

# Technological Hazards

Technological hazards include hazardous materials incidents and nuclear power plant failures. Usually, little or no warning precedes incidents involving technological hazards. In many cases, victims may not know they have been affected until many years later. For example, health problems caused by hidden toxic waste sites—like that at Love Canal, near Niagara Falls, New York—surfaced years after initial exposure.

The number of technological incidents is escalating, mainly as a result of the increased number of new substances and the opportunities for human error inherent in the use of these materials.

Use Part 3 to learn what actions to include in your family disaster plan to prepare for and respond to events involving technological hazards. Learn how to use, store, and dispose of household chemicals in a manner that will reduce the potential for injury to people and the environment.

When you complete Part 3, you will be able to:

- Recognize important terms.
- Take protective measures for technological disasters.
- Know what actions to take if an event occurs.
- Identify resources for more information about technological hazards.



# 3.1

## Hazardous Materials Incidents



Chemicals are found everywhere. They purify drinking water, increase crop production, and simplify household chores. But chemicals also can be hazardous to humans or the environment if used or released improperly. Hazards can occur during production, storage, transportation, use, or disposal. You and your community are at risk if a chemical is used unsafely or released in harmful amounts into the environment where you live, work, or play.

Chemical manufacturers are one source of hazardous materials, but there are many others, including service stations, hospitals, and hazardous materials waste sites.



## Take Protective Measures

### Before a Hazardous Materials Incident

Many communities have Local Emergency Planning Committees (LEPCs) whose responsibilities include collecting information about hazardous materials in the community and making this information available to the public upon request. The LEPCs also are tasked with developing an emergency plan to prepare for and respond to chemical emergencies in the community. Ways the public will be notified and actions the public must take in the event of a release are part of the plan. Contact the LEPCs to find out more about chemical hazards and what needs to be done to minimize the risk to individuals and the community from these materials. The local emergency management office can provide contact information on the LEPCs.



#### Review

See Section 1.3:  
Assemble a Disaster  
Supplies Kit

You should add the following supplies to your disaster supplies kit:

- Plastic sheeting.
- Duct tape.
- Scissors.

### During a Hazardous Materials Incident

Listen to local radio or television stations for detailed information and instructions. Follow the instructions carefully. You should stay away from the area to minimize the risk of contamination. Remember that some toxic chemicals are odorless.

If you are:	Then:
Asked to evacuate	Do so immediately.
Caught Outside	Stay upstream, uphill, and upwind! In general, try to go at least one-half mile (usually 8-10 city blocks) from the danger area. Do not walk into or touch any spilled liquids, airborne mists, or condensed solid chemical deposits.
In a motor vehicle	Stop and seek shelter in a permanent building. If you must remain in your car, keep car windows and vents closed and shut off the air conditioner and heater.
Requested to stay indoors	<ul style="list-style-type: none"> <li>• Close and lock all exterior doors and windows. Close vents, fireplace dampers, and as many interior doors as possible.</li> <li>• Turn off air conditioners and ventilation systems. In large buildings, set ventilation systems to 100 percent recirculation so that no outside air is drawn into the building. If this is not possible, ventilation systems should be turned off.</li> <li>• Go into the pre-selected shelter room. This room should be above ground and have the fewest openings to the outside.</li> <li>• Seal the room by covering each window, door, and vent using plastic sheeting and duct tape.</li> <li>• Use material to fill cracks and holes in the room, such as those around pipes.</li> </ul>

### Shelter Safety for Sealed Rooms

Ten square feet of floor space per person will provide sufficient air to prevent carbon dioxide build-up for up to five hours, assuming a normal breathing rate while resting.

However, local officials are unlikely to recommend the public shelter in a sealed room for more than 2-3 hours because the effectiveness of such sheltering diminishes with time as the contaminated outside air gradually seeps into the shelter. At this point, evacuation from the area is the better protective action to take.

Also you should ventilate the shelter when the emergency has passed to avoid breathing contaminated air still inside the shelter.

## After a Hazardous Materials Incident

The following are guidelines for the period following a hazardous materials incident:

- Return home only when authorities say it is safe. Open windows and vents and turn on fans to provide ventilation.
- Act quickly if you have come in to contact with or have been exposed to hazardous chemicals. Do the following:
  - Follow decontamination instructions from local authorities. You may be advised to take a thorough shower, or you may be advised to stay away from water and follow another procedure.



