Unit Ten: All Hazards

I. Unit Overview and Objectives

A. Unit Overview

1. It is important for citizens to be aware of the hazards that exist in the communities in which they live, work and socialize in. Being attentive to the potential of hazard will make people more prepared and able to respond should a disaster strike.

2. This unit is rich in information about all hazards known to exist in the States, Tribes and Territories of the United States of America. Although all hazards might not apply to your region (for example, ice storms are not likely in Miami), because of ease of travel, it is important to be aware of such dangers.

3. This unit will provide general definitions, preparation, response and recovery information for dams, earthquakes, extreme heat, floods, hazardous materials, hurricanes, landslides and debris flow (mudslides), nuclear emergencies, terrorism, thunderstorms and lighting, tornadoes, tsunamis, volcanoes, and winter storms. Each category is covered in writing; however, your CERT instruction team may only cover issues that are pertinent to your community.

Unit Overview and Objectives

B. Objectives

1. By listening, participating and interacting in class activities, by the end of this unit participants should be able to accurately:

a. Understand the characteristics of natural disasters and acts of terrorism.

b. Identify risks in their communities (to land, infrastructure, people, and society).

c. Describe actions to take before, during and following a disaster.

C. For all disasters in this unit the following information is pertinent:

1. Make sure all family members know how to respond after the disaster.

2. Teach all family members how and when to turn off gas, electricity, and water.

3. Teach children how and when to call 9-1-1, police, or fire department and which radio station to tune to for emergency information.

4. Contact your local emergency management office or American Red Cross chapter for more information on disaster preparedness in your area.

5. Have 72 hours worth of disaster supplies on hand for all household members.

6. Develop an emergency communication plan. Ask an out-of-state relative or friend to serve as the "family contact."

7. Mitigate – engage in activities that prevent an emergency, reduce the chance of an emergency happening, or lessen the damaging effects of unavoidable emergencies. Know your area, mitigate and prepare for disasters specific to your region.

8. Know what your homeowners, renters and personal insurance policies do and do not cover. Keep insurance up-to-date.

I. Dams and Dam Safety[1]

A. Dams are. . .

A dam is a barrier controlling the flow of water. It can be made of earth or concrete and built across a river or stream to obstruct or control the flow of water. There are about 80,000 dams in the United States today, the majority of which are privately owned. Other owners are state and local authorities, public utilities, and federal agencies.

B. When or where can a dam break?

Several things can cause a dam to fail: first, if they are not designed, operated and maintained property, or when major flooding overwhelms the dams capacity or structural damaged caused by people, earthquakes or other natural disasters.

C. What damage can occur from dam failure?

The energy of the water stored behind even a small dam is capable of causing loss of life and great property damage due to flooding, landslides and mudslides to people, communities or property downstream of the dam.

D. Emergency Information

The National Dam Safety Program is dedicated to protecting the lives of American citizens and their property from the risks associated with the development, operation, and maintenance of America's dams.

II. Earthquakes

A. Earthquakes are. . .

An earthquake is a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free causing the ground to shake. Most earthquakes occur at the boundaries where the plates meet; however, some earthquakes occur in the middle of plates.

[1] http://www.fema.gov/hazards/damsafety/

Earthquakes (Continued)

B. When and where do earthquakes occur?

1. Earthquakes strike suddenly, without warning.

2. Earthquakes can occur at any time of the year and at any time of the day or night.

3. All 50 states and all U.S. territories are vulnerable to earthquakes; 45 at moderate to very high risk and they are located in every region of the country.

4. California experiences the most frequent damaging earthquakes; however, Alaska experiences the greatest number of large earthquakes—most located in uninhabited areas.

5. The largest earthquakes in the United States were along the New Madrid Fault in Missouri, where a three-month long series of quakes from 1811 to 1812 included three quakes larger than a magnitude of eight on the Richter scale. They were felt all over the entire Eastern United States.

6. Where earthquakes previously occurred they will happen again.

C. What damage can occur from an earthquake?

1. Aftershocks

   a. Always expect aftershocks after a major earthquake.

   b. Aftershocks are smaller earthquakes that follow the main shock and can cause further damage to weakened buildings.

   c. After-shocks can occur in the first hours, days, weeks, or even months after the quake.

   d. Be aware that some earthquakes are actually foreshocks, and a larger earthquake might occur.

2. Collapse buildings and bridges.

3. Disrupt gas, electric, and phone service.

4. Trigger landslides, avalanches, flash floods, fires, and huge, destructive ocean waves (tsunamis).

Earthquakes (Continued)

5. Shake buildings from foundations.

6. Extensive property damage.

7. Death.

D. Emergency Information

1. Stay inside. The best protection during an earthquake is to get under heavy furniture such as a desk, table, or bench.

2. If outdoors: Move into the open, away from buildings, streetlights, and utility wires. Once in the open, stay there until the shaking stops.

3. If in a moving vehicle: Move to a clear area away from buildings, tree, overpasses or utility wires. Stop quickly and stay in the vehicle. Once the shaking has stopped, proceed with caution. Avoid bridges or ramps that might have been damaged by the quake.

