Section 4
Hazard-Specific Guidance

Scope. The following guidance is provided for each of the three hazard classes: natural, technological, and terrorism. The hazard-specific guidance in this section is linked to Table 4-2 in Standard 4 of Section 1.

General Resources.

General Information - http://www.fema.gov/hazards/
Department of Homeland Security (DHS) – http://www.dhs.gov
READY.gov Website – http://www.ready.gov
DisasterHelp.gov – https://disasterhelp.gov
American Red Cross (ARC) – http://www.redcross.org

Natural Hazards

Destructive Weather Hazards

Scope. Destructive weather hazards include hurricanes, tropical cyclones, typhoons, tornadoes, and all other wind-related emergencies.

Resources.

Hurricane:

General Information - http://www.fema.gov/hazards/hurricanes/
National Hurricane Program - http://www.fema.gov/hazards/hurricanes/nhp.shtm
National Hurricane Center – http://www.nhc.noaa.gov
Hurricane Awareness Links –
http://www.fema.gov/hazards/hurricanes/threats.shtm
http://www.floridadisaster.org/hurricane_aware/english/high_winds.shtml
http://ivis.eps.pitt.edu/courses/hazards/lectures/20.pdf
http://disaster.usda.gov/hurricane_jump.htm

Tornado:

Tornado Information - http://www.fema.gov/hazards/tornadoes/
Tornado Factsheet - http://www.fema.gov/hazards/tornadoes/tornadof.shtm
Tornado Backgrounder - http://www.fema.gov/hazards/tornadoes/tornado.shtm
Tornado Awareness Links –
http://www.floridadisaster.org/hurricane_aware/english/tornadoes.shtml
http://disaster.usda.gov/tornado_jump.htm

Thunderstorm:

Thunderstorm Information: http://www.fema.gov/hazards/thunderstorms/

Preparedness:

DisasterHelp.gov - https://disasterhelp.gov
Hurrevac.com – http://www.hurrevac.com/reg_win.htm
HURREVAC 2000 System (ver 3.0.6 or above)
FEMA Prevention & Planning Library –
http://www.fema.gov/library/prepandprev.shtm#state
Destructive weather conditions and categorizations
https://weather.cherrypoint.usmc.mil/dest_wx_manual.htm
Naval Atlantic Meteorology and Oceanography Facility – NAS Jacksonville (FL)
https://jax.weather.navy.mil

Hazard Overview.

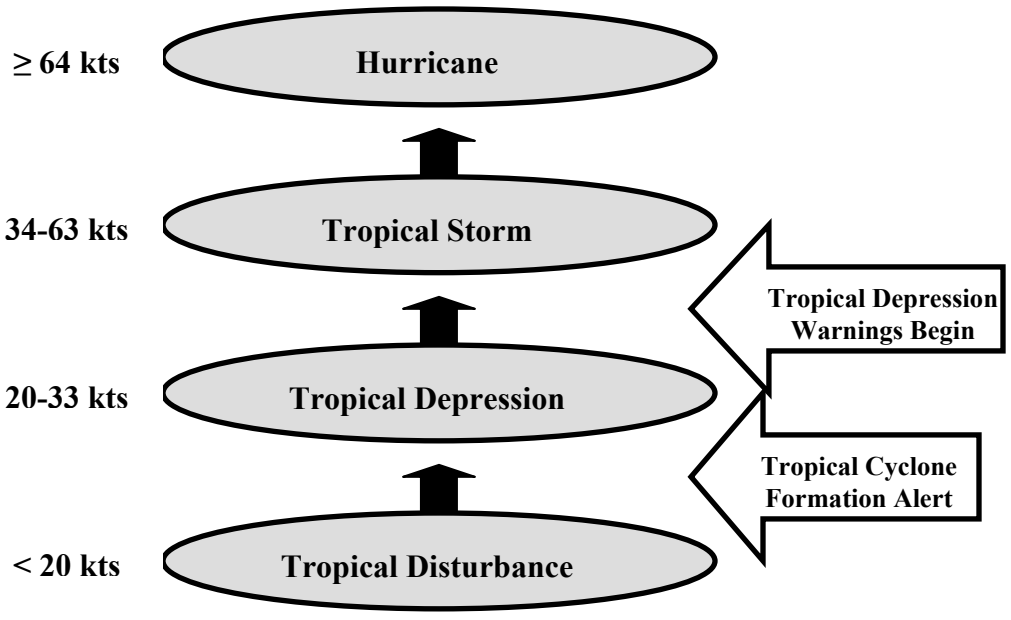
Hurricane – Hurricane is a term utilized to describe a severe tropical cyclone occurring within the Atlantic Ocean. A hurricane is a tropical storm with winds that have reached a constant speed of 74 miles per hour or more. Hurricanes also produce other destructive weather including tornadoes, which add to the hurricane's destructive power.

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

The stages of development of a hurricane are identified in Figure H-1 and are classified as follows:

1. **Tropical Disturbance –** A weather disturbance with maximum sustained winds of < 20 knots.
2. **Tropical Depression** - An organized system of clouds and thunderstorms with a defined circulation and maximum sustained winds of 38 mph (33 knots) or less.
3. **Tropical Storm** - An organized system of strong thunderstorms with a defined circulation and maximum sustained winds of 39 to 73 mph (34-63 knots).

Figure H-1: Hurricane Stages of Development



Hurricanes are further identified by hurricane categories. The Saffir-Simpson scale is used to establish these categories. Hurricane categories provide an estimate of storm surge and potential structural damage based upon maximum sustained wind speed of the hurricane. Please see Table H-1 for details.

Table H-1: Saffir-Simpson Scale

Category	Winds (kts)	Surge (feet)	Damage
1	**64 – 82**	**4 – 5**	**Minimal**
2	**83 – 95**	**6 – 8**	**Moderate**
3	**96 – 113**	**9 – 12**	**Extensive**
4	**113 – 135**	**13 – 18**	**Extreme**
5	**> 135**	**> 18**	**Catastrophic**

Storm surge is an abnormal increase in the ocean's level, sometimes in excess of several meters high and miles wide. Storm surges can come ashore up to five hours before the storm and destroy low-elevation coastal areas. It is especially damaging when the storm surge occurs during high tide and consequently is often responsible for most hurricane-related deaths. Storm surge is a large dome of water often 50 to 100 miles wide that sweeps across the coastline near where a hurricane makes landfall. Storm surge can range from 4 to 6 feet for a minimal hurricane to greater than 20 feet for the stronger ones. The surge of high water topped by waves is devastating. The stronger the hurricane and the shallower the offshore water, the higher the surge will be. Along the immediate coast, storm surge is the greatest threat to life and property, even more so than the high winds.

The Saffir-Simpson scale provides the potential surge above the predicted tide level. Figure H-2 provides a comparison of storm surge in relation to hurricane category.

Figure H-2: Predicted Storm Surge by Hurricane Category

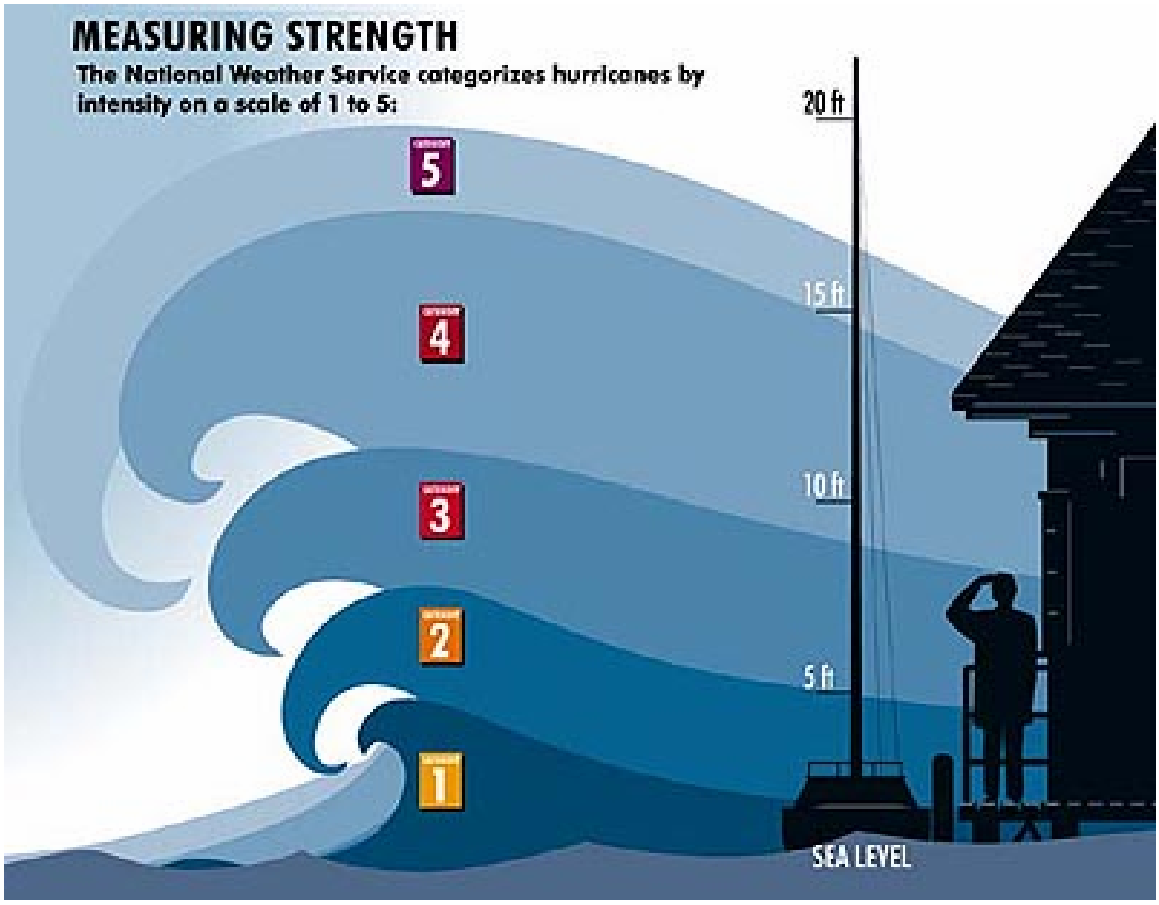
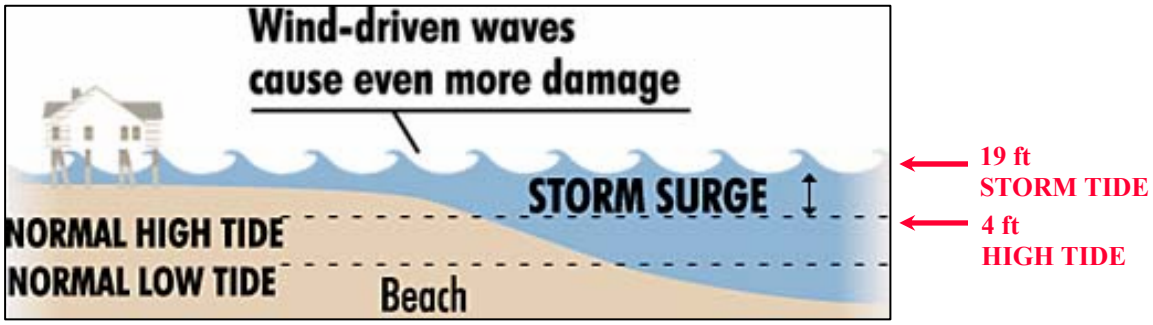


Figure H-3 below describes the potential storm surge impact of a Category 4 hurricane (114-135 kts) generating an approximate 15 foot storm surge.