- Seek medical treatment for unusual symptoms as soon as possible.
- Place exposed clothing and shoes in tightly sealed containers. Do not allow them to contact other materials. Call local authorities to find out about proper disposal.
- Advise everyone who comes in to contact with you that you may have been exposed to a toxic substance.
- Find out from local authorities how to clean up your land and property.
- Report any lingering vapors or other hazards to your local emergency services office.
- Follow the instructions for recovering from a disaster in Part 5.



## 3.2

# Household Chemical Emergencies



Nearly every household uses products containing hazardous materials or chemicals.

**Cleaning Products**

- Oven cleaners
- Drain cleaners
- Wood and metal cleaners and polishes
- Toilet cleaners
- Tub, tile, shower cleaners
- Bleach (laundry)
- Pool chemicals

**Automotive Products**

- Motor oil
- Fuel additives
- Carburetor and fuel injection cleaners
- Air conditioning refrigerants
- Starter fluids
- Automotive batteries
- Transmission and brake fluid
- Antifreeze

**Lawn and Garden Products**

- Herbicides
- Insecticides
- Fungicides/wood preservatives

**Indoor Pesticides**

- Ant sprays and baits
- Cockroach sprays and baits
- Flea repellents and shampoos
- Bug sprays
- Houseplant insecticides
- Moth repellents
- Mouse and rat poisons and baits

**Workshop/Painting Supplies**

- Adhesives and glues
- Furniture strippers
- Oil- or enamel-based paint
- Stains and finishes
- Paint thinners and turpentine
- Paint strippers and removers
- Photographic chemicals
- Fixatives and other solvents

**Miscellaneous**

- Batteries
- Mercury thermostats or thermometers
- Fluorescent light bulbs
- Driveway sealer



### Other Flammable Products

- Propane tanks and other compressed gas cylinders
- Kerosene
- Home heating oil
- Diesel fuel
- Gas/oil mix
- Lighter fluid

Although the risk of a chemical accident is slight, knowing how to handle these products and how to react during an emergency can reduce the risk of injury.

## Take Protective Measures

### Before a Household Chemical Emergency

The following are guidelines for buying and storing hazardous household chemicals safely:

- Buy only as much of a chemical as you think you will use. Leftover material can be shared with neighbors or donated to a business, charity, or government agency. For example, excess pesticide could be offered to a greenhouse or garden center, and theater groups often need surplus paint. Some communities have organized waste exchanges where household hazardous chemicals and waste can be swapped or given away.
- Keep products containing hazardous materials in their original containers and never remove the labels unless the container is corroding. Corroding containers should be repackaged and clearly labeled.
- Never store hazardous products in food containers.
- Never mix household hazardous chemicals or waste with other products. Incompatibles, such as chlorine bleach and ammonia, may react, ignite, or explode.

Take the following precautions to prevent and respond to accidents:

- Follow the manufacturer's instructions for the proper use of the household chemical.
- Never smoke while using household chemicals.
- Never use hair spray, cleaning solutions, paint products, or pesticides near an open flame (e.g., pilot light, lighted candle, fireplace, wood burning stove, etc.) Although you may not be able to see or smell them, vapor particles in the air could catch fire or explode.

- Clean up any chemical spill immediately. Use rags to clean up the spill. Wear gloves and eye protection. Allow the fumes in the rags to evaporate outdoors, then dispose of the rags by wrapping them in a newspaper and placing them in a sealed plastic bag in your trash can.
- Dispose of hazardous materials correctly. Take household hazardous waste to a local collection program. Check with your county or state environmental or solid waste agency to learn if there is a household hazardous waste collection program in your area.

Learn to recognize the symptoms of toxic poisoning, which are as follows:

- Difficulty breathing.
- Irritation of the eyes, skin, throat, or respiratory tract.
- Changes in skin color.
- Headache or blurred vision.
- Dizziness.
- Clumsiness or lack of coordination.
- Cramps or diarrhea.

Be prepared to seek medical assistance:

- Post the number of the emergency medical services and the poison control center by all telephones. In an emergency situation, you may not have time to look up critical phone numbers. The national poison control number is (800)222-1222.

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### During a Household Chemical Emergency

If there is a danger of fire or explosion:

- Get out of the residence immediately. Do not waste time collecting items or calling the fire department when you are in danger. Call the fire department from outside (a cellular phone or a neighbor's phone) once you are safely away from danger.
- Stay upwind and away from the residence to avoid breathing toxic fumes.