4. The greatest danger exists directly outside buildings, at exits, and alongside exterior walls.

5. Ground movement during an earthquake is seldom the direct cause of death or injury. Most earthquake-related casualties result from collapsing walls, flying glass, and falling objects.

III. Extreme Heat

A. Extreme heat[2] is. . .

Temperatures 10 degrees or more above the average high temperature for a region and last for several weeks are defined as extreme heat. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground. Excessively dry and hot conditions provoke dust storms and low visibility. Droughts occur when a long period passes without substantial rainfall.

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[2] http://www.fema.gov/hazards/extremeheat/heat.shtm

Extreme Heat (Continued)

B. Where does extreme heat occur and who is most at risk?

1. All areas in the United States are at risk of drought at any time of the year.

2. In a normal year, approximately 175 Americans die from extreme heat. Young children, elderly people, and those who are sick or overweight are more likely to become victims.

3. Because men sweat more than women do, men are more susceptible to heat illness because they become more quickly dehydrated.

4. Sunburn can significantly slow the skin's ability to release excess heat.

5. People living in urban areas may be at a greater risk from the effects of a prolonged heat wave than people living in rural regions. An increased health problem can occur when stagnant atmospheric conditions trap pollutants in urban areas, thus adding contaminated air to excessively hot temperatures.

C. Emergency Information

1. Heat kills by pushing the human body beyond its limits. Under normal conditions, the body's internal thermostat produces perspiration that evaporates and cools the body. However, in extreme heat and high humidity, evaporation is slowed and the body must work extra hard to maintain a normal temperature.

2. Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Other conditions that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality.

3. A prolonged drought can have a serious economic impact on a community. Increased demand for water and electricity may result in shortages of resources. Moreover, food shortages may occur if agricultural production is damaged or destroyed by loss of crops or livestock.

IV. Floods[3]

A. Floods are. . .

A flood is a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties, at least one of which is your property from:

1. Overflow of inland or tidal waters.

2. Unusual and rapid accumulation or runoff of surface waters from any source, or a mudflow.

3. The collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood.

4. Floods can be slow, or fast rising but generally develop over a period of days.

5. Dam failures are potentially the worst flood events. A dam failure is usually the result of neglect, poor design, or structural damage caused by a major event such as an earthquake. When a dam fails, a gigantic quantity of water is suddenly let loose downstream, destroying anything in its path.

6. A Flash Flood usually results from intense storms dropping large amounts of rain within a brief period. Flash floods occur with little or no warning and can reach full peak in only a few minutes.

B. When and where do most floods occur?

Floods are the most common and widespread of all natural disasters. Tribal, State, and Territorial communities in the United States have experienced some kind of flooding, after spring rains, heavy thunderstorms, or winter snow thaws. **Your homeowners or renters insurance does not cover flood damage.**

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[3] http://www.fema.gov/hazards/floods/

Floods (Continued)

C. Emergency Information

There are several things you can do to keep safe until water levels drop again including:

1. Fill bathtubs, sinks, and jugs with clean water in case water becomes contaminated.

2. Listen to a battery-operated radio for the latest storm information.

3. If local authorities instruct you to do so, turn off all utilities at the main power switch and close the main gas valve.

4. If told by emergency management or law enforcement personnel to evacuate your home, do so immediately!

5. If the waters start to rise inside your house before you have evacuated, retreat to the second floor, the attic, and if necessary, the roof.

6. Floodwaters may carry raw sewage, chemical waste and other disease-spreading substances. If you have been exposed to floodwaters, wash your hands with soap and disinfected water.

7. Avoid walking through floodwaters. As little as six inches of moving water can knock you off your feet.

8. Do not drive through a flooded area. If you come upon a flooded road, turn around and go another way. A car can be carried away by just 2 feet of floodwater. More people drown in their cars than anywhere else.

9. Look out for animals -- especially snakes. Animals lose their homes in floods too.

Floods (Continued)

If you are in a vehicle:

10. If your car stalls, abandon it immediately and get to higher ground. Many deaths have resulted from attempts to move stalled vehicles.

11. Stay away from downed power lines and electrical wires. Electrocution is a source of deaths in floods. Electric current passes easily through water.

12. Do not try to swim to safety; wait for rescuers to come to you get to high ground and stay there.

D. After a flood:

1. Before entering a building, inspect foundations for cracks or other damage. Do not go in if there is any chance of the building collapsing.

2. Upon entering the building, do not use matches, cigarette lighters or any other open flames, since gas may be trapped.

3. Keep power off until an electrician has inspected your system for safety.

4. Floodwaters pick up sewage and chemicals from roads, farms and factories. Protect your health by cleaning right away. Throw out foods and medicines that have met floodwater.

5. Until local authorities proclaim your water supply to be safe, boil water for drinking and food preparation vigorously for five minutes before using.

6. Be careful walking around. After a flood, steps and floors are often slippery with mud and covered with debris, including nails and broken glass.

7. Take steps to reduce your risk of future floods. Make sure to follow local building codes and ordinances when rebuilding, and use flood-resistant materials and techniques to protect yourself and your property from future flood damage.

