and ground water pollution, contamination of surface water, and poisoning of animals and humans by way of the food chain supported the EPA's belief that only a small percentage of generated waste was being disposed of in an environmentally acceptable manner.

Congress had generally addressed the problems of solid waste disposal by enacting the Solid Waste Disposal Act in 1965. The first comprehensive Federal effort to confront the problems of solid and hazardous waste began in 1976 when RCRA was enacted. RCRA is an amendment that completely revised the Solid Waste Disposal Act of 1965.

RCRA was established to regulate the management and disposal of hazardous materials and wastes. RCRA gave EPA the jurisdiction and responsibility to create and enforce the regulations governing the proper identification, handling, storing, treating, and disposal of hazardous waste. RCRA instituted the manifest system of

tracking a hazardous waste from generator through transportation, storage, and disposal. This is often referred to as “cradle to grave” liability tracking system. It also encourages hazardous waste recycling and minimization.

As of 1983, an estimated forty million metric tons of hazardous waste escaped regulatory control through various loopholes in the legislative framework. RCRA was falling short of its intent, and Congress amended it in 1984. These amendments strengthened RCRA to include underground storage tanks (USTs), redefined small quantity generator (SQG) to include more generators, and restrict liquid and hazardous waste from landfills.

### **Toxic Substance Control Act**

The Toxic Substance Control Act gave the EPA authority to regulate the manufacture, distribution, and use of chemical substances for which there are not specific standards already established. TSCA required EPA to evaluate chemicals before they are sold, to prevent any unreasonable chemical risk to humans or the environment, as well as create a list of reviewed harmful substances that need precautions and safe work practices when used by the general public or industry.



**Figure 1.5** Underground storage tank

## **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**

Enacted to fill a void in the RCRA law, CERCLA addresses problems associated with contamination from abandoned facilities or releases of hazardous substances into the environment from vessels or facilities that are not subject to RCRA authority. CERCLA, better known to most of us as “Superfund,” authorizes government money for clean-up of abandoned hazardous waste sites, clean-up and emergency response for transportation incidents involving chemical releases, and payments to injured or affected citizens. This legislation was amended by Superfund Amendment and Reauthorization Act (SARA) in 1986. Superfund:

- Established the National Priority List.
- Provides for identification and cleanup of hazardous waste sites.
- Gets funding to implement these activities from oil tax, waste generator fines, and the United States Treasury (taxpayers).

## **Superfund Amendment and Reauthorization Act (SARA)**

SARA was passed to protect the safety and health of personnel working in hazardous operations, as well as the community at large. First, SARA reauthorized the funding to continue site characterization (assessment) to determine which locations belong on the National Priority List, as well as continuing abandoned site cleanup.

In addition, SARA mandated that the Occupational Safety and Health Administration establish worker safety and health standards for hazardous waste operations and emergency response activities. SARA requires training for both workers and management personnel covering safety and health risks at waste sites, Treatment, Storage and Disposal Facilities (TSDF), and emergency response operations. SARA also initiated the requirement for local and regional emergency contingency planning.



**Figure 1.6** Superfund sites like the one shown above are being cleaned up daily.

Three distinct Titles or sections make up SARA. Titles I and III cover hazardous waste operations, emergency response, and planning, while Title II targets a fund for hazardous waste cleanup activities.

Title I:

- Requires training for hazardous waste operation site workers and emergency response personnel (HAZWOPER).
- Requires preparation of a written emergency response plan for operations where hazardous materials may be spilled or released.
- Requires proper procedures for handling emergency response activities.

Title II:

- Gives authority for Superfund to continue to pay hazardous waste clean up through a tax on industry.

Title III (Community Right to Know) was established in large part as a result of the widely published 1984 disaster in Bhopal, India, in which a massive amount of toxic methyl isocyanate escaped from the Union Carbide facility.

- Developed “Comprehensive Community Emergency Plans” by Local Emergency Planning Committees (LEPCs)
- Reported specific chemical inventory and release information to local fire officials, LEPCs, and the State Emergency Response Commission (SERC)
- Facilities storing chemicals provide the chemical types, quantity on hand, and locations with inventory lists; fees are assessed based on substances and quantities involved
- Local fire departments visit facilities to determine hazards and ensure compliance with this Title.



**Figure 1.7** Fire Marshal Patch

## **DEPARTMENT OF LABOR—OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION**

Under the Department of Labor (DOL), OSHA is the primary federal agency designated to safeguard the safety and health of the nation’s workers in any hazardous activity. OSHA sets, oversees, and enforces health and safety standards for workplace safety. The two most important standards OSHA utilizes to protect employees

are the Hazard Communication Standard and the Hazardous Waste Operations and Emergency Response Standard.

Individual states, called “state plan states,” may write and enforce their own OSHA regulations as long as they are at least as stringent as the federal law.



**Figure 1.8** Department of Labor Logo

## NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH is an agency under the Department of Health and Human Services (DHHS) that investigates incidents, researches occupational safety, and recommends exposure limits (RELs) to OSHA for certain hazardous chemicals. The Institute also tests and certifies all respiratory and air sampling devices (except mining devices), as well as recommends assigned protection factors (APF) for respirators. NIOSH does not act in a regulatory capacity at all.

## DEPARTMENT OF TRANSPORTATION (DOT)

The DOT oversees the transport of hazardous materials through interstate commerce. The Hazardous Materials Transportation Act (1975) granted the DOT authority to establish criteria for packaging, labeling, placarding and shipping papers necessary to transport hazardous materials; as well as the training of personnel responsible for hazardous material transportation. The Act was reauthorized in 1990, becoming the Hazardous Materials Transportation Uniform Safety Act (HMTUSA).

The HMTUSA is the federal transportation act that applies to any person or company that ships hazardous material and/or waste in commerce by air, water, rail, and/or highway. The shipping requirements include preparation of shipping papers or a uniform hazardous waste manifest, packing the material in specific packages, placing the hazard labels on the packages and placards on the shipping containers.

DOT labels are four-inch diamond shaped, color specific stickers that designate the hazard classification of the packaged material. Labels are used on non-bulk containers, less than or equal to one hundred nineteen (119) gallons or eight hundred eighty two (882) pounds, along with the shipping name and identification number of the substance in the container.



**Figure 1.9** NIOSH Placard



**Figure 1.10** DOT Placard

Placards are 10.7 inch square color-specific diamonds used on freight containers, vehicles, and bulk packages, greater than 119 gallons or 882 pounds, in addition to the identification number of the material in the container(s). If necessary, placards are required to be placed on each side and on each end of the freight container(s), vehicle(s), and package(s), for a total of four placards of each type on the container.

Both DOT and the United Nations (UN) transportation systems use a four-digit identification number as a reference for substances and materials. If the UN does not have a UN number designated for a material that is considered hazardous under the DOT system, then DOT issues a NA (North America) number. An identification number may be placed in the center of the placard or displayed on packages as part of the hazard identification system. For example, UN 1203 is the identification number for gasoline.



**Figure 1.11** DOT Label

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

While the NFPA has several standards they have generated, they are not a regulatory or governmental agency. They are a private international group, based in Massachusetts. Of particular note to us in the hazardous material field are these standards:

- NFPA 704 Labeling
- NFPA 472 Professional Competency of Responders to Hazardous Material Emergencies
- NFPA has many others that may have applicability to hazardous materials, but the above two are most noteworthy.



**Figure 1.12** Gasoline Placard—Note the hazard class (three) shown in the lower point of the diamond.

While the NFPA plays a crucial role in establishing codes and standards on an international basis, they are not a governmental or a regulatory agency. Their codes and standards are strictly voluntary, however, many jurisdictions have adopted them and then they become enforceable.

### NFPA 704 Labeling

The 704 standard addresses the health, flammability, instability (reactivity), and related special hazards that may be presented by short-term, acute exposure to a material during handling under conditions of fire, spill, leak, or similar emergencies. It provides four pieces of information to workers and also instructions for a simple, readily recognized, and easily understood system of markings that provides a gen-

eral idea of the hazards of chemical materials stored and/or used in an area or space (such a warehouse or storage facility). The severity of these hazards as they relate to handling, fire prevention, exposure, and control is also included.

The hazard ratings reflect the acute effect of a chemical material which involve short-term (minutes or hours), high concentrations and immediate deleterious health effects (e.g., severe burns, respiratory failure, coma, death, and irreversible damage to a vital organ). Acute exposures are usually related to an accident such as a chemical spill, massive skin splash and fire. Acute exposures, typically, are sudden and severe, and are characterized by rapid absorption of the chemical that is quickly circulated through the body and damages one or more of the vital organs.

The objectives of the NFPA 704 labeling system are:

- To provide an appropriate signal or alert and on-the-spot information to safeguard the lives of emergency response personnel (e.g., fire fighters, HAZMAT responders, site workers).
- To assist in planning effective fire and hazardous material emergency control operations, including clean up activities.
- To assist all designated field personnel, engineers, equipment operators and safety personnel in evaluating hazards.

The NFPA 704 diamond system is intended to provide basic information to fire fighting, emergency and other personnel, enabling them to more easily decide whether to evacuate the area or to commence emergency control procedures. It is also intended to provide them with information to assist in selecting fire fighting tactics, appropriate personal protective equipment, and emergency procedures.

How is the degree of hazard severity positioned and indicated to reflect potential acute health and/or safety hazard? The NFPA 704 sign (label) consists of four diamonds within a larger diamond. The red, flammability diamond is at “12 o’clock”; the yellow, instability diamond is at “3 o’clock”; the white, special hazards diamond is at “6 o’clock” and the blue, health hazard diamond is at “9 o’clock”.

The degree of hazard severity for a chemical liquid or solid—flammability, health hazard, instability (reactivity) is indicated by a numerical rating that ranges from four (4), indicating the most severe hazard to zero (0), indicating no significant hazard.

Special hazards are indicated in the white section that is located in the lower region of the 704 sign. There are two special hazard categories:

- Water reactive—Chemicals that demonstrate unusual reactivity with water are designated by the letter W with a horizontal line through the center **W**.
- Oxidizers—Chemicals that decompose readily under certain conditions to yield oxygen are designated by the symbol **OXY**. They may cause a fire in contact with combustible materials, can react violently with water and when involved in a fire can react violently.



**Figure 1.13** NFPA Label—This NFPA label outlines the four categories and shows what the numbers mean.

- You may also see other symbols such as the skull and crossbones for a poison, the radioactive symbol for a radioactive material, etc.
- This section will not have number, but instead will feature a symbol or letter to indicate if any special hazard is present

### Hazard Communication Standard

The Hazard Communication Standard (Haz Com) or Right to Know Law was enacted in 1980. It is also referred to as 29 CFR 1910.1200. The Haz Com Standard requires the following:

- Manufacturers and/or importers of chemicals to evaluate the hazards
- Chemical hazards information be passed on to employees who have to work with these substances
- Employees to know and understand the chemical and physical hazards present in their work environment

The Hazard Communication Standard also addresses five major topic areas:

- Hazard Determination
- Written Hazard Communication Program