If someone has been exposed to a household chemical:

- Find any containers of the substance that are readily available in order to provide requested information. Call emergency medical services.
- Follow the emergency operator or dispatcher's first aid instructions carefully. The first aid advice found on containers may be out of date or inappropriate. Do not give anything by mouth unless advised to do so by a medical professional.

Discard clothing that may have been contaminated. Some chemicals may not wash out completely.

## Checking Your Home

There are probably many hazardous materials throughout your home. Take a tour of your home to see where these materials are located. Use the list of common hazardous household items presented earlier to guide you in your hunt. Once you have located a product, check the label and take the necessary steps to ensure that you are using, storing, and disposing of the material according to the manufacturer's directions. It is critical to store household chemicals in places where children cannot access them. Remember that products such as aerosol cans of hair spray and deodorant, nail polish and nail polish remover, toilet bowl cleaners, and furniture polishes all fall into the category of hazardous materials.



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## For More Information

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If you require more information about any of these topics, the following are resources that may be helpful.

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### FEMA Publications

*Household Hazardous Materials: A Guide for Citizens*. IS 55. An independent study resource for parents and teachers. Web-based safety program focused on reducing the number of deaths and injuries in the home. Available online at <http://training.fema.gov/emiweb/is/is55.asp>

*Chemical Emergencies*. A pamphlet promoting awareness of chemical hazards in the home, how to prevent them, and what to do if exposed. Available online at [www.fema.gov/pdf/rrr/talkdiz/chemical.pdf](http://www.fema.gov/pdf/rrr/talkdiz/chemical.pdf)

*Backgrounder: Hazardous Materials*. 0.511. Information sheet available online at [www.fema.gov/hazards/hazardousmaterials/hazmat.shtm](http://www.fema.gov/hazards/hazardousmaterials/hazmat.shtm)

*USFA: Factsheet: Baby-sitters Make the Right Call to EMS*. 0510. Available online at [www.usfa.fema.gov/public/factsheets/mtrc.shtm](http://www.usfa.fema.gov/public/factsheets/mtrc.shtm)