V. Hazardous Materials[4]

A. Hazardous materials are. . .

Hazardous materials are chemical substances, which if released or misused can pose a threat to the environment or health. These chemicals are used in industry, agriculture, medicine, research, and consumer goods. Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released because of transportation accidents or because of chemical accidents in plants.

B. When and where do most hazardous materials disasters occur?

1. Between 1982 and 1991, there was an annual average of 6,774 hazardous materials transportation incidents. In 1991, 9,069 transportation incidents resulted in 10 deaths and 436 injuries.

2. Varying quantities of hazardous materials are manufactured, used, or stored at an estimated 4.5 million facilities in the United States--from major industrial plants to local dry cleaning establishments or gardening supply stores.

3. Modes of transportation experiencing incidents involving hazardous materials included air, highway, railway, waterways and pipelines.

C. What damage can be caused by hazardous material disasters?

1. Serious injury.
2. Death.
3. Long-lasting health effects.
4. Damage to buildings, homes and other property.
5. Interruption of travel and commerce.

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[4] http://www.fema.gov/hazards/hazardousmaterials/hazmat.shtm

Hazardous Materials (Continued)

D. Emergency Information

1. During a Hazardous Materials Disaster:

   a. If you hear a siren or other warning signal, turn on a radio or television for further emergency information.

   b. If you see an accident, call 9-1-1 or the local fire department to report the nature and location of the accident as soon as possible.

   c. Move away from the accident scene and help keep others away. Do not walk into or touch any of the spilled substance. Try not to inhale gases, fumes and smoke. If possible, cover mouth with a cloth while leaving the area.

   d. Stay away from accident victims until the hazardous material has been identified.

   e. Try to stay upstream, uphill and upwind of the accident.

2. <u>If asked to stay indoors by authorities</u>

   In Place Sheltering –

   a. Bring pets inside.

   b. Seal house so contaminants cannot enter.

   c. Close and lock windows and doors.

   d. Seal gaps under doorways and windows with wet towels and duct tape.

   e. Seal gaps around window and air conditioning units, bathroom and kitchen exhaust fans, and stove and dryer vents with duct tape and plastic sheeting, wax paper or aluminum wrap.

   f. Close fireplace dampers.

Hazardous Materials (Continued)

g. Close off nonessential rooms such as storage areas, laundry rooms and extra bedrooms.

h. Fill up bathtubs or large containers for an additional water supply.

i. Turn off ventilation systems.

j. Monitor the Emergency Broadcast System station for further updates and remain in shelter until authorities indicate it is safe to come out.

3. Authorities decide if evacuation is necessary based primarily on the type and amount of chemical released and how long it might affect an area. If asked to evacuate:

a. Stay tuned to a radio or television for information on evacuation routes, temporary shelters, and procedures.

b. Follow the routes recommended by the authorities--shortcuts may not be safe. Leave at once.

c. If you have time, minimize contamination in the house by closing all windows, shutting all vents, and turning off attic fans.

d. Take pre-assembled disaster supplies.

e. Remember to help your neighbors who may require special assistance--infants, elderly people and people with disabilities.

4. Returning home after a hazardous materials disaster:

a. Return home only when authorities say it is safe.

b. Follow local instructions concerning the safety of food and water.

c. Clean up and dispose of residue carefully. Follow instructions from emergency officials concerning clean-up methods.

VI. Hurricanes[5]

A. Hurricanes are. . .

1. A hurricane is a tropical storm with winds that have reached a constant speed of 74 miles per hour or more. Hurricane winds blow in a large spiral around a relative calm center known as the "eye." The "eye" is generally 20 to 30 miles wide, and the storm may extend outward 400 miles.

2. As a hurricane approaches, the skies will begin to darken and winds will grow in strength. As a hurricane nears land, it can bring torrential rains, high winds, and storm surges. A single hurricane can last for more than 2 weeks over open waters and can run a path across the entire length of the eastern seaboard.

B. When and where do hurricanes occur?

1. August and September are peak months during the hurricane season, which lasts from June 1 through November 30.

2. Hurricanes form in open waters and come inland from the shore.

C. Damage caused by a hurricane can include:

1. Death.

2. Serious injury.

3. Infrastructure damage.

4. Severe damage or destruction of homes, business and other property.

5. Interruption of travel and commerce.

[5] **http://www.fema.gov/hazards/hurricanes/**

Hurricanes (Continued)

D. Emergency Information

1. During a Hurricane Warning – issued when hurricane conditions are expected in 24 hours or less (e.g. winds of 74 miles per hour or greater or dangerously high water and rough seas).

a. Listen constantly to a battery-operated radio or television for official instructions. If in a mobile home, check tie-downs and evacuate immediately.

b. Avoid elevators.

c. If at home:

- Stay inside, away from windows, skylights, and glass doors.
- Keep a supply of flashlights and extra batteries handy. Avoid open flames, such as candles and kerosene lamps, as a source of light.
- If power is lost, turn off major appliances to reduce power "surge" when electricity is restored.

d. If officials indicate evacuation is necessary:

- Leave as soon as possible. Avoid flooded roads and watch for washed-out bridges.
- Secure your home by unplugging appliances and turning off electricity and the main water valve.
- Tell someone outside the storm area where you are going.
- If time permits, and you live in an identified surge zone, elevate furniture to protect it from flooding or better yet, move it to a higher floor.
- Take pre-assembled emergency supplies, warm protective clothing, blankets and sleeping bags to shelter.
- Lock up home and leave.