Figure H-3: Storm Surge (Example)



Within the Commander, Fleet Forces Command (CFFC) area of responsibility along the Eastern seaboard and the Gulf of Mexico, designated Regions and Installations must set and maintain specified Tropical Cyclone Conditions of Readiness (COR) as shown in Table H-2.

Table H-2: Tropical Cyclone Conditions of Readiness (CFFC AOR)

Tropical Cyclone Conditions of Readiness	
Indicates time until onset of winds ≥ 50 knots	
COR 5	**1 June – 30 November every year**
COR 4	**72 hours**
COR 3	**48 hours**
COR 2	**24 hours**
COR 1	**12 hours**
Note:	"Tropical Wind Advisory" issues for expected tropical winds from 34 – 49 knots.

Guidance for hurricanes is also applicable to other large, organized weather-related hazards known by other names within other geographic boundaries. Examples include:

- North Pacific = Typhoon
- Indian Ocean = Cyclone
- Australia = Willy Willy
- Philippines = Baguio

Tornado – 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.

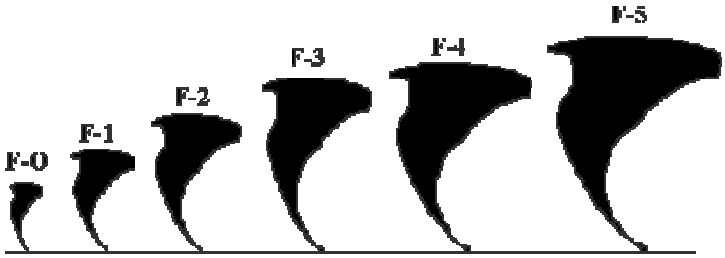
The damage from a tornado is a result of the high wind velocity and wind-blown debris. Tornado season is generally March through August, although tornadoes can occur at any time of year. They tend to occur in the afternoons and evenings (over 80 percent of all tornadoes strike between noon and midnight). Tornadoes can occur in any state but are more frequent in the Midwest, Southeast and Southwest. The states of Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Mississippi, Missouri, Nebraska, Oklahoma, South Dakota, and Texas are at greatest risk.

Refer to Table H-3 and Figure H-4 for details on the Fujita-Pearson Tornado Scale, which is used to classify tornado strength based upon a similar method as the Saffir-Simpson scale discussed above.

Table H-3: Fujita - Pearson Tornado Scale

Saffir-Simpson Hurricane Category	Fujita Tornado Category	Hurricane Wind Speeds (3-sec gust)	Tornado Wind Speeds (3-sec gust)
	F0		45 - 77
C1	F1	93 – 119	78 - 118
C2	F2	120 – 138	119 - 163
C3		139 – 163	
C4	F3	164 – 194	164 - 210
C5	F4	>194	211 - 262
	F5		262 +

Figure H-4: Fujita - Pearson Tornado Scale



Damage Estimates. The following damage can be expected based upon each of the six tornado types.

- F-0: 40-72 mph, chimney damage, tree branches broken
- F-1: 73-112 mph, mobile homes pushed off foundation or overturned
- F-2: 113-157 mph, considerable damage, mobile homes demolished, trees uprooted
- F-3: 158-205 mph, roofs and walls torn down, trains overturned, cars thrown
- F-4: 207-260 mph, well-constructed walls leveled
- F-5: 261-318 mph, homes lifted off foundation and carried considerable distances, autos thrown as far as 100 meters

Hazard Summary.

- The best protection during a tornado is in an interior room on the lowest level of a building, preferably a safe room.
- Tornadoes strike with incredible velocity. Wind speeds may approach 300 miles per hour. These winds can uproot trees and structures and turn harmless objects into deadly missiles, all in a matter of seconds. Mobile homes are particularly vulnerable to tornadoes.
- Injury or deaths related to tornadoes most often occur when buildings collapse, people are hit by flying objects or are caught trying to escape
- Tornadoes are most destructive when they touch ground. Normally a tornado will stay on the ground for no more than 20 minutes; however, one tornado can touch ground several times in different areas.

Danger Zones. Tornadoes can occur in any Region or State, but are more frequent in the Midwest, Southeast and Southwest. The states of Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Mississippi, Missouri, Nebraska, Oklahoma, South Dakota, and Texas are at greatest risk.

Mitigation Resources.

General mitigation guides: http://www.fema.gov/fima/planning_toc5.shtm

Best Practices & Case Studies.

General mitigation success stories: http://www.fema.gov/fima/success.shtm

Seismic/Geological Hazards

Scope. Seismic and geological hazards include earthquakes, volcanoes, tsunamis, landslides, mudslides, and all other seismic/geological-related emergencies.

Resources.

Earthquake:

General Information - http://www.fema.gov/hazards/earthquakes/
Earthquake Factsheet - http://www.fema.gov/hazards/earthquakes/quakef.shtm
Earthquake Backgrounder – http://www.fema.gov/hazards/earthquakes/quake.shtm
Earthquake Awareness Links – http://www.fema.gov/pdf/hazards/eqfs.pdf

Volcano:

General Information – http://www.fema.gov/hazards/volcanoes/
Volcano Factsheet - http://www.fema.gov/hazards/volcanoes/volcanof.shtm
Volcano Backgrounder – http://www.fema.gov/hazards/volcanoes/volcano.shtm

Tsunami:

General Information – http://www.fema.gov/hazards/tsunamis/
Tsunami Factsheet – http://www.fema.gov/hazards/tsunamis/tsunamif.shtm
Tsunami Backgrounder – http://www.fema.gov/hazards/tsunamis/tsunami.shtm

Landslides/Mudslides:

General Information – http://www.fema.gov/hazards/landslides/

Preparedness:

DisasterHelp.gov - https://disasterhelp.gov
FEMA Prevention & Planning Library – http://www.fema.gov/library/prepandprev.shtm#state

Hazard Overview.

Earthquake – An earthquake is a sudden, rapid shaking of the Earth's crust caused by the breaking and shifting of rock beneath the Earth's surface.

Shaking as a result of an earthquake can cause buildings and bridges to collapse; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and huge, destructive ocean waves (tsunamis). Buildings with foundations resting on unconsolidated landfill, old waterways, or other unstable soil are most at risk. Buildings or trailers and manufactured homes not tied to a reinforced foundation anchored to the ground are also at risk since they can be shaken off their mountings during an earthquake. Earthquakes can occur at any time of the year.

Aftershocks are smaller earthquakes that follow the main shock and can cause further damage to weakened buildings. After-shocks can occur in the first hours, days, weeks, or even months after the quake. Be aware that some earthquakes are actually foreshocks, and a larger earthquake might occur.

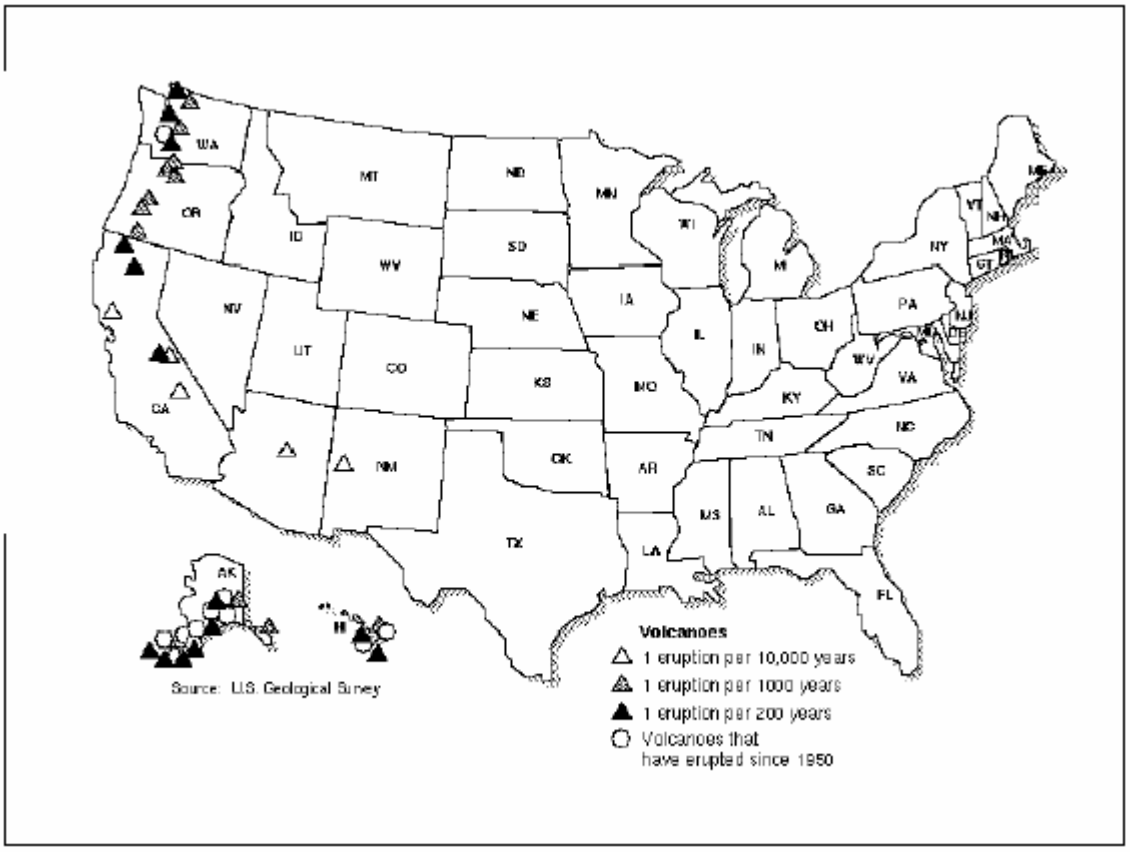
Ground movement during an earthquake is seldom the direct cause of death or injury. Most earthquake-related injuries result from collapsing walls, flying glass, and falling objects as a result of the ground shaking, or people trying to move more than a few feet during the shaking. Much of the damage in earthquakes is predictable and preventable. We must all work together in our communities to apply our knowledge to building codes, retrofitting programs, hazard hunts, and neighborhood and family emergency plans. Earthquakes occur most frequently west of the Rocky Mountains, although historically the most violent earthquakes have occurred in the central United States. All 50 states and all U.S. territories are vulnerable to earthquakes. Forty-one states or territories are at moderate to high risk.

Volcano – A volcano is a mountain that opens downward to a reservoir of molten rock below the surface of the earth. When pressure from gases and the molten rock becomes strong enough to cause an explosion, eruptions occur.

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. Active volcanoes of the Cascade Mountain Range in California, Oregon, and Washington have created problems recently. The danger area around a volcano covers approximately a 20-mile radius. Ash plumes from volcanoes can travel hundreds of miles, creating significant problems in other states such as Idaho, Montana and Wyoming.

See Figure H-5 for identified Volcano hazard areas within the U.S. (Courtesy of the U.S. Geological Survey).

Figure H-5: Volcano Hazard Areas (U.S. Only)

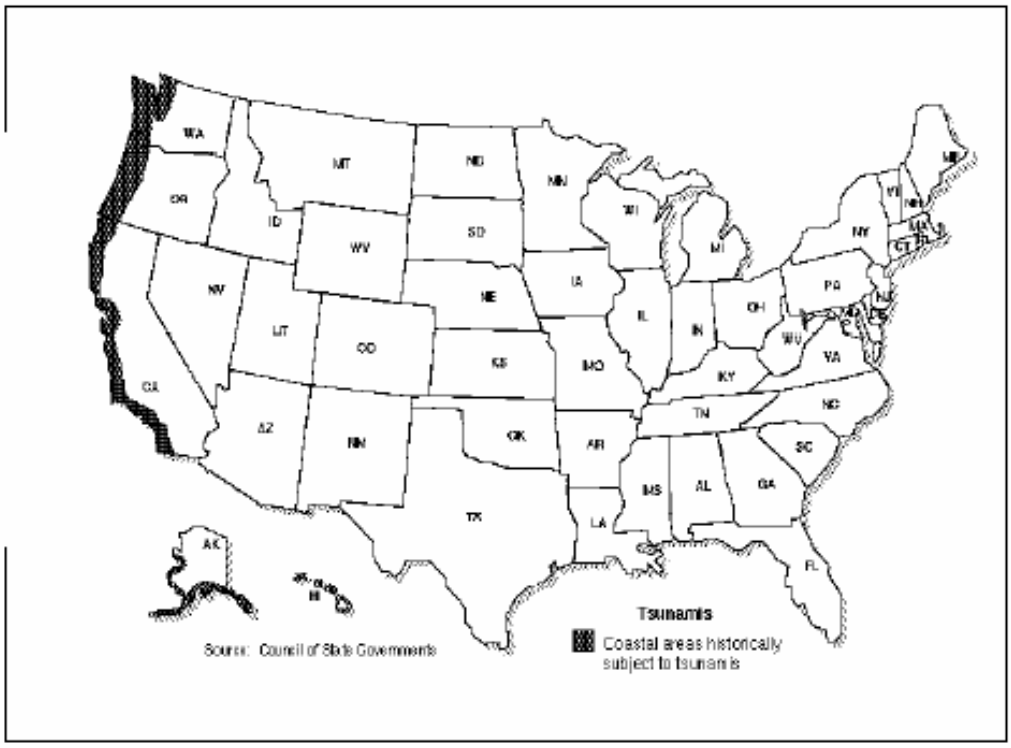


Tsunami – A tsunami (pronounced “soo-nahm'ee”) is a series of waves generated by an undersea disturbance such as an earthquake.

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.

See Figure H-6 for identified Tsunami hazard areas within the U.S. (Courtesy of the Council of State Governors).

Figure H-6: Tsunami Hazard Areas (U.S. Only)



Landslides/Mudslides – Debris flows, sometimes referred to as **mudslides**, mudflows, lahars, or debris avalanches, are common types of fast-moving landslides. These flows generally occur during periods of intense rainfall or rapid snow melt.

Debris flows, sometimes referred to as mudslides, mudflows, lahars, or debris avalanches, are common types of fast-moving landslides. These flows generally occur during periods of intense rainfall or rapid snow melt. They usually start on steep hillsides as shallow landslides that liquefy and accelerate to speeds that are typically about 10 miles per hour, but can exceed 35 miles per hour. The consistency of debris flow ranges from watery mud to thick, rocky mud that can carry large items such as boulders, trees, and cars. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides.

Mitigation Resources.

General mitigation guides: http://www.fema.gov/fima/planning_toc5.shtm
Earthquake: http://www.fema.gov/hazards/earthquakes/eqmit.shtm (NEHRP)
Volcano: http://www.fema.gov/pdf/hazards/vocfs.pdf
Tsunami: http://www.fema.gov/pdf/hazards/tsufs.pdf
Landslides/Mudslides: http://www.fema.gov/hazards/landslides

Best Practices & Case Studies.

General mitigation success stories: http://www.fema.gov/fima/success.shtm
Earthquake mitigation success stories:
http://www.fema.gov/fima/nehrpsuccess.shtm

Water-related Hazards

Scope. Water-related hazards include floods, tidal surges, seiche, and all other water-related emergencies.

Resources.

Flood:

General Information - http://www.fema.gov/hazards/floods/

Preparedness:

DisasterHelp.gov - https://disasterhelp.gov

FEMA Prevention & Planning Library –

http://www.fema.gov/library/prepandprev.shtm#state

Hazard Overview.

Floods – Floods are one of the most common and widespread of all natural disasters. Most communities in the United States have experienced some kind of flooding, after spring rains, heavy thunderstorms, or winter snow thaws.

Heavy rains and ocean waters brought ashore by strong winds can cause flooding in excess of 50 cm (20 in) over a 24 hour period. The runoff systems in many cities are unable to handle such an increase in water because of the gentle topography in many of the coastal areas where hurricanes occur. Hurricanes are capable of producing copious amounts of flash flooding rainfall. During landfall, a hurricane rainfall of 10 to 15 inches or more is common. If the storm is large and moving slowly-less than 10 mph-the rainfall amounts from a well-organized storm are likely to be even more excessive. To get a generic estimate of the rainfall amount (in inches) that can be expected, divide the storm's forward motion by 100, i.e. Forward Speed/100 = estimated inches of rain. Rainfall and Flooding fact: Tropical Storm Claudette (1979) brought 45 inches of rain to an area near Alvin, Texas, contributing to more than $600 million in damage.
The heaviest rain usually occurs along the coastline, but sometimes there is a secondary maximum further inland. This heavy rain usually occurs slightly to the right of the cyclone track and usually occurs between 6 hours before and 6 hours after landfall. The amount of rain depends on the size of the cyclone, the forward speed of the cyclone and whether it interacts with a cold front. Interaction with a cold front will not only produce more tornadoes but more rainfall as well.

Mitigation Resources.

General mitigation guides: http://www.fema.gov/fima/planning_toc5.shtm
Flooding: http://www.fema.gov/hazards/floods

Mitigation is the cornerstone of emergency management. It's the ongoing effort to lessen the impact disasters have on people's lives and property through damage prevention and flood insurance. Through measures such as, building safely within the floodplain or removing homes altogether; engineering buildings and infrastructures to withstand earthquakes: and creating and enforcing effective building codes to protect property from floods, hurricanes and other natural hazards, the impact on lives and communities is lessened.

Flood mitigation actions can be grouped into six broad categories:

1. Prevention. Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.

2. Property Protection. Actions that involve the modification of existing buildings or structures to protect them from a hazard or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.

3. Public Education and Awareness. Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.

4. Natural Resource Protection. Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

5. Emergency Management. Actions that protect people and property during and immediately after a disaster or hazard event. Actions include warning systems, emergency response, and protection of critical facilities.

6. Structural Projects. Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

Best Practices & Case Studies.

General mitigation success stories: http://www.fema.gov/fima/success.shtm

Fire Hazards

Background. Due to the history of large scale, multi-jurisdictional wildland fires impacting Navy Installations, these types of fires have become a significant hazard that require prior significant planning and coordination onboard Navy Installations within probable hazard areas.

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Scope. Fire hazards include wildland, structural, and industrial fires.

References.

(a) DoD Instruction 6055.6(Series) DoD Fire and Emergency Services Program (10 Oct 2000)
(b) OPNAV Instruction 11320.23(Series) Shore Activities Fire Protection and Emergency Service Program (25 April 2001)

Resources.

Wildland Fires:

General Information - http://www.fema.gov/hazards/fires/wildfires.shtm
National Interagency Fire Center - http://www.nifc.gov/
Surviving the Wildfire: http://www.fema.gov/pdf/hazards/98surst_wf.pdf
Additional Resources - http://www.fema.gov/pdf/hazards/wdfrdam.pdf

Preparedness:

DisasterHelp.gov - https://disasterhelp.gov
FEMA Prevention & Planning Library – http://www.fema.gov/library/prepandprev.shtm#state

Hazard Overview.

Structural Fires – Response to structural fires shall be conducted per the tactics, techniques, and procedures defined within references (a) and (b).

Industrial Fires - Response to structural fires shall be conducted per the tactics, techniques, and procedures defined within references (a) and (b).

Wildland Fires - There are three different types of wildfires: a surface fire, ground fire, and crown fire. A surface fire is the most common type and burn along the floor of a forest, moving slowly and killing or damaging trees. A ground fire is usually started by lightning and burns on or below the forest floor. Crown fires spread rapidly and move quickly by jumping along tops of trees.

Mitigation Resources.

General mitigation guides: http://www.fema.gov/fima/planning_toc5.shtm
Mitigation Techniques: http://www.fema.gov/fima/how2001.shtm

Mitigation procedures for military personnel & sponsored family members are included below.

What to Do Before a Wildfire

- Prepare a disaster plan—a plan of action to take in case such a disaster should occur
- Build fire away from nearby trees or bushes
- Always have a way to extinguish the fire quickly and completely
- Never leave a fire, of any type, burning unattended
- Avoid open burning completely, especially during dry seasons
- Observe local fire and building codes
- Use fire-resistant materials in building, renovating or retrofitting structures
- Create a safety zone to separate structures from combustible plants and vegetation
- Bury electric lines underground, if possible
- Keep all tree and shrub limbs trimmed and away from electrical lines
- Keep combustible or flammable materials in approved safety containers
- Make evacuation plans
- Have disaster supplies on hand
- Develop an emergency communication plan

What to Do During a Wildfire

- Turn on battery-operated radio to get latest emergency information
- Remove combustible items from around the structure
- Close all doors and windows to prevent draft
- Close gas valves and turn of all pilot lights
- Turn on lights in rooms for visibility in heavy smoke
- Place valuable that will not be damaged by water in a pool or pond
- Leave sprinklers and hoses on

What to Do After a Wildfire

- Take care when reentering the burned area
- Watch out for hot spots
- Check structure's roof to extinguish any sparks or embers
- Recheck for smoke and sparks for several hours thereafter
- Be aware of bare ground poses the danger of flooding or mudslides when the next rains occur

Key points

- Living in a forest or wildland area poses the real danger of a wildfire
- Protection is your responsibility
- The homeowner's checklist helps in learning what to do
- Other sources of information—local fire departments, forestry offices, emergency management offices or building departments for information concerning local fire codes, building codes and protection measures

Best Practices & Case Studies.

General mitigation success stories: http://www.fema.gov/fima/success.shtm

Best practices for Military Personnel & sponsored family members are included below.

General

- Know your wildfire risk
- Thin out and maintain the vegetation round the structure
- Create a 30-foot safety zone around the structure
- Create a second zone at least 100 feet around the structure
- Keep combustible material away from the structure

Outside

- Remove all combustible material from outbuildings
- Close all vents and shutters
- Have water hoses available to reach all portions of the buildings
- Have large containers of water nearby
- Soak large rags or burlap sacks in water to be ready for use
- Have ladders available to reach the roof of a structure (if possible); position on the side opposite the fire
- Turn off all gas at the meter

Inside

- Close all windows and doors (do not lock the doors)
- Fill containers with water (tubs, sinks)
- Remove curtains and light drapes
- Close heavy drapes or fire resistant window coverings
- Move furniture away from windows and sliding glass doors
- Store valuable papers in fireproof containers

Winter Storms

Scope. Winter storms can be defined differently in various parts of the country. **Heavy snow** in the south can be a dusting in the mountains. Check with the local emergency management office, National Weather Service (NWS) office, or local American Red Cross for terms and definitions specific to the area. **Sleet** is raindrops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects; however, it can accumulate like snow and cause a hazard to motorists. **Freezing rain** is rain that falls onto a surface with a temperature below freezing; this causes it to freeze to surfaces, such as trees, cars, and roads, forming a glaze of ice. Even small accumulations of ice can cause a significant hazard. An ice storm occurs when freezing rain falls and freezes immediately on impact; communications and power can be disrupted for days, and even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

Resources.

Winter Storms:

General Information - http://www.fema.gov/hazards/

Additional Information –

http://www.fema.gov/rrr/talkdiz/winter.shtm

http://www.fema.gov/pdf/rrr/talkdiz/winter.pdf

Preparedness:

DisasterHelp.gov - https://disasterhelp.gov

FEMA Prevention & Planning Library –

http://www.fema.gov/library/prepandprev.shtm#state

Hazard Overview. A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. People can become trapped at home, without utilities or other services. Heavy snowfall and blizzards can trap motorists in their cars. Attempting to walk for help in a blizzard can be a deadly decision.

Winter storms can make driving and walking extremely hazardous. The aftermath of a winter storm can have an impact on a community or region for days, weeks, or even months. Storm effects such as extremely cold temperatures and snow accumulation, and sometimes coastal flooding, can cause hazardous conditions and hidden problems for people in the affected area.

A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. People can become trapped at home, without utilities or other services.

Winter storms are considered deceptive killers because most deaths are indirectly related to the storm. The leading cause of death during winter storms is from automobile or other transportation accidents. Exhaustion and heart attacks caused by overexertion are the two

most likely causes of winter storm-related deaths. Elderly people account for the largest percentage of hypothermia victims. Many older Americans literally "freeze to death" in their own homes after being exposed to dangerously cold indoor temperatures, or are asphyxiated because of improper use of fuels such as charcoal briquettes, which produce carbon monoxide.

House fires occur more frequently in the winter due to lack of proper safety precautions when using alternate heating sources (unattended fires, disposal of ashes too soon, improperly placed space heaters, etc.). Fire during winter storms presents a great danger because water supplies may freeze and it may be difficult for firefighting equipment to get to the fire.

Mitigation Resources.

General mitigation guides: http://www.fema.gov/fima/planning_toc5.shtm

Best Practices & Case Studies.

General mitigation success stories: http://www.fema.gov/fima/success.shtm

Mitigation procedures for Military Personnel & sponsored family members are included below.

Plan for a Winter Storm - Develop a Family Disaster Plan. Develop a winter storm-specific plan. Learn about your area's winter storm risk. Different areas have different risks associated with winter storms. Contact your local Red Cross chapter, emergency management office, or local National Weather Service office about your area's winter storm risk.

If you are at risk from winter storms:

- Understand the hazards of wind chill, which combines the cooling effect of wind and cold temperatures on exposed skin. As the wind increases, heat is carried away from a person's body at an accelerated rate, driving down the body temperature. "Wind chill" is a calculation of how cold it feels when the effects of wind speed and temperature are combined. A strong wind combined with a temperature of just below freezing can have the same effect as a still air temperature about 35 degrees colder.
- Service snow removal equipment before winter storm season. Equipment should be available for use if needed. Maintain it in good working order.
- Keep your car's gas tank full for emergency use and to keep the fuel line from freezing.
- Get training. Take an American Red Cross first aid course to learn how to treat exposure to the cold, frostbite, and hypothermia.
- Discuss with your family what to do if a winter storm WATCH or WARNING is issued. Designate one household member as the winter storm preparedness leader. Have him or her discuss what to do if a winter storm watch or warning is issued. Have another household member state what he or she would do if caught outside or in a vehicle during a winter storm. Everyone should know what to do in case all family

members are not together. Discussing winter storms ahead of time helps reduce fear and lets everyone know how to respond during a winter storm.
- Assemble winter storm supplies (see "Disaster Supplies Kit")

What to Do Before a Winter Storm
- Use a NOAA Weather Radio with a tone-alert feature to keep you informed of watches and warnings issued in your area. The tone alert feature will automatically alert you when a watch or warning is issued.
- Contact your local emergency management office or American Red Cross for information on designated public shelters in case you lose power or heat.

What to Do During a Winter Storm WATCH
- Listen to a NOAA Weather Radio, or local radio or television stations for updated information. Local authorities will provide you with the best information for your particular situation.
- Be aware of changing weather conditions. Severe weather can happen quickly. Temperatures may drop rapidly, winds may increase or snow may fall at heavier rates. What is happening where you are may not agree with local forecasts.
- Move animals to sheltered areas. Have a water supply available. Most animal deaths in winter storms are from dehydration.
- Avoid unnecessary travel. Your safest place during a winter storm is indoors. About 70 percent of winter deaths related to ice and snow occur in automobiles.

What to Do During a Winter Storm WARNING or a Blizzard WARNING
- Stay indoors and dress warmly during the storm. Wearing layers of loose-fitting, lightweight, warm clothing will keep you warmer than one bulky sweater. Remove layers to avoid overheating, perspiration and subsequent chill.
- Listen to a battery-powered radio or television for updated emergency information. If the power goes out, you will still have access to important information.
- Eat regularly. Food provides the body with energy for producing its own heat.
- Keep the body replenished with fluids to prevent dehydration. Drink liquids such as warm broth or juices. Avoid caffeine and alcohol. Caffeine, a stimulant, accelerates the symptoms of hypothermia. Alcohol, such as brandy, is a depressant and hastens the effects of cold on the body. Alcohol also slows circulation and can make you less aware of the effects of cold. Both caffeine and alcohol can cause dehydration.
- Conserve fuel. Winter storms can last for several days. Great demand may be placed on electric, gas, and other fuel distribution systems (fuel oil, propane, etc.). Suppliers of propane and fuel oil may not be able to replenish depleted supplies during severe weather. Electric and gas services may be temporarily disrupted when many people demand large amounts at the same time. Lower the thermostat to 65°F during the day and 55°F at night. Close off unused rooms, and stuff towels or rags in cracks under doors. Cover windows at night.
- If you must go outside, protect yourself from winter storm hazards.

What to Do After a Winter Storm

- Continue listening to local radio or television stations or a NOAA Weather Radio for updated information and instructions. Access may be limited to some parts of the community, or roads may be blocked.
- Help a neighbor who may require special assistance - infants, elderly people, and people with disabilities. Elderly people and people with disabilities may require additional assistance. People who care for them or who have large families may need additional assistance in emergency situations.
- Avoid driving and other travel until conditions have improved. Roads may be blocked by snow or emergency vehicles.
- Avoid overexertion. Heart attacks from shoveling heavy snow are a leading cause of deaths during winter.
- Follow forecasts and be prepared when venturing outside. Major winter storms are often followed by even colder conditions.

Temperature-related Hazards

Scope. Temperature-related hazards include periods of extreme heat and severe cold.

Resources.

Extreme Heat:

General Information - http://www.fema.gov/hazards/extremeheat/heat.shtm
Extreme Heat Factsheet - http://www.fema.gov/hazards/extremeheat/heatf.shtm
Additional Resources - http://www.state.il.us/iema/prep/heatwaves.htm

Severe Cold:

General Information - http://www.fema.gov/hazards/winterstorms/
Additional Resources - http://www.state.il.us/iema/wsbooklet.pdf

Preparedness:

DisasterHelp.gov - https://disasterhelp.gov
FEMA Prevention & Planning Library –
http://www.fema.gov/library/prepandprev.shtm#state

Hazard Overview.

Extreme heat is characterized as temperatures that hover 10 degrees or more above the average high temperature for a region and last for several weeks.

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.

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.
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 a loss of crops or livestock.

All areas in the United States are at risk of drought at any time of the year. Drought gripped much of the West and Midwest from 1987 to 1991. The Missouri River Basin and California have experienced extended periods of drought as well.

Cold – Frostbite is a severe reaction to cold exposure of the skin that can permanently damage fingers, toes, the nose, and ear lobes. Symptoms are numbness and a white or pale appearance to the skin. When symptoms are apparent, seek medical help immediately. Hypothermia, or low body temperature, is a condition brought on when the body temperature drops to less than 95 degrees F. Symptoms include slow or slurred

speech, incoherence, memory loss, disorientation, uncontrollable shivering, drowsiness, repeated stumbling, and apparent exhaustion. If these symptoms are detected, take the person's temperature. If below 95 degrees F, immediately seek medical attention.
The wind chill is based on the rate of heat loss from exposed skin caused by the combined effects of the wind and cold.

Mitigation Resources.

General mitigation guides: http://www.fema.gov/fima/planning_toc5.shtm

Heat Mitigation Strategies: The media can raise awareness about extreme heat and drought by providing important information to the community.

- Publish a special section with emergency information on extreme heat. Localize the information by including the phone numbers of local emergency services offices, the American Red Cross, and hospitals.
- Conduct media interviews with MTF/Clinic providers about the dangers of sunburn, heat exhaustion, heat stroke, and other possible conditions caused by excessive heat.
- During a drought, run a week-long series suggesting ways that individuals can conserve water and energy in their homes and their workplaces.
- Sponsor a "Helping Your Neighbors" program through your local school system to encourage children to think of those persons who require special assistance such as elderly people, infants or people with disabilities during severe weather conditions.

Best Practices & Case Studies.

General mitigation success stories: http://www.fema.gov/fima/success.shtm

Technological Hazards

Hazardous Materials

Scope. Hazardous materials include all chemical, biological, radiological, and explosive materials, flammable & combustible substances, and compressed gases.

References.

(a) Department of Transportation North American Emergency Response Guide (NAERG) (2004 Edition)

Resources.

Hazardous Materials:

General Information - http://www.fema.gov/hazards/hazardousmaterials/
Hazardous Materials Factsheet – http://www.fema.gov/hazards/hazardousmaterials/hazmatf.shtm
Hazardous Materials Backgrounder – http://www.fema.gov/pdf/hazards/haz matfs.pdf
Department of Transportation - http://hazmat.dot.gov/
North American Emergency Response Guidebook (NAERG) – http://hazmat.dot.gov/gydebook.htm
National Response Center - http://www.nrc.uscg.mil/nrchp.html
National Response Team – http://www.nrt.org

Preparedness:

DisasterHelp.gov - https://disasterhelp.gov
FEMA Prevention & Planning Library – http://www.fema.gov/library/prepandprev.shtm#state

Hazard Overview.

Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released as a result of transportation accidents or because of chemical accidents at industrial plants or warehouses. Hazardous materials in various forms can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. Many products containing hazardous chemicals are used and stored in homes routinely. These products are also shipped daily on the nation's highways, railroads, waterways, and pipelines.

Reference (a) provides a guide to aid first responders in (1) quickly identifying the specific or generic classification of the material(s) involved in the incident, and (2) protecting themselves and the general public during this initial response phase of the incident.

Guidebook Contents:

- Yellow-bordered pages: Index list of dangerous goods in numerical order of ID number. This section quickly identifies the guide to be consulted from the ID Number of the material involved. This list displays the 4-digit ID number of the material followed by its assigned emergency response guide and the material name.
    - For example: ID No. Guide No. Name of Material
      1090 127 Acetone

- Blue-bordered pages: Index list of dangerous goods in alphabetical order of material name. This section quickly identifies the guide to be consulted from the name of the material involved. This list displays the name of the material followed by its assigned emergency response guide and 4-digit ID number.
    - For example: Name of Material Guide No. ID No.
      Sulfuric acid 137 1830

- Orange-bordered pages: This section is the most important section of the guidebook because it is where all safety recommendations are provided. It comprises a total of 62 individual guides, presented in a two-page format. Each guide provides safety recommendations and emergency response information to protect yourself and the public. The left hand page provides safety related information whereas the right hand page provides emergency response guidance and activities for fire situations, spill or leak incidents and first aid. Each guide is designed to cover a group of materials which possess similar chemical and toxicological characteristics. The guide title identifies the general hazards of the dangerous goods covered.
    - For example: Guide 124 - Gases-Toxic and/or Corrosive-Oxidizing.

- Each guide is divided into three main sections: the first section describes potential hazards that the material may display in terms of fire/explosion and health effects upon exposure. The highest potential is listed first. The emergency responder should consult this section first. This allows the responder to make decisions regarding the protection of the emergency response team as well as the surrounding population. The second section outlines suggested public safety measures based on the situation at hand. It provides general information regarding immediate isolation of the incident site, recommended type of protective clothing and respiratory protection. Suggested evacuation distances are listed for small and large spills and for fire situations (fragmentation hazard). It also directs the reader to consult the tables listing Toxic Inhalation Hazard materials (TIH) and water-reactive materials (green-bordered pages) when the material name is highlighted in the yellow-bordered and blue-bordered pages. The third section covers emergency response actions, including first aid. It outlines special precautions for incidents which involve fire, spill or chemical exposure. Several recommendations are listed under each part which will further assist in the decision making process. The information on first aid is general guidance prior to seeking medical care.

- Green-bordered pages: This section contains a table which lists, by ID number, TIH materials, including certain chemical warfare agents, and water-reactive materials which produce toxic gases upon contact with water.
    - The table provides two different types of recommended safe distances which are “Initial isolation distances” and “Protective action distances.” The materials are highlighted for easy identification in both numeric (yellow-bordered pages) and alphabetic (blue-bordered pages) lists of the guidebook. The table provides distances for both small (approximately 200 liters or less) and large spills (more than 200 liters) for all highlighted materials. The list is further subdivided into daytime and nighttime situations. This is necessary due to varying atmospheric conditions which greatly affect the size of the hazardous area. The distances change from daytime to nighttime due to different mixing and dispersion conditions in the air. During the night, the air is generally calmer and this causes the chemical to disperse less and therefore create a toxicity zone which is greater than would usually occur during the day. During the day, the chemical is generally dispersed by a more active atmosphere. The chemical will be present in a larger area; however, the actual area where toxic levels are reached will be smaller (due to increased dispersion). It is the quantity of the chemical that poses problems not its mere presence.
    - The “Initial Isolation Distance” is a distance within which all persons should be considered for evacuation in all directions from the actual spill/leak source. It is a distance (radius) which defines a circle (Initial Isolation Zone) within which persons may be exposed to dangerous concentrations upwind of the source and may be exposed to life threatening concentrations downwind of the source.
    - For example, in the case of Compressed gas, toxic, n.o.s., ID No. 1955, Inhalation Hazard Zone A, the isolation distance for small spills is 430 meters, therefore, representing an evacuation circle of 860 meters in diameter. For the same material, the “Protective Action Distance” is 4.2 kilometers for a daytime incident and 8.4 kilometers for a nighttime incident, these distances represent a downwind distance from the spill/leak source within which Protective Actions could be implemented. Protective Actions are those steps taken to preserve the health and safety of emergency responders and the public. People in this area could be evacuated and/or sheltered in-place.

Safety Precautions:

- APPROACH CAUTIOUSLY FROM UPWIND. Resist the urge to rush in; others cannot be helped until the situation has been fully assessed.
- SECURE THE SCENE. Without entering the immediate hazard area, isolate the area and assure the safety of people and the environment, keep people away from the scene and outside the safety perimeter. Allow enough room to move and remove your own equipment.
- IDENTIFY THE HAZARDS. Placards, container labels, shipping documents, material safety data sheets, Rail Car and Road Trailer Identification Charts, and/or knowledgeable persons on the scene are valuable information sources. Evaluate all available information and consult the recommended guide to reduce immediate risks. Additional information, provided by the shipper or obtained from another authoritative source, may change some of the emphasis or details found in the guide. Remember, the guide provides only the most important and worst case scenario information for the initial response in relation to a family or class of dangerous goods. As more material-specific information becomes available, the response should be tailored to the situation.
- ASSESS THE SITUATION. Consider the following:
    - Is there a fire, a spill or a leak?
    - What are the weather conditions?
    - What is the terrain like?
    - Who/what is at risk: people, property or the environment?
    - What actions should be taken: Is an evacuation necessary? Is diking necessary? What resources (human and equipment) are required and are readily available?
    - What can be done immediately?
- OBTAIN HELP. Advise your headquarters to notify responsible agencies and call for assistance from qualified personnel.
- DECIDE ON SITE ENTRY. Any efforts made to rescue persons, protect property or the environment must be weighed against the possibility that you could become part of the problem. Enter the area only when wearing appropriate protective gear (see PROTECTIVE CLOTHING, page 364 of reference (c)).
- RESPOND. Respond in an appropriate manner. Establish a command post and lines of communication. Rescue casualties where possible and evacuate if necessary. Maintain control of the site. Continually reassess the situation and modify the response accordingly. The first duty is to consider the safety of people in the immediate area, including your own.
- ABOVE ALL - Do not walk into or touch spilled material. Avoid inhalation of fumes, smoke and vapors, even if no dangerous goods are known to be involved. Do not assume that gases or vapors are harmless because of lack of a smell—odorless gases or vapors may be harmful.

Contact Information: National Response Center (NRC): The NRC, which is operated by the U.S. Coast Guard, receives reports required when dangerous goods and hazardous substances are spilled. After receiving notification of an incident, the NRC will immediately notify the appropriate Federal On-Scene Coordinator and concerned Federal agencies. Federal law requires that anyone who releases into the environment a reportable quantity of a hazardous substance (including oil when water is, or may be affected) or a material identified as a marine pollutant, must immediately notify the NRC. When in doubt as to whether the amount released equals the required reporting levels for these materials, the NRC should be notified.

NRC Contact Information (24 hours)

- Call 1-800-424-8802 (Toll-free in the U.S., Canada, and the U.S. Virgin Islands)
- Call 202-267-2675 in the District of Columbia
- Calling the emergency response telephone number, CHEMTREC®, CHEM-TEL, INC., INFOTRAC or 3E COMPANY, does not constitute compliance with regulatory requirements to call the NRC.

Emergency Response Communication Services:

- CHEMTREC®, a 24-hour emergency response communication service, can be reached at 1-800-424-9300 or 703-527-3887 (Collect calls are accepted)
- CHEM-TEL, INC., a 24-hour emergency response communication service, can be reached at 1-800-255-3924 or 813-248-0585 (Collect calls are accepted)
- INFOTRAC, a 24-hour emergency response communication service, can be reached at 1-800-535-5053 or 352-323-3500 (Collect calls are accepted)
- 3E COMPANY, a 24-hour emergency response communication service, can be reached at 1-800-451-8346 or 760-602-8703 (Collect calls are accepted)

The emergency response information services shown above have requested to be listed as providers of emergency response information and have agreed to provide emergency response information to all callers. They maintain periodically updated lists of state and Federal radiation authorities who provide information and technical assistance on handling incidents involving radioactive materials.

For assistance at incidents involving materials being shipped by, for, or to the Department of Defense (DOD):

- U.S. Army Operations Center: Call 703-697-0218 (call collect) for incidents involving explosives and ammunition.
- Defense Logistics Agency: Call 1-800-851-8061 (toll free in the U.S.) for incidents involving dangerous goods other than explosives and ammunition.

Hazard Classification System: The hazard class of dangerous goods is indicated either by its class (or division) number or name. For a placard corresponding to the primary hazard class of a material, the hazard class or division number must be displayed in the lower corner of the placard. However, no hazard class or division number may be displayed on a placard representing the subsidiary hazard of a material. For other than Class 7 or the OXYGEN placard, text indicating a hazard (for example, "CORROSIVE") is not required. Text is shown only in the U.S. The hazard class or division number must appear on the shipping document after each shipping name.

Class 1 - Explosives
Division 1.1 Explosives with a mass explosion hazard
Division 1.2 Explosives with a projection hazard
Division 1.3 Explosives with predominantly a fire hazard
Division 1.4 Explosives with no significant blast hazard
Division 1.5 Very insensitive explosives; blasting agents
Division 1.6 Extremely insensitive detonating articles

Class 2 - Gases
Division 2.1 Flammable gases
Division 2.2 Non-flammable, non-toxic* compressed gases
Division 2.3 Gases toxic* by inhalation
Division 2.4 Corrosive gases (Canada)

Class 3 - Flammable liquids (and Combustible liquids [U.S.])

Class 4 - Flammable solids; Spontaneously combustible materials; and Dangerous when wet materials
Division 4.1 Flammable solids
Division 4.2 Spontaneously combustible materials
Division 4.3 Dangerous when wet materials

Class 5 - Oxidizers and Organic peroxides
Division 5.1 Oxidizers
Division 5.2 Organic peroxides
Class 6 - Toxic* materials and Infectious substances
Division 6.1 Toxic* materials
Division 6.2 Infectious substances

Class 7 - Radioactive materials

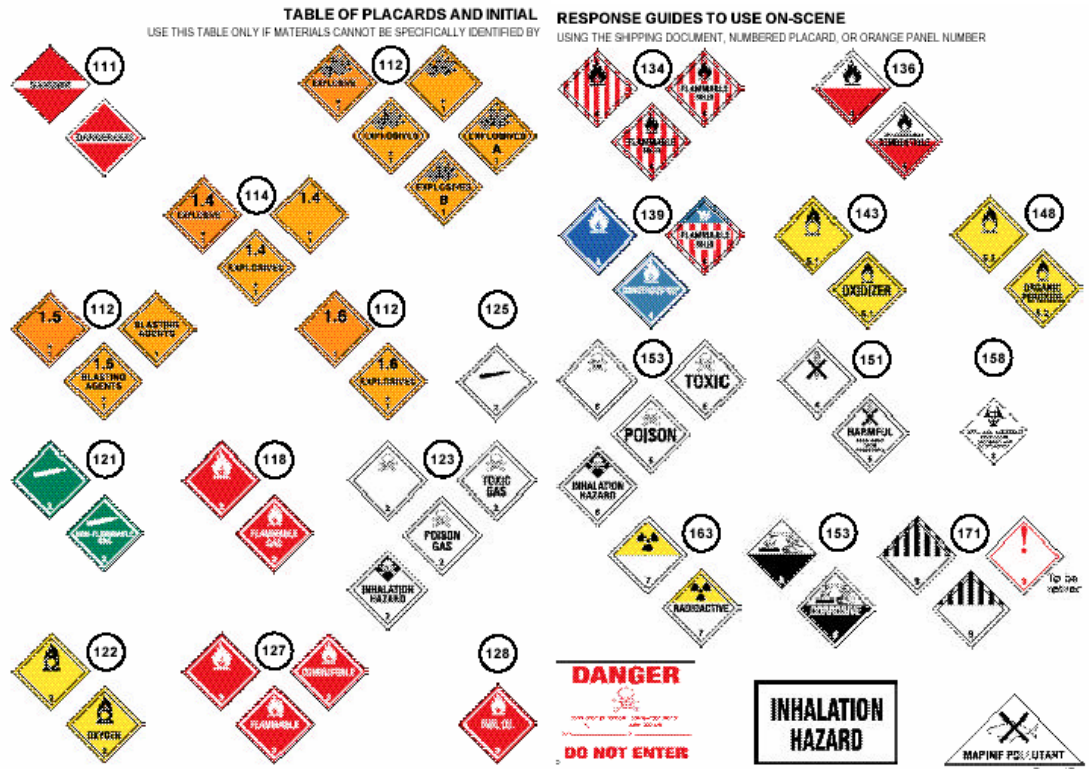
Class 8 - Corrosive materials

Class 9 - Miscellaneous dangerous goods
Division 9.1 Miscellaneous dangerous goods (Canada)
Division 9.2 Environmentally hazardous substances (Canada)
Division 9.3 Dangerous wastes (Canada)

** The words "poison" or "poisonous" are synonymous with the word "toxic".*

Hazardous Materials Placards: The placards shown below in Table H-7 represent all of the authorized placards utilized within the U.S., Canada, and Mexico. Above each placard is the number of the response guide to be used during response to an accident involving the identified material.

Figure H-7: Hazardous Materials Placards



Refer to reference (a) for additional information.

Mitigation Resources.

General mitigation guides: http://www.fema.gov/fima/planning_toc5.shtm

Mitigation procedures for Military Personnel & sponsored family members are available at the following sites:

http://www.fema.gov/pdf/hazards/hzmthmfs.pdf
http://www.fema.gov/hazards/hazardousmaterials/homehazf.shtm
http://www.tallytown.com/redcross/library/AreYouReadyHazardousMaterialsIncidents.pdf

The purpose of the Hazardous Materials Transportation Program, first established by statute in 1974, is to identify and manage risks presented by transportation of hazardous materials in commerce. Safety is of paramount importance as the Department of Transportation seeks to involve the public, industry, and other interested parties in determining levels of risk that are acceptable, affordable, and comparable with other risks inherent in modern society. More information is available at http://hazmat.dot.gov/risk.htm.

Best Practices & Case Studies.

General mitigation success stories: http://www.fema.gov/fima/success.shtm
National Response Team Lessons Learned:
http://www.nrt.org/production/nrt/home.nsf
Hazardous Materials Emergency Planning:
http://www.co.brazos.tx.us/emermgmt/planpdfs/AnnexQ-Hazardous_Materials_Response.pdf

Moving/Fixed Technological Hazards

Scope. Moving & fixed technological hazards include building collapse, power outages, dam failures, agricultural incidents, and other man-made events.

Resources.

Building Collapses:

- Building Collapse Overview - http://www.emergency.com/bldgclps.htm
- FEMA Building Guidance - http://www.fema.gov/txt/fima/427/fema427_ch4.txt

Power Outages/Blackouts:

- American Red Cross "Blackout" Website – http://www.redcross.org/services/disaster/0,1082,0_133_,00.html
- Power Outage Guide - http://www.bt.cdc.gov/poweroutage/index.asp
- U.S. Power Plan Listing - http://www.usbr.gov/dataweb/powerplants/

Dam Safety/Hazards:

- General Information - http://www.fema.gov/fima/damsafe/
- Dam Safety Resources - http://www.fema.gov/fima/damsafe/resources.shtm
- U.S. Society on Dams - http://www2.privatei.com/~uscold/index.html
- Association of State Dam Safety Officials - http://www.damsafety.org/
- Listing of Dams within the U.S. - http://www.usbr.gov/dataweb/dams/

Agriculture:

- NIOSH National Agriculture Safety Database – http://www.cdc.gov/niosh/nasd.html
- Penn State Agricultural Emergency Response and Rescue Training – http://agemergencies.cas.psu.edu/PART/PARTprograms.html
- Penn State Farm Family Emergency Response - http://agemergencies.cas.psu.edu/FFERT/FFERTmodules.html
- Penn State Agricultural Safety and Health – http://www.abe.psu.edu/extension/agsafety/index.htm
- Grain Bin & Silo Emergencies - http://www.mufrti.org/catalog/suppression.htm#2
- Silo Safety - http://www.saftek.net/worksafe/farm_15.htm
- Farm Rescue - http://www.nraes.org/publications/nraes10.html

Preparedness:

- DisasterHelp.gov - https://disasterhelp.gov
- FEMA Prevention & Planning Library – http://www.fema.gov/library/prepandprev.shtm#state

Hazard Overview. Building collapse can result from weather/seismic conditions, non-terrorism and terrorism events. **Power outages** include grid failures and rolling blackouts. A **dam** is any man-made barrier or obstruction, together with appurtenant works, if any, across a stream or channel, watercourse, or natural drainage area which impounds or diverts water. All structures necessary to impound a single body of water shall be considered a dam. **Agricultural incidents** include grain bin and silo emergencies. General references and mitigation information are listed in this section.

Building collapse - Building collapse rescue is an often complex and confusing situation. It will frequently involve large numbers of specialized rescue personnel and equipment that might not generally be recognized as being part of a normal rescue organization. It should also require a combination of a variety of technical rescue skills and an advanced knowledge of building structures and materials.

When a building collapses, it generally does so in one of two ways. The building can be thought of as having "exploded" or "imploded". The primary difference between the two types of collapse is the direction of force as it applies to the materials contained in the structure. It will also assist in a determination of the density of the debris that is involved in the rubble.

The nature of building collapses, rescue guidelines and different types of rescues can be found at http://www.emergency.com/bldgclps.htm.

For predicting damage levels, damage mechanisms, correlation between damage and injuries, and further reading: http://www.fema.gov/txt/fima/427/fema427_ch4.txt.

Power outages – Electricity emergencies have the greatest potential for causing loss of life and affecting health and safety. Unlike oil and gas emergencies, where electricity can be substituted to provide heat, the loss of electricity shuts off all heating systems that require ignition or fans. Electricity emergencies also affect lighting, water and sewer processing and pumping services, food processing, refrigeration, communications, Internet service, life support systems, security systems, banking and bankcard services, and gasoline pumping. The Energy Emergency Planning and Response can be found at http://www.cted.wa.gov/energy/archive/BR2001/Chapter%204.pdf.

Dams - 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. The benefits of dams are numerous: they provide water for drinking, navigation, and agricultural irrigation. Dams also provide hydroelectric power and create lakes for fishing and recreation. Most important, dams save lives by preventing or reducing floods.

If dams have many benefits, they also can pose a risk to communities if not designed, operated, and maintained properly. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life and great property damage if there are people downstream of the dam. 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.

Agricultural incidents – website lists grain, silo, machinery incidents and how to deal with them http://www.cdc.gov/nasd/menu/topic/grain.html.

Mitigation Resources.

General mitigation guides: http://www.fema.gov/fima/planning_toc5.shtm

Building Collapse mitigations:

- Mitigation and design - http://www.fema.gov/txt/fima/427/fema427_ch5.txt
- Building Safety Issues - http://www.sema.state.mo.us/safety.htm
- Risk management for buildings (multi-hazard approach) - http://www.fema.gov/fima/rmsp.shtm

Power Outage mitigations:

- FEMA - http://www.fema.gov/fima/ and search 'Utility Protective Measures

Dam Safety mitigations:

- Identify condition of dams whose failure could be reasonably expected to endanger human life, the maximum area that could be flooded if the dam failed, and public facilities that would be affected by the flooding.
- Apply for funding through grant programs to make improvements to existing local dams using cost effective measures as researched by FEMA.
- Ensure that new dams are constructed using methods and procedures that comply with the national dam safety hazard reduction initiative.
- Distribute public awareness materials as provided by the State to increase public acceptance and support of dam safety programs.
- Encourage local representatives or public officials to attend training or workshops regarding hazards associated with dam failure and related matters.
- Create, update, and/or maintain existing emergency procedures to be used if a dam fails or if the failure of a dam is imminent.
- Identify, review and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts.

Agricultural Safety mitigations:

- Preplanning for farm emergencies
  - http://www.cdc.gov/nasd/docs/d000901-d001000/d000937/d000937.html
- Grain bin safety
  - http://www.cdc.gov/nasd/docs/d001201-d001300/d001201/d001201.html

Best Practices & Case Studies.

General mitigation success stories: http://www.fema.gov/fima/success.shtm

Agricultural Case Studies:

www.cdc.gov/niosh/face/in-house/full8933.html
http://www.cdc.gov/nasd/docs/d000901-d001000/d000938/d000938.html

Power Outage Case Studies:

http://www.cted.wa.gov/energy/archive/BR2001/Chapter%204.pdf

Building Collapse Case Studies:

http://www.fema.gov/usr/about5.shtm
http://www.emergency.com/bldgclps.htm
Oklahoma City Attack –
http://www.eqe.com/publications/revf95/oklahoma.htm
http://www.eqe.com/publications/revf95/ok2.htm

Terrorism

References.

(a) National Response Plan (December 2004)

Scope. Terrorism covers a board range of hazards. Terrorism includes physical acts such as hijackings, assassinations, and assaults using small arms. However, the predominate means for causing large-scale terrorist incidents resulting in significant Consequence Management (CoM) requirements is through the employment of chemical, biological, radiological, nuclear, and explosive (CBRNE) agents and materials.

See Appendix C for planning guidance and reference (a) for overarching Federal guidance.

Resources.

All-Hazards Planning:

General Information - http://www.fema.gov/rrr/allhzpln.shtm

Preparedness:

DisasterHelp.gov - https://disasterhelp.gov

FEMA Prevention & Planning Library – http://www.fema.gov/library/prepandprev.shtm#state

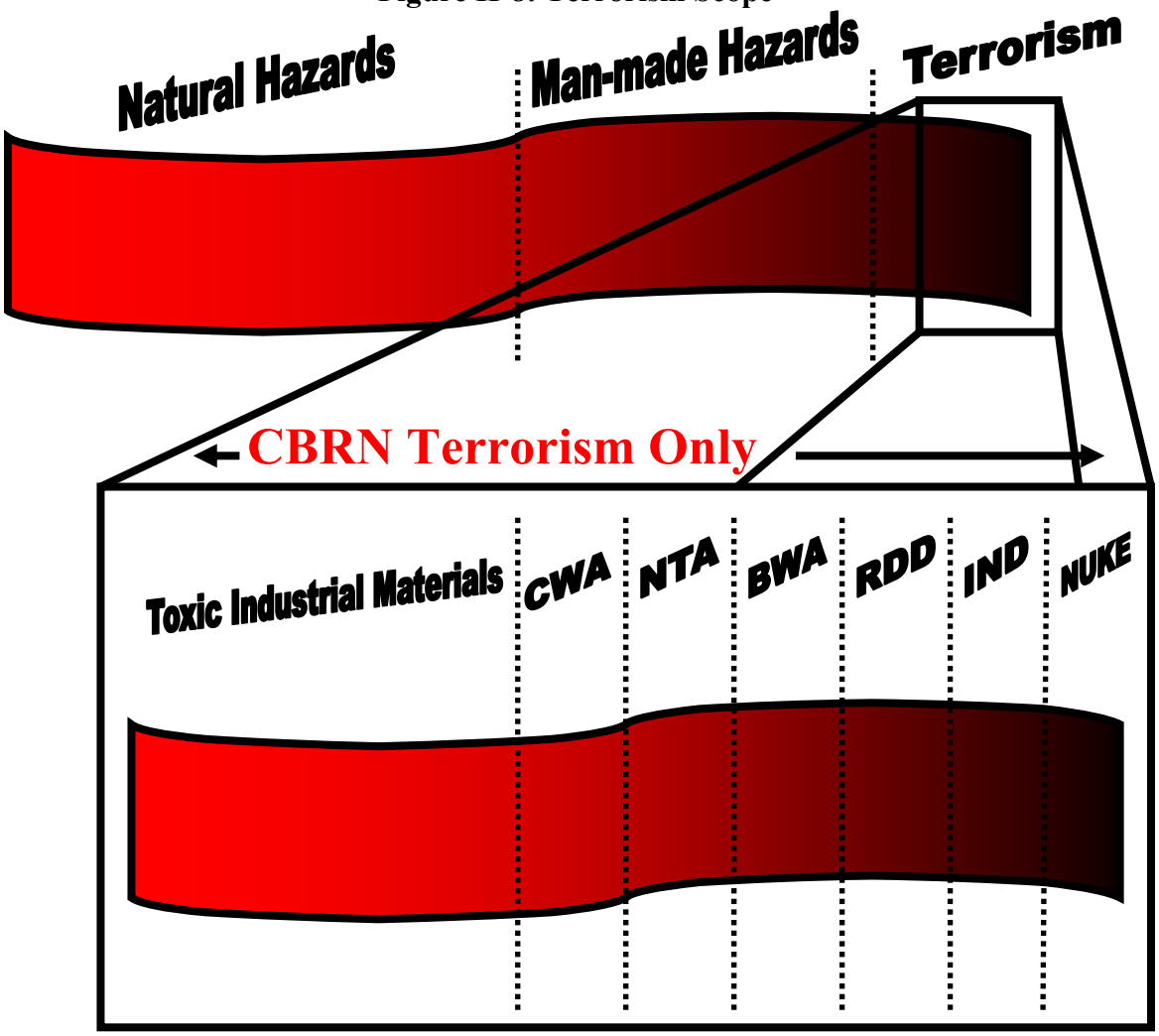
Hazard Overview. Table H-4 provides a list of common acronyms used in this terrorism hazard discussion.

Table H-4: Common Terrorism Acronyms

Common Acronyms	
CBRNE	Chemical, Biological, Radiological, Nuclear, & Explosive
CBRN	Chemical, Biological, Radiological, & Nuclear
CWA	Chemical Warfare Agents
NTA	Non-Traditional Agents
TIM	Toxic Industrial Materials
BWA	Biological Warfare Agents
RDD	Radiological Dispersal Device
IND	Improvised Nuclear Device
NUKE	Nuclear or Thermonuclear Weapon

The graphic in Figure H-8 portrays the scope of CBRN terrorism. This graphic illustrates the breadth of potential agents and materials that may be employed by terrorist organizations. There are approximately 123,000 toxic industrial materials (TIM) in use in manufacturing, science, and industry.

Figure H-8: Terrorism Scope



Mitigation Resources.

General mitigation guides: http://www.fema.gov/fima/planning_toc5.shtm

Best Practices & Case Studies.

General mitigation success stories: http://www.fema.gov/fima/success.shtm

Chemical Terrorism

Scope. Chemical terrorism includes the use of chemical warfare agents (CWA), non-traditional agents (NTA), and toxic industrial materials (TIM).

Reference.

(a) NTRP 3-11.32 Potential Military Chemical/Biological Agents and Compounds (10 January 2005)

Resources.

Chemical Terrorism:

General Information - http://www.fema.gov/hazards/
Chemical and Biological Information Analysis Center (CBIAC) – http://www.cbiac.apgea.army.mil
U.S. Army Research, Development, & Engineering Command (RDECOM, formerly SBCCOM) – http://www.rdecom.army.mil
Department of Homeland Security (DHS) – http://www.dhs.gov
Environmental Protection Agency (EPA) – http://www.epa.gov/
American Red Cross (ARC) – http://www.redcross.org
Center for Strategic and International Studies (CSIS) – http://www.csis.org
Oklahoma City National Memorial Institute for the Prevention of Terrorism – http://www.mipt.org
Organization for the Prevention of Chemical Weapons (OPCW) – http://www.opcw.org

Preparedness:

DisasterHelp.gov - https://disasterhelp.gov
FEMA Prevention & Planning Library – http://www.fema.gov/library/prepandprev.shtm#state

Hazard Overview. A thorough review of potential military CWAs may be found in reference (a). There are no unclassified references currently available for NTAs. Detailed guidance on the response to TIM hazards may be found in the Hazardous Materials guidance in the Technological Hazards portion of this section.

Mitigation Resources.

General mitigation guides: http://www.fema.gov/fima/planning_toc5.shtm

The most effective method of mitigating the affects of a chemical terrorist incident is the preparation for response by the first responder and the medical community and in educating the public to take protective action when an event occurs. Regional/ Installation EM Plans must be prepared with a hazard-specific appendix for such events (see Standard 7 & Appendix C), and responders and the medical community must be familiar with the plan. In the event of an incident, Category 2-4 personnel should be aware of the terrorism threat and be prepared to evacuate in an emergency by becoming

familiar with shelter-in-place, shelter, and safe haven procedures as well as evacuation routes.

Best Practices & Case Studies.

General mitigation success stories: http://www.fema.gov/fima/success.shtm
Ready.gov – http://www.ready.gov

As in an industrial chemical event, the best practices available to Category 2-4 personnel are shelter-in-place or evacuation. Sheltering-in-place can consist of taking measures to develop a shelter-in-place kit and developing methods for securing ventilation systems, doors, and windows for a short (no more than 4-6 hours usually) amount of time. Then the radio is turned on to await the official "all-clear" notification. Evacuation takes more time, but is more effective if it is carried out before the hazard arrives from its source. An effective evacuation requires a lot of up-front planning by local officials, including prescribed evacuation routes for specific geographic areas.

Biological Terrorism

Scope. Biological terrorism includes the use of biological warfare agents (BWA).

References.

(a) NTRP 3-11.32 Potential Military Chemical/Biological Agents and Compounds (10 January 2005)
(b) Public Health Security and Bioterrorism Preparedness and Response Act (Public Law 107-188)

Resources.

Biological Terrorism:

General Information - http://www.fema.gov/hazards/
Chemical and Biological Information Analysis Center (CBIAC) – http://www.cbiac.apgea.army.mil
U.S. Army Research, Development, & Engineering Command (RDECOM, formerly SBCCOM) – http://www.rdecom.army.mil
Department of Homeland Security (DHS) – http://www.dhs.gov
Centers for Disease Control (CDC) Emergency Preparedness & Response – http://www.bt.cdc.gov/
Environmental Protection Agency (EPA) – http://www.epa.gov/
American Red Cross (ARC) – http://www.redcross.org
Center for Strategic and International Studies (CSIS) – http://www.csis.org
Oklahoma City National Memorial Institute for the Prevention of Terrorism – http://www.mipt.org
Johns Hopkins Bloomberg School of Public Health – http://www.jhsph.edu
University of South Florida (USF) Center for Biological Defense (CBD) - http://www.usf.edu/cbd
University of Pittsburgh Medical Center (UPMC) Center for Biosecurity – www.upmc-biosecurity.org

Preparedness:

DisasterHelp.gov - https://disasterhelp.gov
FEMA Prevention & Planning Library – http://www.fema.gov/library/prepandprev.shtm#state

Hazard Overview. A thorough review of potential military BWAs may be found in reference (a).

The Centers for Disease Control and Prevention lists 51 difference biological agents that could be used in bioterrorism attacks. The following describes the different paths that terrorists might use biological agent in the Agriculture industry, to include processed food.

Biological Terrorism & Food Safety

Food terrorism is an act or threat of deliberate contamination of food for human consumption with chemical, biological, or radionuclear agents for the purpose of causing injury or death to civilian populations and/or disrupting social, economic, or political stability. Terrorists can attack our food supply at several stages along the food chain by:

- Targeting livestock and crops during production, harvesting, storage, or transport (this is called *agricultural bioterrorism* or *agroterrorism*)
- Targeting processed foods during the processing, manufacturing, storage, transport, distribution, or service of such foods (this is called *terrorism targeting processed foods*).

Agricultural Biological Terrorism

This type of bioterrorism is directed towards livestock and crops. An agroterrorism attack in the United States would likely be a part of economic warfare. *Economic warfare* is the intentional harming of a nation's agricultural or ecological infrastructure by use of a biologic weapon. The U.S. livestock industry alone has annual revenues of approximately $150 billion, and, thus, is a prime target for economic warfare.

The Agricultural Bioterrorism Protection Act of 2002 is a subpart of reference (b). It was designed to improve the ability of the U.S. government to prevent, prepare for, and respond to Bioterrorism and other public health emergencies that could threaten American agriculture.

Terrorism Targeting Processed Foods

This type of terrorism involves the contamination of food products during processing, manufacturing, storage, transport, distribution, or service. Depending on the type of contaminated food and the biological agent, an outbreak could be slow, diffuse, and initially unremarkable, or it could result in an explosive epidemic. The government has developed a variety of prevention, surveillance, and control initiatives and programs aimed at this type of terrorism.

Reference (b) was designed to improve the ability of the United States to prevent, prepare for, and respond to bioterrorism and other public health emergencies.

Additional Resources.

USDA (U.S. Department of Agriculture)
The bioterrorism protection effort of the USDA includes:
- Protecting U.S. borders from invasive pests and diseases.
- Increasing safeguarding personnel at meat and poultry slaughter and processing plants.
- Protecting the health of farm animals, crops, and natural resources.

APHIS (Animal and Plant Health Inspection Service)
The APHIS has been designated by the Secretary of the USDA as the implementing agency for the provisions of reference (b).
- Reference (b) requires that entities (such as research laboratories, universities, vaccine companies, etc.) that possess, use, or transfer agents or toxins that are deemed a threat to animal or plant health register these agents with the APHIS.
- APHIS and UDSA created a list of the agents and toxins that pose a severe threat to animal health.

CDC (Centers for Disease Control and Prevention)
The CDC was designated by the Secretary of the Department of Health and Human Services (DHHS) as the agency to implement the provisions of reference (b).
- Reference (b) requires that all persons possessing biological agents or toxins deemed a threat to public health register these agents with the CDC.
- The CDC and DHHS created a list of the agents and toxins that pose a severe threat to the public.
- The CDC is also involved in epidemiological investigations of outbreaks and research efforts to discover and produce vaccines and treatments against food terrorism agents.

FDA (Food and Drug Administration)
The FDA is in charge of Title III of reference (b), which consists of protecting the safety and security of the food and drug supply. Under Title III of reference (b):
- All food facilities must register with the FDA.
- The FDA is required to maintain records on the sources and recipients of foods.
- The FDA must be notified of all shipments of foods being imported into the United States (type of food, country of origin, etc.)
- The FDA is permitted to detain any food thought to cause harm to humans or animals without court hearings or a specified time frame.

EPA (Environmental Protection Agency)
The EPA is in charge of pesticide security. The EPA has issued the following regulatory initiatives:
- Ensuring proper security at pesticide manufacturing and storage facilities.
- Ensuring proper security of pesticide application equipment.
- Designing facilities and equipment to minimize risk.

Mitigation Resources.

General mitigation guides: http://www.fema.gov/fima/planning_toc5.shtm

Biological Terrorism events are more difficult to track because of the latent onset of symptoms. To mitigate the affects of a biological terrorism event, the medical staff must be familiar with the plans and prepared to immediately implement measures for detection, surveillance, laboratory analysis, emergency response, treatment, and communication with the public. The critical element in responding to a biological terrorism event is early detection and recognition. The medical staffs need to work with local, state and federal officials to expand surveillance systems to detect unusual or suspicious disease occurrences. Additionally, a rapid alert system to receive and pass information among physicians, other health care providers and health officials is critical.

Best Practices & Case Studies.

General mitigation success stories: http://www.fema.gov/fima/success.shtm

Radiological Terrorism

Scope. Radiological terrorism includes the use of both non-explosive and explosive radiological dispersal devices (RDD) as well as any other dispersion of radiological material as part of a terrorism event.

Resources.

Radiological Terrorism:

General Information - http://www.fema.gov/hazards/
U.S. Army Research, Development, & Engineering Command (RDECOM, formerly SBCCOM) – http://www.rdecom.army.mil
Department of Homeland Security (DHS) – http://www.dhs.gov
Environmental Protection Agency (EPA) – http://www.epa.gov/
Department of Energy (DOE) – http://www.doe.gov
American Red Cross (ARC) – http://www.redcross.org
Center for Strategic and International Studies (CSIS) – http://www.csis.org
Oklahoma City National Memorial Institute for the Prevention of Terrorism – http://www.mipt.org

Preparedness:

DisasterHelp.gov - https://disasterhelp.gov
FEMA Prevention & Planning Library – http://www.fema.gov/library/prepandprev.shtm#state

Hazard Overview. Because of recent terrorist events, concern is higher about the possibility of a terrorist attack involving radioactive materials, possibly through the use of a “dirty bomb,” and the harmful effects of radiation from such an event. The Centers for Disease Control and Prevention has prepared this fact sheet to help people understand what a dirty bomb is and how it may affect their health.

An explosive RDD is a device that combines conventional explosives, such as dynamite, with radioactive materials in the form of powder or pellets. The idea behind a “dirty bomb” is to blast radioactive material into the area around the explosion. This could possibly cause buildings and people to be exposed to radioactive material. The main purpose of a “dirty bomb” is to frighten people and make buildings or land unusable for a long period of time.

The atomic explosions that occurred in Hiroshima and Nagasaki were conventional nuclear weapons involving a fission reaction. A dirty bomb is designed to spread radioactive material and contaminate a small area. It does not include the fission products necessary to create a large blast like those seen in Hiroshima and Nagasaki.
There has been a lot of speculation about where terrorists could get radioactive material to place in a dirty bomb. The most harmful radioactive materials are found in nuclear power plants and nuclear weapons sites. However, increased security at these facilities makes obtaining materials from them more difficult.

Because of the dangerous and difficult aspects of obtaining high-level radioactive materials from a nuclear facility, there is a greater chance that the radioactive materials used in a dirty bomb would come from low-level radioactive sources. Low-level radioactive sources are found in hospitals, on construction sites, and at food irradiation plants. The sources in these areas are used to diagnose and treat illnesses, sterilize equipment, inspect welding seams, and irradiate food to kill harmful microbes.
If low-level radioactive sources were to be used, the primary danger from a dirty bomb would be the blast itself. Gauging how much radiation might be present is difficult when the source of the radiation is unknown. However, *at the levels created by most probable sources, not enough radiation would be present in a dirty bomb to cause severe illness from exposure to radiation.*

Mitigation Resources.

General mitigation guides: http://www.fema.gov/fima/planning_toc5.shtm

Radiation cannot be seen, smelled, felt, or tasted by humans. Therefore, if people are present at the scene of an explosion, they will not know whether radioactive materials were involved at the time of the explosion. If people are not too severely injured by the initial blast, they should:

- Leave the immediate area on foot. Do not take public or private transportation such as buses, subways, or cars because if radioactive materials were involved, these materials may contaminate cars or the public transportation system.
- Go inside the nearest building. Staying inside will reduce people's exposure to any radioactive material that may be on dust at the scene.
- Remove their clothes as soon as possible, place them in a plastic bag, and seal it. Removing clothing will remove most of the contamination caused by external exposure to radioactive materials. Saving the contaminated clothing would allow testing for exposure without invasive sampling.
- Take a shower or wash themselves as best they can. Washing will reduce the amount of radioactive contamination on the body and will effectively reduce total exposure.
- Be on the lookout for information. Once emergency personnel can assess the scene and the damage, they will be able to tell people whether radiation was involved.

Even if people do not know whether radioactive materials were present, following these simple steps can help reduce their injury from other chemicals that might have been present in the blast.

Potassium iodide (KI)

Potassium iodide, also called KI, only protects a person's thyroid gland from exposure to radioactive iodine. KI will not protect a person from other radioactive materials or protect other parts of the body from exposure to radiation. It must be taken prior to exposure (for example, if people hear that a radioactive cloud is coming their way) or immediately after exposure to be effective. Since there is no way to know at the time of an incident whether radioactive iodine was used in the explosive device, taking KI would probably not be beneficial. Also, KI may be dangerous to some people. Taking KI is **not** recommended unless there is a specific risk of exposure to radioactive iodine.

If radioactive materials were involved

Keep televisions or radios tuned to local news networks. If a radioactive material was released, people will be told where to report for radiation monitoring and blood tests to determine whether they were exposed to the radiation as well as what steps to take to protect their health.

Risk of cancer from a dirty bomb

Some cancers can be caused by exposure to radiation. Being at the site where a dirty bomb exploded does not guarantee that people were exposed to the radioactive material. Until doctors are able to check people's skin with sensitive radiation detection devices, it will not be clear whether they were exposed. Just because people are near a radioactive source for a short time or get a small amount of radioactive material on them does not mean that they will get cancer. Doctors will be able to assess risks after the exposure level has been determined.

Best Practices & Case Studies.

General mitigation success stories: http://www.fema.gov/fima/success.shtm

Radiation threat, commonly referred to as a "dirty bomb" or radiological dispersion device (RDD), is the use of common explosives to spread radioactive materials over a targeted area. It is not a nuclear blast. The force of the explosion and radioactive contamination will be more localized. While the blast will be immediately obvious, the presence of radiation will not be clearly defined until trained personnel with specialized equipment are on the scene. As with any radiation, you want to try to **limit exposure**. It is important to avoid breathing radiological dust that may be released in the air.

- If you are outside and there is an explosion or authorities warn of a radiation release nearby, cover your nose and mouth and quickly go inside a building that has not been damaged.
- If you are already inside check to see if your building has been damaged. If your building is stable, stay where you are.
- Close windows and doors; turn off air conditioners, heaters or other ventilation systems.
- If you are inside and there is an explosion near where you are or you are warned of a radiation release inside, cover nose and mouth and go outside immediately. Look for a building or other shelter that has not been damaged and quickly get inside.
- Once you are inside, close windows and doors; turn off air conditioners, heaters or other ventilation systems.
- If you think you have been exposed to radiation, take off your clothes and wash as soon as possible.
- Stay where you are, watch TV, listen to the radio, or check the Internet for official news as it becomes available.

- Remember: To limit the amount of radiation you are exposed to, think about time, distance, and shielding.
  - **Time:** Minimizing time spent exposed will also reduce your risk.
  - **Distance:** The farther away you are away from the blast and the fallout the lower your exposure.
  - **Shielding:** If you have a thick shield between yourself and the radioactive materials more of the radiation will be absorbed, and you will be exposed to less.

As with any emergency, local authorities may not be able to immediately provide information on what is happening and what you should do. However, you should watch TV, listen to the radio, or check the Internet often for official news and information as it becomes available.

Nuclear Terrorism

Scope. Nuclear terrorism includes the use of either improvised or manufactured nuclear devices or weapons.

Resources.

Nuclear Terrorism:

General Information - http://www.fema.gov/hazards/
U.S. Army Research, Development, & Engineering Command (RDECOM, formerly SBCCOM) – http://www.rdecom.army.mil
Department of Homeland Security (DHS) – http://www.dhs.gov
Environmental Protection Agency (EPA) – http://www.epa.gov/
Department of Energy (DOE) – http://www.doe.gov
American Red Cross (ARC) – http://www.redcross.org
Nuclear Control Institute – http://www.nci.org/nuketerror.htm
Center for Strategic and International Studies (CSIS) – http://www.csis.org
Oklahoma City National Memorial Institute for the Prevention of Terrorism – http://www.mipt.org

Preparedness:

DisasterHelp.gov - https://disasterhelp.gov
FEMA Prevention & Planning Library – http://www.fema.gov/library/prepandprev.shtm#state

Hazard Overview. A study prepared for Nuclear Control Institute by five former U.S. nuclear weapons designers concluded that a sophisticated terrorist group would be capable of designing and building a workable nuclear bomb from stolen plutonium or highly enriched uranium, with potential yields in the kiloton range. This risk must be taken seriously, particularly in light of documented attempts by al Qaeda to acquire nuclear material and nuclear-weapon design information. Despite claims to the contrary from plutonium-fuel advocates in the nuclear power industry, effective and devastating weapons could be made using "reactor-grade" plutonium, hundreds of tons of which are processed, stored and circulated around the world in civilian nuclear commerce. (From the Nuclear Control Institute)

Mitigation Resources.

General mitigation guides: http://www.fema.gov/fima/planning_toc5.shtm

The first steps to mitigate the possibility of nuclear terrorism would be serious and rapid effort to build intelligence capabilities that might warn of a potential attack, and take actions aimed at shoring up possible sources of nuclear material

In the event of a terrorist nuclear attack, a national emergency-response plan would be activated and would include federal, state, and local agencies. The effects of the attack would differ from a radiological event in that a nuclear detonation would have the addition affect of destroying buildings and property and killing people in the blast effects.

Preparedness is the most effective measure to mitigate the affects of a nuclear terrorist attack by communicating measures the public may take to minimize and prevent exposure. The general public should seek shelter in a stable building and listen to local radio or television stations for national emergency-alert information. The local emergency-response organizations, police agencies, and public health facilities may be able to supply you with additional information. The public should be educated to know that they need to be familiar with plans and follow the protective-action recommendations that are made by the state or local health department. As a general rule, the potential exposure and subsequent health consequences can be reduced by limiting time near the radiation source, increasing distance from the source, or keeping a physical barrier (such as the wall of a building) between individuals and the source.

Best Practices & Case Studies.

General mitigation success stories: http://www.fema.gov/fima/success.shtm

If there is a nuclear blast, take cover immediately, as far below ground as possible, though any shield or shelter will help protect you from the immediate effects of the blast and the pressure wave. Protecting oneself from the radiation affects of a nuclear blast is the same as from other sources of radiation. The major difference is in the affects of the blast and the shock wave.

If there is no warning:

- Quickly assess the situation.
- Consider if you can get out of the area or if it would be better to go inside a building to limit the amount of radioactive material you are exposed to.
- If you take shelter go as far below ground as possible, close windows and doors, turn off air conditioners, heaters or other ventilation systems. Stay where you are, watch TV, listen to the radio, or check the Internet for official news as it becomes available.
- Just as in a radiological event, to limit the amount of radiation you are exposed to, think about shielding, distance and time, which is discussed above.

Use available information to assess the situation.

Explosives

Scope. Terrorists may employ a broad range of improvised and manufactured explosive devices.

References.

(a) Public Law 104-201 "Defense Against Weapons of Mass Destruction Act of 1996" (23 September 1996)

Resources.

High-Yield Explosive Incidents:

General Information - http://www.fema.gov/hazards/
Department of Homeland Security (DHS) – http://www.dhs.gov
American Red Cross (ARC) – http://www.redcross.org
Oklahoma City National Memorial Institute for the Prevention of Terrorism – http://www.mipt.org

Preparedness:

DisasterHelp.gov - https://disasterhelp.gov
FEMA Prevention & Planning Library – http://www.fema.gov/library/prepandprev.shtm#state

Hazard Overview. Explosives are considered a "Weapon of Mass Destruction (WMD)" per reference (a).

An explosion is an extremely rapid release of energy in the form of light, heat, sound, and a shock wave. The shock wave consists of highly compressed air that wave-reflects off the ground surface to produce a hemispherical propagation of the wave that travels outward from the source at supersonic velocities. As the shock wave expands the incident or over-pressures decrease. When it encounters a surface that is in line-of-sight of the explosion, the wave is reflected, resulting in a tremendous amplification of pressure. Unlike acoustical waves, which reflect with an amplification factor of two, shock waves can reflect with an amplification factor of up to thirteen, due to the supersonic velocity of the shock wave at impact. The magnitude of the reflection factor is a function of the proximity of the explosion and the angle of incidence of the shock wave on the surface.

The response demands generated by some explosives incidents (pipe bomb, package bomb, letter bomb) in the pre- and post- blast stages are not new to emergency responders. High-yield explosive devices may lead to large-scale structural collapse, utility failure, transportation impacts, and mass casualties. The terrorist intentions are intended to injure citizens and/or first responders by the timeliness of the detonation. This can be through a secondary explosive device or through an explosive device intended to disseminate chemical, biological, or radiological agents/materials. This significantly increases response demands to include those additional hazards.

Mitigation Resources.

General mitigation guides: http://www.fema.gov/fima/planning_toc5.shtm

Best Practices & Case Studies.

General mitigation success stories: http://www.fema.gov/fima/success.shtm