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### Other Publications

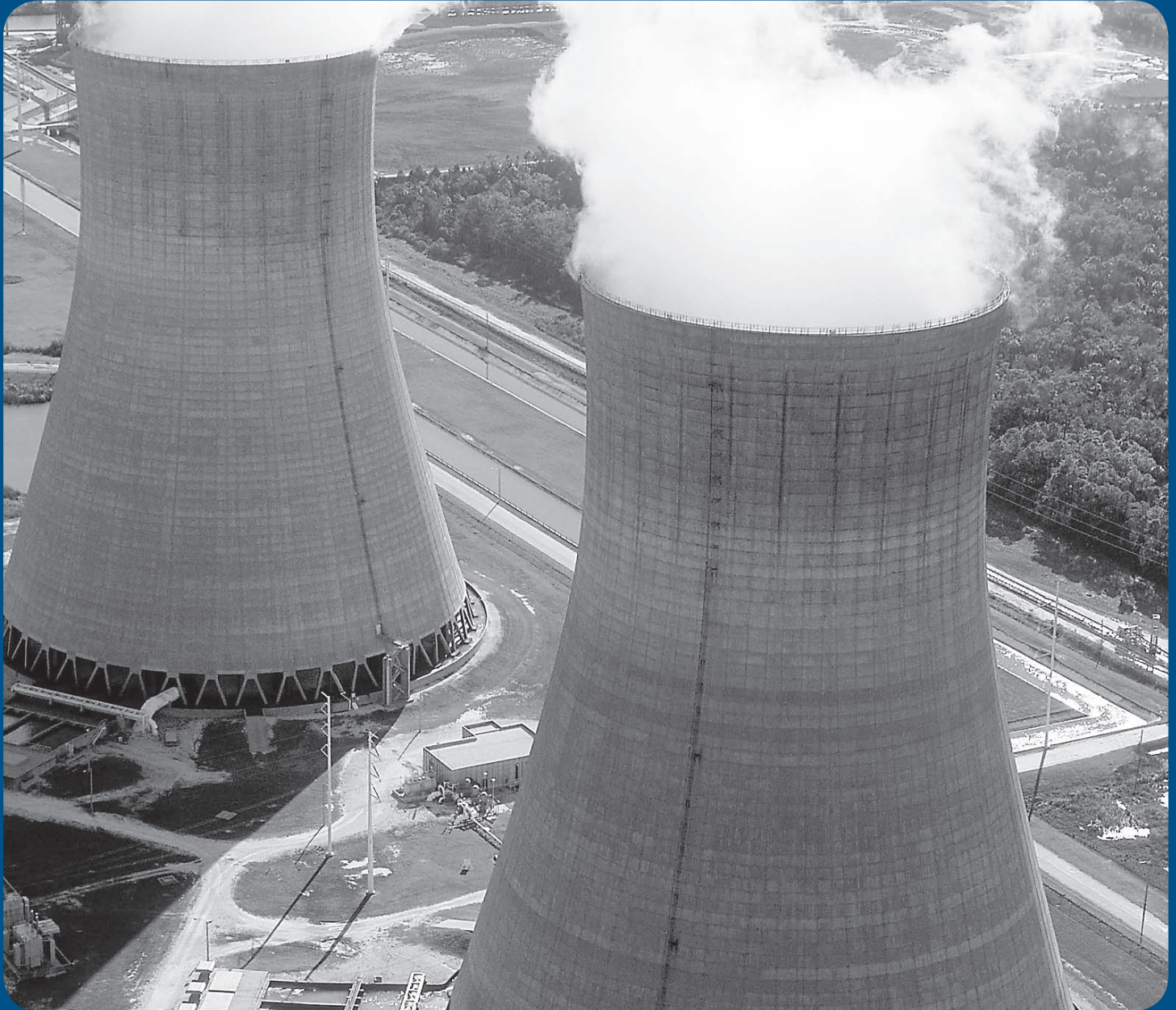
#### American Red Cross

*Chemical Emergencies*. Extensive document describing the hazards of household chemicals and what to do in an emergency. Available online at [www.redcross.org/services/disaster/0,1082,0\\_581\\_,00.html](http://www.redcross.org/services/disaster/0,1082,0_581_,00.html)



3.3

# Nuclear Power Plants



Nuclear power plants use the heat generated from nuclear fission in a contained environment to convert water to steam, which powers generators to produce electricity. Nuclear power plants operate in most states in the country and produce about 20 percent of the nation's power. Nearly 3 million Americans live within 10 miles of an operating nuclear power plant.

Although the construction and operation of these facilities are closely monitored and regulated by the Nuclear Regulatory Commission (NRC), accidents are possible. An accident could result in dangerous levels of radiation that could affect the health and safety of the public living near the nuclear power plant.

Local and state governments, federal agencies, and the electric utilities have emergency response plans in the event of a nuclear power plant incident. The plans define two "emergency planning zones." One zone covers an area within a 10-mile radius of the plant, where it is possible that people could be harmed by direct radiation exposure. The second zone covers a broader area, usually up to a 50-mile radius from the plant, where radioactive materials could contaminate water supplies, food crops, and livestock.

The potential danger from an accident at a nuclear power plant is exposure to radiation. This exposure could come from the release of radioactive material from the plant into the environment, usually characterized by a plume (cloud-like formation) of radioactive gases and particles. The major hazards to people in the vicinity of the plume are radiation exposure to the body from the cloud and particles deposited on the ground, inhalation of radioactive materials, and ingestion of radioactive materials.

Radioactive materials are composed of atoms that are unstable. An unstable atom gives off its excess energy until it becomes stable. The energy emitted is radiation. Each of us is exposed to radiation daily from natural sources, including the Sun and the Earth. Small traces of radiation are present in food and water. Radiation also is released from man-made sources such as X-ray machines, television sets, and microwave ovens. Radiation has a cumulative effect. The longer a person is exposed to radiation, the greater the effect. A high exposure to radiation can cause serious illness or death.

#### Minimizing Exposure to Radiation

- **Distance** - The more distance between you and the source of the radiation, the better. This could be evacuation or remaining indoors to minimize exposure.
- **Shielding** - The more heavy, dense material between you and the source of the radiation, the better.
- **Time** - Most radioactivity loses its strength fairly quickly.



If an accident at a nuclear power plant were to release radiation in your area, local authorities would activate warning sirens or another approved alert method. They also would instruct you through the Emergency Alert System (EAS) on local television and radio stations on how to protect yourself.