Hurricanes (Continued)

2. <u>After the hurricane</u>:

a. Return home only after authorities advise that it is safe to do so.

b. Avoid loose or dangling power lines and report them immediately to the Power Company, police, or fire department.

d. Enter your home with caution. Beware of snakes, insects, and animals driven to higher ground by floodwater.

e. Open windows and doors to ventilate and dry your home.

f. Check refrigerated foods for spoilage.

g. Take pictures of the damage, both to the house and its contents for insurance claims.

h. Drive only if absolutely necessary and avoid flooded roads and washed-out bridges.

i. Use telephone only for emergency calls.

VII. Landslides and Mudslides (Debris Flow)[6]

A. Landslides and mudslides are. . .

1. Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement.

2. Mudflows (or debris flows) are rivers of rock, earth, and other debris saturated with water.

[6] http://www.fema.gov/hazards/landslides/

Landslides and Mudslides (Continued)

B. When and where do they occur?

1. Landslides and debris flow are a serious geologic hazard common to almost every state in the United States.

2. Landslides – Factors that allow the force of gravity to overcome the resistance of earth material to landslide movement include: saturation by water, steep slopes caused by erosion or construction, alternate freezing or thawing, earthquake shaking, and volcanic eruptions. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides.

3. Mudflows – Develop when water rapidly accumulates in the ground, such as during heavy rainfall or rapid snowmelt, changing the earth into a flowing river of mud or "slurry." A slurry can flow rapidly down slopes or through channels, and can strike with little or no warning at avalanche speeds. A slurry can travel several miles from its source, growing in size as it picks up trees, cars, and other materials along the way.

C. What damage can be caused by landslides and mudflows?

1. Death - from 25 to 50 deaths annually.

2. Serious injury.

3. Infrastructure damage.

4. Severe damage or destruction of homes, business and other property - is estimated that nationally they have caused almost $2 billion in damages.

5. Interruption of travel and commerce.

Landslide and Mudslides (Continued)

D. Emergency Information

1. Prepare before intense storms by:

a. Becoming familiar with the land around you. Learn whether landslides and debris flows have occurred in your area by contacting local officials, state geological surveys or departments of natural resources, and university departments of geology. Knowing the land can help you assess your risk for danger.

b. Watch the patterns of storm-water drainage on slopes near your home, and especially the places where runoff water converges, increasing flow over soil-covered slopes. Watch the hillsides around your home for any signs of land movement, such as small landslides or debris flows, or progressively tilting trees. Watching small changes could alert you to the potential of a greater landslide threat.

2. During a land or mudslide:

a. If inside a building: stay inside and take cover under a desk, table, or other piece of sturdy furniture.

b. If outdoors:

- Try and get out of the path of the landslide or mudflow.
- Move quickly to the nearest high ground in a direction away from the path.
- If rocks and other debris are approaching, run for the nearest shelter such as a group of trees or a building.
- If escape is not possible, curl into a tight ball and protect your head.

Landslide and Mudslides (Continued)

c. After a land or mudslide:

- Stay away from the slide area .There may be danger of additional slides.
- Listen to a battery-operated radio or television for the latest emergency information.
- Remember that flooding may occur after a mudflow or a landslide.
- Check for damaged utility lines. Report any damage to the utility company.
- Check the building foundation, chimney, and surrounding land for damage.
- Replant damaged ground as soon as possible since erosion caused by loss of ground cover can lead to flash flooding.
- Seek the advice of geotechnical expert for evaluating landslide hazards or designing corrective techniques to reduce landslide risk.

VIII. Nuclear Energy Emergency

A. A nuclear energy emergency is. . .

Nuclear physics is the study of the nucleus of an atom. Scientific nuclear power comes from utility plants that produce energy through fission or fusion from the nucleus of an atom. Such plants produce fuel rods containing radiation which must be stored as waste products for millions of years. Nuclear weapons produce nuclear explosions that release radiation and can cause items they come in contact with to be destroyed or become radioactive.

The United States government requires commercial nuclear power plants within their borders to have both onsite and offsite emergency response plans.

Nuclear Energy (Continued)

B. When and where could a nuclear emergency happen?

1. At a nuclear power plant.
2. In the environment and communities surrounding a nuclear power plant.
3. On the road or railways which transport nuclear weapons or waste.
4. At the storage facilities for nuclear waste.
5. In the environment and communities surrounding a nuclear waste storage facility.
6. In the production plants for military equipment.
7. Anyplace where military weapons containing nuclear power are stored or used.

C. What damage can occur from exposure to nuclear energy?

1. Death.
2. Long-term illness.
3. Destruction of environment, infrastructure and human property.

D. Emergency Information

1. Before a disaster:

a. Know the site-specific emergency response plans.

b. Keep educated on information regarding plants, transportation and storage facilities in your area.

c. Monitor the Alert and Notification System and Emergency Alert Systems.

d. Be prepared to respond to an alert, general or site area emergency.

Nuclear Energy (Continued)

2. If you are advised to evacuate the area:

   a. Stay calm and do not rush.

   b. Listen to emergency information.

   c. Close and lock windows and doors.

   d. Turn off air conditioning, vents, fans, and furnace.

   e. Close fire place dampers.

   f. Use your own transportation or make arrangements to ride with a neighbor. Keep car windows and air vents closed and listen to an EAS radio station.

   g. Public transportation should be available for those who have not made arrangements.

   h. Follow the evacuation routes provided. If you need a place to stay, congregate care information will be provided.

3. If advised to remain at home:

   a. Bring pets inside.

   b. Close and lock windows and doors.

   c. Turn off air conditioning, vents, fans and furnace.

   d. Close fireplace dampers.

   e. Go to the basement or other underground area.

   f. Stay inside until authorities say it is safe.

IX. Terrorism[7]

A. Terrorism is. . .

Terrorism is the use of force or violence against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom. Terrorists often use threats to create fear among the public, to try to convince citizens that their government is powerless to prevent terrorism, and to get immediate publicity for their causes.

B. When and where can terrorism happen?

Terrorist attacks can occur anywhere with or without warning.

C. What damage can occur from terrorism?

1. Terrorist attacks can result in:

    a. Mass casualties.

    b. Loss of critical resources.

    c. Disruption of vital services.

    d. Disruption of the economy.

    e. Individual and/or mass panic.

2. Terrorist Weapons – Experts generally agree that there are five categories of possible terrorist weapons. The acronym B-NICE will help you to remember. The weapons thought to be available to at least some terrorist groups include:

    a. **B**iological weapons – Biological agents are found in nature. However some countries, groups and individuals have devised ways to make biological agents into weapons so that they can be disseminated to affect broad segments of the human or animal populations or crops. Some biological agents are contagious, but many are not. Routes of exposure for biological weapons are: inhalation, ingestion, absorption.

[7] http://www.fema.gov/hazards/terrorism/terrorf.shtm

Terrorism (Continued)

b. **N**uclear weapons and radiological dispersal devices – A terrorist attack with a nuclear weapon would be much different from an attack with a conventional explosive device. There would be potential for physical injury and death to persons who were not injured in the initial attack. The affected area would be much larger than in a conventional attack, and debris and other usually harmless items would be contaminated. The long-term health effects would be more difficult to ascertain and manage. Fortunately, experts believe that the complexities of a terrorist group obtaining a nuclear weapon and maintaining the tolerances that are required for the weapon to function make the use of nuclear weapons by terrorist groups a low risk.

- Radiation dispersal devices (RDDs) are considered to be a much higher threat because radiological materials are much easier to obtain than enriched nuclear materials and the technology required to detonate an RDD is similar to that involved in detonating conventional explosives.

c. **I**ncendiary devices –Incendiary devices are mechanical, electrical, or chemical devices used intentionally to initiate combustion and start a fire. Incendiary devices consist of three basic components:

- An igniter or fuse.
- A container or body.
- An incendiary material or filler.

Incendiary devices are relatively easy to make. A device containing a chemical incendiary would usually be metal or other non-breakable material (but not plastic because many chemicals are corrosive); a device containing a liquid incendiary material would usually be a breakable material such as glass.

Terrorism (Continued)

d. **C**hemical weapons – Unlike biological agents or nuclear materials, which are difficult to produce or purchase, the ingredients used to produce chemical weapons are found in common products and petrochemicals. Terrorists can turn these common products into lethal weapons. There are five categories of chemical weapons:

- Blister agents cause blisters, burns, and other tissue damage. Exposure may be made through liquid or vapor contact with any exposed skin, inhalation, or ingestion.
- Blood agents are absorbed into the bloodstream and deprive blood cells of oxygen. Exposure may be made through liquid or vapor contact with any exposed skin, inhalation, or ingestion.
- Choking agents attack the lungs. Following exposure through inhalation, the lungs fill with fluid, which prevents oxygen from being absorbed by, and carbon dioxide from being removed from, the blood.
- Nerve agents affect the central nervous system. These agents act most quickly and are the most lethal of all chemical agents, acting within seconds of exposure.
- Riot-control agents cause respiratory distress and tearing and are designed to incapacitate rather than kill. Riot-control agents cause intense pain, especially in the moist areas of the body.

e. **E**xplosive devices – Can be classified into two types:

- Conventional explosives include: grenades, mortars, and shoulder-fired surface-to-air missiles.
- Improvised explosive devices include any device that is created in an improvised manner, incorporating explosives or other materials designed to destroy, disfigure, distract, or harass.

Terrorism (Continued)

D. Emergency Information – Some of the steps for preparing for a terrorist incident are the same as for natural hazards but some require special planning.

1. The steps to take to prepare for a terrorist attack include:

a. Assembling a disaster supply kit.

b. Identifying a safe room in the home or workplace and a meeting place outside of the home or workplace.

2. Procedures for sheltering in place during a chemical or biological attack include:

a. Shutting off the ventilation system and latching all doors and windows to reduce airflow from the outside.

b. Using pre-cut plastic sheeting to cover openings where air can enter the room, including doors, windows, vents, electrical outlets, and telephone outlets.

c. Taping the plastic sheeting around all doors and windows using duct tape to ensure a good seal.

d. Seal with duct tape other areas where air can come in, such as under doors and areas where pipes enter the home. Air can be blocked by placing towels or other soft objects in areas where air could enter, then securing them with duct tape.

e. Listen to a battery-powered radio for the all clear. Chemicals used in an attack will be carried on the wind and will dissipate over time. Listen to the Emergency Alert System broadcasts to know when it is safe to leave the safe room.

Terrorism (Continued)

3. There are special terms emergency management personnel will use during a terrorism incident including:

a. The hot zone includes the incident scene and the contaminated area around the scene. If the incident is outdoors, the hot zone will spread downwind, taking wind speed into consideration.

b. The warm zone is upwind from the hot zone and is used to isolate victims during decontamination. It is called the warm zone because the evacuees can carry or spread a contaminant into this area. Professional responders will hold those who require decontamination in the warm zone until decontamination is complete so that contaminants do not spread.

c. The cold zone is located upwind and beyond the warm zone. Those who are not contaminated or who have been decontaminated will be evacuated to the cold zone and kept there until professional responders authorize them to leave.

X. Thunderstorms and Lightning[8]

A. Thunderstorms and Lightning are. . .

1. A thunderstorm is formed from a combination of moisture, rapidly rising warm air and a force capable of lifting air such as a warm and cold front, a sea breeze or a mountain. All thunderstorms contain lightning. Thunderstorms may occur singly, in clusters or in lines. Thus, it is possible for several thunderstorms to affect one location in the course of a few hours. Some of the most severe weather occurs when a single thunderstorm affects one location for an extended time. Thunderstorms can bring heavy rains (which can cause flash flooding), strong winds, hail, lightning and tornadoes.

[8] http://www.fema.gov/hazards/thunderstorms/thunder.shtm

Thunderstorms and Lightning (Continued)

2. Lightning is an electrical discharge that results from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a "bolt." This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning reaches a temperature approaching 50,000 degrees Fahrenheit in a split second. The rapid heating and cooling of air near the lightning causes thunder.

B. When and where could Thunderstorms and Lightning happen?

1. At any given moment, nearly 1,800 thunderstorms are in progress over the surface of the earth.

2. On average, the United States gets 100,000 thunderstorms each year. Approximately 1,000 tornadoes develop from these storms.

3. While thunderstorms and lightning can be found throughout the United States, they are most likely to occur in the central and southern states. The state with the highest number of thunderstorm days is Florida.

4. It is a myth that lightning never strikes twice in the same place. In fact, lightning will strike several times in the same place in the course of one discharge.

C. What damage can occur from Thunderstorms and Lightning?

1. Death or Serious Injury – More deaths from lightning occur on the East Coast.

2. Infrastructure damage – especially to power sources and straight-line winds exceeding 100 mph are responsible for most thunderstorm damage.

3. Severe damage or destruction of homes, business and the environment. The power of lightning's electrical charge and intense heat can electrocute on contact, split trees, ignite fires and cause electrical failures. Large hail results in nearly $1 billion in damage to property and crops. Approximately $100 million in annual losses result from forest and building fires caused by lightning. Approximately 10,000 forest fires are started each year by lightning.

Thunderstorms and Lightning (Continued)

D. Emergency Information – Thunderstorms and Lightning

1. Thunderstorms can bring heavy rains (which can cause flash flooding), strong winds, hail, lightning and tornadoes. In a severe thunderstorm get inside a sturdy building and stay tuned to a battery-operated radio for weather information.

2. Lightning is a major threat during a thunderstorm. In the United States between 75 to 100 Americans are hit and killed each year by lightning. If you are caught outdoors, avoid natural lightning rods such as tall, isolated trees in an open area or the top of a hill and metal objects such as wire fences, golf clubs and metal tools.

XI. Tornadoes

A. Tornados are. . .

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud. It is spawned by a thunderstorm (or sometimes as a result of a hurricane) and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. Danger signs include:

1. An approaching cloud of debris can mark the location of a tornado even if a funnel is not visible.

2. Before a tornado hits, the wind may die down and the air may become very still.

B. When and where could a tornado happen?

1. Tornadoes generally occur near the trailing edge of a thunderstorm. It is not uncommon to see clear, sunlit skies behind a tornado.

2. When a tornado is coming, you have only a short amount of time to make life-or-death decisions. Advance planning and quick response are the keys to surviving a tornado.

3. Tornado season is generally March through August, although tornadoes can occur at any time of year. They tend to occur in the afternoons and evenings: over 80 percent of all tornadoes strike between noon and midnight.

Tornadoes (Continued)

C. What damage can occur from tornadoes?

1. Death.
2. Serious injury..
3. Infrastructure damage.
4. Severe damage or destruction of homes, business and other property.
5. Interruption of travel and commerce.

D. Emergency Information –

1. A tornado watch is issued by the National Weather Service when tornadoes are possible in your area. Remain alert for approaching storms. This is time to remind family members where the safest places within your home are located, and listen to the radio or television for further developments.
2. A tornado warning is issued when a tornado has been sighted or indicated by weather radar.
3. Mobile homes are particularly vulnerable. A mobile home can overturn very easily even if precautions have been taken to tie down the unit. When a tornado warning is issued, take shelter in a building with a strong foundation. If shelter is not available, lie in ditch or low-lying area a safe distance away from the unit.
4. What to do during a tornado:

    a. If at home:

    - If you have a tornado safe room or engineered shelter, go there immediately.
    - Go at once to a windowless, interior room; storm cellar; basement; or lowest level of the building.
    - If there is no basement, go to an inner hallway or a smaller inner room without windows, such as a bathroom or closet.

Tornadoes (Continued)

- Get away from the windows.
- Get under a piece of sturdy furniture such as a workbench, heavy table or desk and hold on to it.
- Use arms to protect head and neck.
- If in a mobile home, get out and find shelter elsewhere.

b. If at work or school

- Go to the area designated in your tornado plan.
- Avoid places with wide-span roofs such as auditoriums, cafeterias, large hallways, or shopping malls.
- Get under a piece of sturdy furniture such as a workbench, heavy table or desk and hold on to it.
- Use arms to protect head and neck.

c. If outdoors

- If possible, get inside a building.
- If shelter is not available or there is no time to get indoors, lie in a ditch or low-lying area or crouch near a strong building. Be aware of the potential for flooding.
- Use your arms to protect your head and neck.

d. If in a car

- Never try to out-drive a tornado in a car or truck.
- Get out of the car immediately and take shelter in a nearby building.
- If there is no time to get indoors, get out of the car and lie in a ditch or low-lying area away from the vehicle. Be aware of the potential for flooding.

XII. Tsunami[9]

A. Tsunamis are. . .

A tsunami (pronounced “soo-nahm'ee”) is a series of waves generated by an undersea disturbance such as an earthquake. From the area of the disturbance, the waves will travel outward in all directions, much like the ripples caused by throwing a rock into a pond. The time between wave crests may be from 5 to 90 minutes, and the wave speed in the open ocean will average 450 miles per hour.

Tsunamis reaching heights of more than 100 feet have been recorded. As the waves approach the shallow coastal waters, they appear normal and the speed decreases. Then as the tsunami nears the coastline, it may grow to great height and smash into the shore, causing much destruction.

B. When and where could a tsunami happen?

Tsunamis can originate hundreds or even thousands of miles away from coastal areas. The range of damage can go in-land for many miles. Areas at greatest risk are less than 50 feet above sea level and within one mile of the shoreline. Local geography may intensify the effect of a tsunami.

In the United States parts of Alaska, California, Hawaii, Oregon and Washington states have been damaged by tsunamis.

C. What damage can occur from a tsunami?

1. Death – Most deaths during a tsunami are a result of drowning.
2. Serious injury.
3. Infrastructure damage.
4. Severe damage or destruction of homes, business and other property – associated risks include flooding, polluted water supplies, and damaged gas lines.
5. Interruption of travel and commerce.

[9] **http://www.fema.gov/hazards/tsunamis/tsunami.shtm**

Tsunami (Continued)

D. Emergency Information –

1. Before a tsunami:

- Find out if your home is in a danger area. Know the height of your street above sea level and the distance of your street from the ocean shore.

- Make evacuation plans. Pick an inland location that is elevated. After an earthquake or other natural disaster, roads in and out of the vicinity may be blocked, so pick more than one evacuation route

2. During a tsunami:

- Listen to a radio or television to get the latest emergency information, and be ready to evacuate if asked to do so.

- If you hear an official tsunami warning or detect signs of a tsunami, evacuate at once. Climb to higher ground. A tsunami warning is issued when authorities are certain that a tsunami threat exists.

- Stay away from the beach. Never go down to the beach to watch a tsunami come in. If you can see the wave you are too close too escape it.

- Return home only after authorities advise it is safe to do so. A tsunami is a series of waves. Do not assume that one wave means that the danger over. The next wave may be larger than the first one. Stay out of the area.

XIII. Volcanoes[10]

A. Volcanos are. . .

A volcano is a mountain that opens downward to a reservoir of molten rock below the surface of the earth. Unlike most mountains, which are pushed up from below, volcanoes are built up by an accumulation of their own eruptive products lava, ash flows, as well as airborne ash and dust. When pressure from gases and the molten rock becomes strong enough to cause an explosion, eruptions occur. Gases and rock shoot up through the opening and spill over, or fill the air with lava fragments. Volcanic products are used as building or road-building materials, as abrasive and cleaning agents, and as raw materials for many chemical and industrial uses. Lava ash makes soil rich in mineral nutrients.

B. When and where could a volcano eruption happen?

In the United States, volcanic eruptions are most likely in the Pacific Rim states of Hawaii, Alaska, Washington, Oregon, and California. The chance of eruptions that could damage populated areas is the greatest for the active volcanoes of Hawaii and Alaska.

The danger area around a volcano covers approximately a 20-mile radius. Some danger may exist 100 miles or more from a volcano, leaving Montana and Wyoming at risk.

C. What damage can occur from a volcano eruption?

1. Death – from the lava flow or from inhalation of too much ash.
2. Serious injury.
3. Infrastructure damage.
4. Severe damage or destruction of homes, business and other property – an erupting volcano can also trigger tsunamis, flash floods, earthquakes, rock falls, and mudflows.
5. Interruption of travel and commerce.

[10] http://www.fema.gov/hazards/volcanoes/volcano.shtm

Volcanoes (Continued)

D. Emergency Information –

1. Before a volcano erupts:

- Volcanic eruptions can hurl hot rocks for at least 20 miles. Floods, airborne ash, or noxious fumes can spread 100 miles or more. If you live near a known volcano, active or dormant, be ready to evacuate at a moment's notice.
- Learn about your community warning systems.
- Be prepared for these disasters that can be spawned by volcanoes.
  - Earthquakes
  - Flash floods
  - Landslides and mudflows
  - Thunderstorms
  - Tsunamis
- Make evacuation plans. You want to get to high ground away from the eruption. Plan a route out and have a backup route in mind.

2. During an eruption:

- Seek high ground.
- Protect eyes (with goggles if possible) and mouth (use a throw-away breathing mask.
- Protect yourself from lateral blasts – Sideways directed volcanic explosions, known as "lateral blasts," can shoot large pieces of rock at very high speeds for several miles. These explosions can kill by impact, burial, or heat. They have been known to knock down entire forests. The majority of deaths attributed to the Mount St. Helens volcano eruption in 1980 were a result of lateral blast and tree blow-down.

XIV. Winter Storms[11]

A. Winter storms are. . .

When cold weather turns severe (x degrees below normal temperatures for winter months) and excessive amounts of ice and snow falls, a winter storm is at hand. Three fundamental elements of a winter storm include: watches and warnings, wind chill factors and blizzard conditions.

1. A winter storm may feel colder than the actual temperature indicates due to wind chill. "Wind chill" is a calculation of how cold it feels outside when the effects of temperature and wind speed are combined.

2. Winter Storm Watches and Warnings – A winter storm watch indicates that severe winter weather may affect your area. A winter storm warning indicates that severe winter weather conditions are definitely on the way.

3. A blizzard warning means that large amounts of falling or blowing snow and sustained winds of at least 35 miles per hour are expected for several hours.

B. When and where could a winter storm happen?

Winter storms tend to happen in the months of October through April in colder climates.

C. What damage can occur from winter storms?

1. Death – occurs not only from the cold, but from unsafe measures people take to keep warm. Alcohol and caffeine can dehydrate the body. Kerosene heaters can cause fires. Charcoal fires without ventilation can cause suffocation.

2. Serious injury – frostbite (a severe reaction to cold exposure) can permanently damage the skin and bones of victims. Hypothermia (when body temperature drops to less than 90 degrees Fahrenheit) can cause shivering, slow speech, memory lapses, stumbling, drowsiness and exhaustion.

[11] http://www.fema.gov/hazards/winterstorms/stormsf.shtm

Winter Storms (Continued)

3. Infrastructure damage.

4. Severe damage or destruction of homes, business and other property.

5. Interruption of travel and commerce.

D. Emergency Information –

1. If Indoors:

- Stay indoors and dress warmly.
- Conserve fuel.
- Lower the thermostat to 65 degrees during the day and 55 degrees at night.
- Close off unused rooms.
- If the pipes freeze, remove any insulation or layers of newspapers and wrap pipes in rags. Completely open all faucets and pour hot water over the pipes, starting where they were most exposed to the cold (or where the cold was most likely to penetrate).
- Listen to the radio or television to get the latest information.

2. If Outdoors:

- Dress warmly.
- Wear loose-fitting, layered, light-weight clothing.
- Layers can be removed to prevent perspiration and chill.
- Outer garments should be tightly woven and water repellant.
- Mittens are warmer than gloves because fingers generate warmth when they touch each other.

Winter Storms (Continued)

- Stretch before you go out. If you go out to shovel snow, do a few stretching exercises to warm up your body. Also take frequent breaks.

- Cover your mouth. Protect your lungs from extremely cold air by covering your mouth when outdoors. Try not to speak unless absolutely necessary.

- Avoid overexertion. Cold weather puts an added strain on the heart. Unaccustomed exercise such as shoveling snow or pushing a car can bring on a heart attack or make other medical conditions worse. Be aware of symptoms of dehydration.

- Watch for signs of frostbite and hypothermia.

- Keep dry. Change wet clothing frequently to prevent a loss of body heat. Wet clothing loses all of its insulating value and transmits heat rapidly.

NEXT . . .

1. If your CERT class continues on the same day, take your break and return to this classroom.

2. If your CERT class continues on another day (next week or next month) your **Homework Assignment** is to come prepared to participate in the class review and final exercise.

End of Unit Ten