### Know the Terms

Familiarize yourself with these terms to help identify a nuclear power plant emergency:

#### Notification of Unusual Event

A small problem has occurred at the plant. No radiation leak is expected. No action on your part will be necessary.

#### Alert

A small problem has occurred, and small amounts of radiation could leak inside the plant. This will not affect you and no action is required.

#### Site Area Emergency

Area sirens may be sounded. Listen to your radio or television for safety information.

#### General Emergency

Radiation could leak outside the plant and off the plant site. The sirens will sound. Tune to your local radio or television station for reports. Be prepared to follow instructions promptly.

## Take Protective Measures

### Before a Nuclear Power Plant Emergency

Obtain public emergency information materials from the power company that operates your local nuclear power plant or your local emergency services office. If you live within 10 miles of the power plant, you should receive these materials yearly from the power company or your state or local government.



## During a Nuclear Power Plant

### Emergency

The following are guidelines for what you should do if a nuclear power plant emergency occurs. Keep a battery-powered radio with you at all times and listen to the radio for specific instructions. Close and lock doors and windows.

<i>If you are told to evacuate...</i>	<i>If you are advised to remain indoors...</i>
<ul style="list-style-type: none"> <li>Keep car windows and vents closed; use re-circulating air.</li> </ul>	<ul style="list-style-type: none"> <li>Turn off the air conditioner, ventilation fans, furnace, and other air intakes.</li> <li>Go to a basement or other underground area, if possible.</li> <li>Do not use the telephone unless absolutely necessary.</li> </ul>

If you expect you have been exposed to nuclear radiation:

- Change clothes and shoes.
- Put exposed clothing in a plastic bag.
- Seal the bag and place it out of the way.
- Take a thorough shower.

Keep food in covered containers or in the refrigerator. Food not previously covered should be washed before being put in to containers.

## After a Nuclear Power Plant

### Emergency

Seek medical treatment for any unusual symptoms, such as nausea, that may be related to radiation exposure.

Follow the instructions for recovering from a disaster in Part 5.



## Technological Hazards Knowledge Check

Answer the following questions. Check your responses with the answer key below.

1. What are some things you can do to reduce the threat from hazardous materials in your home?
2. What should you do if you are caught at the scene of a hazardous materials incident?
3. What is the telephone number for the National Poison Control Center?
4. What are three ways to minimize radiation exposure?
5. Are there special warning requirements for nuclear power plants? If so, what are they?
6. What does it mean when a nuclear power plant has issued a general emergency? What actions should you take?
7. If you are at home and instructed to shelter-in-place because of a chemical release, where will you go?
8. If you are in a car and unable to seek shelter in a building and a chemical release occurs, you should?
9. Who can you contact to find out about hazardous materials stored in your community?
10. What are some common places hazardous materials may be present in the community?

1. a. Learn to identify hazardous materials.
  - b. Follow manufacturer's instructions for storage, use, and disposal.
  - c. Never store hazardous products in food containers.
  - d. Keep products in original containers unless the container is corroding.
  - e. Never mix household hazardous chemicals or waste with other products.
  - f. Take household hazardous waste to a local collection program.
  - g. Never smoke while using household chemicals.
  - h. Clean up spills immediately with rags.
  - i. Buy only as much of a chemical as you think you will use.
2. a. Do not walk into or touch any spilled liquids, airborne mists, or condensed solid chemical deposits.
  - b. Stay upstream, uphill, and upwind! In general, try to go at least one-half mile (usually 8-10 city blocks) from the danger area.
3. (800)222-1222
  4. Distance, shielding, and time.
  5. Yes. Nuclear power plants are required to install sirens or other approved warning systems.
  6. Radiation could leak outside the plant and off the plant site. The sirens will sound. Tune to local radio or television station for reports. Be prepared to follow instructions promptly.
  7. An above ground room with the fewest exterior doors and windows.
  8. Keep car windows and vents closed and shut off the air conditioner or heater.
  9. Local Emergency Planning Committee (LEPC). The local emergency management office can provide contact information for the LEPCs.
  10. Agricultural operations and farms, auto service stations and junkyards, chemical manufacturing and storage facilities, construction sites, dry cleaners, electronics manufacturers, paint shops, hospitals, hazardous materials waste sites, and transportation routes.

Answers: