The American Civil Defense Association is dedicated to emergency, disaster and nuclear preparedness.

TACDA ACADEMY - CIVIL DEFENSE BASICS

1. Psychology of Civil Defense
2. Nuclear Weapons Effects
3. All Hazard Sheltering
4. Chemical / Biological Warfare
5. EMP (Electro-Magnetic Pulse) & Power Failure
6. Radiation
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**"IN A DANGEROUS SITUATION WE HAVE
CHOSEN THE MOST DANGEROUS OF COURSES…
WE HAVE CHOSEN NOT TO FACE OUR DANGER!"
Dr. EDWARD TELLER (1908-2003)
Father of the Hydrogen Bomb**

1. PSYCHOLOGY OF CIVIL DEFENSE

1.01 Introduction:

People do not like to think about disaster. In the minds of most people, comfort, health and plenty remain the rule throughout all time, and they live their lives accordingly. When crisis looms in any form that announces warning, they rush in panic to the grocery store to purchase a few extra supplies. This scene re-plays for the majority of the population prior to every major storm. Few places in the United States have suffered a long-term disaster. Help in the form of shelter, food and water have always been provided within a few days. We anticipate and expect this help to arrive, and have grown dependent and apathetic because of it.

In many other parts of the world, help is not readily available. Vast populations in areas affected by war, pandemics, earthquakes, land slides and floods are left to their own devices for weeks and even months. Fear, panic, and sheer terror overwhelm the masses during and immediately after major disasters. Panic is soon replaced by overwhelming depression and apathy. Modern day threats have the potential to leave our own population in this same condition. Our survival is dependent upon a change of attitude and the acknowledgment that we are at risk.

1.02 Assessing Your Risk:

Most people consider the risk of a long-term natural or man-made disaster to be very small. No such crisis has ever occurred in our country, therefore, they consider the probability of such an event to be near zero. Keep in mind, however, that a true risk assessment must include both probability and consequence.

Our country is prone to earthquakes. Extreme weather patterns have increased significantly over that past decade. The possibility of an electro magnetic pulse (EMP) attack by a rogue country has become a frightening reality. Most of our national security strategists agree that the possibility of a nuclear attack from terrorist countries and organizations grows daily. The technology is well known and the nuclear fuel for such weapons is available on the 'black market'. China and North Korea have made veiled nuclear threats against our borders; terrorist organizations claim to have 'suitcase bombs'; and Russia and China continue to modernize every aspect of their strategic nuclear arsenal. The probability of a major disaster is much greater than most people could imagine.

The consequences of these events, in loss of property and human life vary widely. Historically, earthquakes in the United States have caused relatively few deaths. There is great potential and growing concern, however, for tsunamis and earthquakes affecting high population density areas. Terrorist attacks have claimed thousands of lives and billions of dollars in collateral damage. A

Nuclear attack could claim tens of millions of lives and could totally destroy our economy and possibly our very sovereignty.

When multiplying both the growing probability factor for these threats, by the huge consequence factor, we see a resulting risk factor that is huge. We believe this assessment justifies the expense and effort of preparing for these disasters.

1.03 A Change of Attitude:

After completing an honest risk assessment, attitudes often change. There are mental exercises that help with this process. Preparation is a natural result of attitude change.

- Accept the possibility that disasters can and do occur on a regular basis.
- Worry can be a constructive tool. Role-play various disasters and plan what actions should be taken.
- Read real or fictional accounts of survival experiences.
- Exercise a hope for the future. Spiritual anchors provide the will to survive.

A great deal of time and money is put into preparations for natural and man-made disaster. These preparations will be lost if the plan is not worked and the equipment maintained.

1.04 Neighborhood Emergency Plan:

During wide spread emergencies such as in hurricanes, earthquakes and floods, it is possible that state and federal assistance would be unavailable for the misplaced and injured for several days or even weeks. The goal of the neighborhood emergency plan is for members, if necessary, to function independent from state assistance.

This program encourages planning sessions and is designed to help people prepare and cope emotionally and physically with local disasters.

Each neighborhood unit should meet the following requirements:

1. Rescue people whose lives are threatened.
2. Provide first aid.
3. Account for the condition and location of all members.
4. Provide emergency water, food, clothing, and housing.
5. Restore normal living conditions as quickly as possible.
6. Prevent or limit property damage.
7. Fortify social, emotional, and spiritual strength.
8. Be able to report to the next higher organization level the following information:
    a. Your name, title, unit, and how you can be reached.
    b. Description, location, and magnitude of the emergency.
    c. Names of any injured, missing or dead, and contact information for their next of kin.
    d. Exact location and extent of property damage.
    e. Number of persons needed to provide assistance and specific tasks to be done.

f. Number of people who need skilled medical help.
g. Actions being taken to help those in distress.
h. Number of members available to provide assistance, including those with specific skills.
i. Assistance needed that is unavailable in the unit affected, including medicine, food, water, clothing, shelter, or fuel.

These goals are to be accomplished in the following manner:

- Organize neighborhoods in groups of 10 to 12 family units. Because of the variety and diverse talents of large numbers of people, the overall success of this plan should increase with the number of adjacent neighborhoods involved.
- Meet and decide on a neighborhood chairman. If you are able to organize a number of neighborhoods, choose a leader over this larger area. Use natural boundaries such as voting districts boundaries where large numbers of people already know one another and work well together.
- Train as many people from the area neighborhoods as possible in basic civil defense (sheltering, fallout meters, evacuation, etc.), CPR and first aid. Utilize instructors from your city or county Emergency Management / Civil Defense Dept., Red Cross, CERT, Community Education, or your own neighborhoods. *All scouts seeking Eagle level have merit badges in emergency preparedness. Utilize these well-qualified individuals. Train a team in a 50-hour advanced first aid course. Choose individuals who have a natural interest and inclination towards first aid, but not professional medical personnel who would be required to work on a state level.
- Make a list of all heavy equipment and drivers that would be available to the neighborhood in an emergency.
- Teach all members the proper line of authority in an emergency and how the neighborhoods should relate to the state emergency management system.

Establish a neighborhood family unit program structured in the following manner:

1. The area chairman will map and divide the area into units of 10 to 12 families living in close proximity to one another. (Families with special needs such as illness, elderly, widows, etc. may need to be placed with more capable units.) The units will each be assigned a number for identification.
2. During the initial area meeting each unit will be assigned a unit leader who, during the following week, will call and organize a home meeting for all the families in his unit.
3. During the home meeting, each unit should make assignments to individuals who could best meet the needs of that unit. All units will not have the same needs, but they might include some or all of the following:
    a. Vote for a chairman and secretary.
    b. Make a list of the possible emergencies that their unit might face. Don't exclude the possibility of earthquake, war or terrorist attack.

c. Make a list of the resources of that unit. Include tractors, trucks, 4-wheel drive vehicles and those people capable of driving them. List people trained in first aid, civil defense, search and rescue, construction, and any other skills that might need to be used in an emergency. If possible, check basements for fallout shelter protection. Encourage neighbors to consolidate their resources.
d. Make a list of each family's blood types, special medical needs, next of kin, personal physician, place of work, and contact information for a friend or family member out of state. Have the chairman or secretary keep a copy of this list in a safe place such as in a labeled vile in his or her refrigerator.
e. Assign a couple that could do a damage and injury survey. If possible they should have access to a walkie-talkie so this information could be immediately reported to the local authorities.
f. List all children going to the same school. Write a request that these children be released from school to a pre-assigned person or persons who are normally at home and are well known to the children. Include all the parent's signatures and give this list to the principal now, where he will keep it on file. In case some parents are not at home or are otherwise detained this will assure that the children will be gathered and cared for until the return of their parents. Ask the school to keep this list on file as well as on a computer, as the school may not have access to the computer in some kinds of emergencies.
g. Assign someone to keep materials on hand to make a temporary outside toilet for their unit in case the sewers have been damaged.
h. Assign someone to make up a menu for several days of mass community cooking for the unit, preferably using items that would be naturally rotated in most homes. Suggest that this person assign her neighbors to keep different ingredients for these menus on hand at all times.
i. Assign a couple to familiarize themselves with the gas turn off valve at each home in their unit. Have them keep the tool for this purpose ready and available at all times for themselves and all other families who are not at home. *(Make sure they know that gas should be turned off only when there is suspicion the line has been broken. Once gas is turned off, it must only be turned on by the fuel company, as there is distinct danger of explosion or fire if turned on improperly.
j. Assign individuals for the care of pre-school and elementary age children of the unit in the event the parents are injured or have other assignments in the community. Utilize older children to help with the younger children.
k. Suggest that each person choose an outside gathering place for their family in case their home is damaged. Decide on a place to put a note-keeping box, so members of the family and unit can leave communications to one another. This information would be necessary to keep someone from entering a dangerously damaged home in search of people who have already left the area.
l. Use this meeting to train members in emergency management skills.
m. Encourage the head of each family to prepare a document containing pertinent financial & personal information and suggest that they keep this information in a safe, fire and waterproof container in their home.

   n. Encourage families to each buy an inexpensive walkie-talkie. Several neighborhoods could go together to buy a radiation meter. Radiation levels for the area could then be transmitted over a pre-assigned channel to people sheltering in their basements or shelters. Familiarize your units with evacuation routes, basic sheltering principals, nuclear effects and survival skills.
   o. Ask ham radio operators in your area to help with your unit's communications plans. In an emergency, they can receive valuable information that could then be sent to your people through your CB's or walkie-talkies.
4. The units should meet together as often as they feel necessary. Once every 4 months should be adequate after the initial planning stage. During these meetings children should be familiarized with the plans and included in discussions and decisions where possible. Try to keep a positive and happy outlook and refrain from frightening them. This would be a good time to talk about updating 72-hour kits, reviewing evacuation plans, and encouraging members to have fire and earthquake drills.
5. In a large-scale emergency, all units should report to the proper state and local emergency organizations.

The plan may seem idealistic, but it is in place and working in many areas of country. Remember, that **POST EVENT SURVIVAL** is dependent upon **PRE-EVENT PREPAREDNESS**.

1.05 Psychological Preparation for Life in a Shelter:
There are fundamental necessities that are required for each person to feel comfortable, safe and secure. By closely attending to these needs before the disaster, the occupants will feel less stress, and they will be more able to remain emotionally stable during adverse conditions.

- **Personal space** - Each person should have room for their personal items. Storage space should be provided under each bunk. Each person should have their own personal supply of underwear, socks, clothing, shoes, personal medications and hygiene items.
- **Entertainment** - Store reading materials, games, educational materials, writing materials, toys and other items to keep the occupants occupied. Store a favorite toy for the children. Store a musical instrument such as a guitar or violin and encourage singing. Tell and read stories to the children.
- **Reassurance** - Talk about the future and reconstruction plans. Tell the occupants what they should expect to see after the event. If you have perceived a blast, prepare them for the possibility that their home and neighborhood may have been damaged.
- **Communications** - It is psychology imperative that you have outside contact. Listen to the radios, but plan to transmit sparingly on your CB or ham radio, as transmitting on these radios requires a great deal more power than when they are in the 'receiving' mode. If others that you know have shelters, plan to use the same frequencies.
- **Physical Exercise** - Encourage everyone to exercise. You may wish to include an exercise machine in your shelter. Everyone should have a turn turning the crank on the ventilator.
- **Light** - Light requires battery power. It is absolutely mandatory, however, that there be one light on at all times for the sanity and safety of the occupants. Carefully monitor your battery system to insure enough power to get through the first 3 weeks of the disaster.

- **Warmth** - Dress warmly. Cold people will not be happy or stay healthy. If properly installed, underground shelters should stay at a temperature between 45 and 65 degrees F.
- **Rest** - Rotate sleeping into three shifts. Provide comfortable mats and warm bedding. Store earplugs for light sleepers. At least two people should be awake at all times. People need to ventilate the shelter, continually monitor the radio, take radiation levels and guard the shelter.
- **Privacy** - Provide a separate area for the toilet and personal hygiene. You may wish to place curtains on the bunks, but be sure to leave adequate ventilation room.
- **Comfort Foods** - Store a two-week supply of foods that need little preparation. Store some 'comfort' foods and items that are familiar to the diet of the children. Make sure everyone is drinking enough water.

1.06 Plan of Action in the Event of a Disaster:
Spend time in the shelter sleeping, eating and practicing your plan. Practice what the family would do in the event of an escalating crises, or eminent attack. This should be an exercise similar to a 'fire drill'. Spend a full day and night in the shelter once every month or two.

The following is a duty list that should guide you in the event that you need to go to your shelter in an emergency. Read through this list on a regular basis. Post it inside the shelter. Turn off your power and let the family hear the power-drop alarm, and proceed to the shelter as you would in a real emergency. Use this list as a shelter exercise.

- If the EMP alarm has been activated, switch off the alarm.
- Check the telephone & radio for an electromagnetic pulse (EMP). If you have seen arcing from your outlets, or if the test of the telephone & radio fails, send everyone to the shelter. Every needful thing should already be in the shelter. Don't stop to retrieve anything except the flashlights. Everyone should know the location of the flashlights and should have his own flashlight.
- The first person to the shelter should shine his flashlight into the entrance. An adult should enter the shelter first, and assists the others down the ladder. An older child or adult should proceed through the horizontal run, enter the shelter, and turn on one battery powered shelter light. One light should always remain on at all times.
- Assign a person to assist the younger children through the horizontal tunnel if needed.
- An adult should immediately assist all children to a hammock. Everyone should have been pre-warned to stay away from the shelter wall, as a ground shock could cause severe injury through the sides and floor of the shelter. Everyone should remain in the hammock until told by the adult in charge, that it is safe to leave.
- The last person entering the shelter should close and lock the shelter from the inside. He should then immediately proceed to his own bunk or hammock and take a 'ready' position.
- There may be more than one blast. If a blast is heard or felt, continue holding the ready position for at least one hour after hearing or feeling the last blast. If not performing an essential task, everyone should remain in his hammock for 24 hours.

- If, after one hour there has been no indication of a blast, someone should be assigned to start monitoring for radiation. After taking an initial reading, he should charge all dosimeters and assign them to people in various areas of the shelter.
- If there is no indication of blast or radiation, an assigned person should remove one of the inexpensive battery powered radios from the faraday cage, and listen for activity. Assuming your shelter is connected to the grid, you should receive a signal by holding the transistor radio (AM stations, only) near a power cord. Listen for activity throughout the day. Do not risk using your expensive ham radios during the first two days.
- A person should be assigned to record radiation levels, hourly. Place children and small adults in the areas of least exposure. Areas near the shelter entrances will be the most likely place for significant levels of radiation.
- In the event of a confirmed EMP, no one should leave the shelter for at least 24 hours. After 24 hours, if there has been no blast and no reading on the radiation meters, one person may wish to venture out to check for activity.
- In order to protect the filtration system from smoke, dust and radiation, the ventilation system should remain closed for a six-hour period after a blast. Six hours after the last blast, the hoses should be attached to the gas filter and the assigned person should turn the lever on the hose to the 'open' position. Make sure you have carefully studied this action, and that you are placing the hoses in the correct position. Adjust the flow of air via the meter to the wartime gas filtered velocity (red indicator). The meter has been set by the manufacturer to allow for the proper airflow during filtered operation. The proper residence time within the filter for chemical agents must not be exceeded.
- In the unlikely event that the blasts continue, you may be forced to ventilate the shelter before the end of the 6-hour period. A volume of 130 cubic feet of free air space per person is required in order to shut down for 6 hours.
- Anyone entering the shelter at a later time should be instructed to enter through the air lock and wait for the positive pressure to re-establish. If they have been contaminated with fallout, they should remove their outer clothing in the decontamination area of the air lock and place their clothing into plastic bags. Fresh clothing should be stored in the air lock for those who may have received fallout contamination.

Quick Instructions for Occupation of Shelter

- **Check for EMP and turn off alarm.**
- **Gather family & flashlights.**
- **Enter shelter & lock door.**
- **Go directly to hammocks.**
- **After one-hour, turn on battery-powered radio.**
- **Charge dosimeters & take meter readings.**
- **Stay in hammocks for 24 hours (except for essential tasks).**
- **Do not ventilate until 6 hours after blast (if there is no smoke, you may ventilate sooner).**
- **Connect hoses to gas filter and fully open air lever.**
- **Ventilate at rate that shows the 'red button' on the meter.**

PERTINENT FINANCIAL & PERSONAL INFORMATION

Keep a notebook with the following information:

1. **Personal information:**
    a) Copy of wills, marriage license, birth certificates
    b) Record of immediate family member names, birth-dates, SS numbers and places of birth, current pictures
    c) Veteran information (ID numbers, discharge papers, insurance)
    d) Pertinent medical records (vaccinations, surgeries)
    e) Small biography
    f) Financial statements
2. **Banking information:**
    a) Keep a list of all checking & savings accounts information & banks
    b) Note name of banker
    c) Save cancelled checks, receipts, and bankbooks for six years and note where they are stored.
    d) Arrange to have access to at least one source of ready cash in the event of your spouse's death.
    e) Make note of all safety deposit boxes and keep duplicate keys & authorization (boxes are sometimes sealed after a person's death)
3. **Tax records**
    a) Note where tax records are stored
    b) Note names of Investment advisors & accountants
    c) Note times that personal & corporate taxes are due
4. **Assets:**
    a) Note names of stalk brokers & investment advisors
    b) Note names of attorneys & executor of wills
    c) Note loans against insurance policies
    d) Investments, properties, pensions, stocks, trusts, bonds, partnerships, LLCs, jewelry, art objects of value, rare books, deeds, rentals, real estate properties, loans you have made to others
5. **List of debts**
    a) What you owe others, and what others owe you
    b) Regular monthly, quarterly & annual bills and payments
6. **Insurance Policies**
    a) Health insurance (check to see if policy terminates with death of spouse or parent).
    b) Life Insurance policies & beneficiaries
    c) Car, house, property insurance
    d) Name of Insurance agents
7. **Funeral arrangements (special requests, burial plots & funeral plans)**
8. **Seasonal tasks:**
    a) Drain sprinkler systems, change furnace filters,
    b) Preparation of winter storage of lawn mowers, etc.
    c) Vehicle maintenance

VIAL OF LIFE INFORMATION

Name _____ Birth Date_____

Home Address _____

Place of Employment _____ Phone_____

Dentist _____ Phone_____

Physician _____ Phone_____

Specialists _____ Phone_____

_____ Phone_____

_____ Phone_____

Preferred Hospital _____ Phone_____

Persons to contact in emergency

1. Name (local) _____ Phone _____
2. Name (Out of State) _____ Phone _____
3. Name (Next of kin) _____ Phone _____

Medications being taken _____

_____

Allergies _____

Medical Problems _____

Blood Type _____ Pacemaker? _____

Glasses? _____ Contacts? _____

Religious Affiliation _____

Bishop/Pastor _____

Health Insurance Co. _____

Policy No. _____

Attorney _____ Phone _____

Place this information in a vial, or other simple container, and place into your refrigerator on the top shelf of the door.

2. NUCLEAR WEAPONS EFFECTS

2.01 Introduction:

The energy characteristics and output from nuclear weapons differ significantly from conventional weapons. Nuclear detonations exhibit much higher temperature within the fireball and produce peak temperatures of several hundred million degrees and intense x-ray heating that results in air pressure pulses of several million atmospheres. Conventional chemical explosions result in much lower temperatures and release the bulk of their energy as air blast and shock waves.

In an atmospheric detonation, such as was deployed in Japan, it is the blast and thermal component of the nuclear explosion that is the major factor in destruction and death, not nuclear radiation, as the public believes. The effective range of immediate harm to humans from nuclear radiation from the atmospheric explosion is much less than the effective range from blast and thermal heating.

In order to limit the discussion of weapons effects to elementary terms, this discussion is based upon a single worst-case scenario. Probably the largest weapon that might be employed against a population would have a yield of less than one-megaton (or 1 million tons of TNT equivalent energy or simply 1 MT). However, a crude terrorist nuclear device would probably be in the range of a few thousand tons of TNT equivalent energy or a few KT). The discussion here is based upon a nuclear detonation of 1 MT.

2.02 Yield:

The destructive power of a nuclear weapon, when compared to the same amount of energy produced by TNT is defined as the 'yield' of the nuclear weapon. A 20-kiloton (KT) weapon, such as was detonated over Japan in World War II was equivalent in energy yield to 20,000 tons of TNT. A 1-MT yield weapon is equivalent to 1 million tons of TNT.

2.03 Types of Nuclear Weapons:

Nuclear Weapons are much smaller in volume and mass than conventional weapons. But nuclear detonation produce energy release thousands of times greater and over a shorter time period (chemical explosion – milliseconds, nuclear explosions – microseconds). The energy from a nuclear detonation can result from two basic nuclear processes—nuclear fission and nuclear fusion.

The first nuclear weapons were only fission devices made from either uranium-235 (a relatively scarce isotope of uranium), or from a man-made isotope of plutonium, namely Plutonium-239.

When certain isotopes of uranium or plutonium (U-235 or Pu-239 or fissile isotopes) are bombarded with neutrons, the nucleus of these isotopes can split apart (fission) releasing about 200 million electron volts of energy. This energy release is about a 100 million times greater than the burning (oxidation) of a carbon atom in a fossil fuel. Furthermore, during the fission process additional neutrons are released (typically two or more) and these neutrons can fission other fissile isotopes. This process if carefully designed can lead to a rapidly increasing chain reaction releasing a great amount of energy before the remaining fissile material is blown apart by the rapid increase

of energy. Indeed, the essential design feature in the design of an effective nuclear weapon is containing the fissile material together for sufficient time to liberate the energy yield desired.

The fusion and fission reactions produce energy in different ways. Fusion occurs when two light isotopes (usually deuterium and tritium – heavy isotopes of hydrogen) at very high temperatures and pressures, unite and form a heavier isotope (usually helium). A fission reaction can produce both the high temperature and high radiation pressure required for fusion to occur and so in the design of all fusion weapons (often called thermonuclear systems) a primary fission reaction is used to initiate the secondary fusion reaction. One pound of the hydrogen isotope can release as much energy as is found in 26,000 tons of TNT.

During the fusion process, high-energy neutrons are also liberated as in fission. These high-energy neutrons can cause a fission reaction in the abundant isotope, uranium-238. Some large yield, thermonuclear weapons use this fission-fusion-fission process.

2.04 Types of Bursts:
Phenomena from weapons effects vary with the type of burst. The desired effects to be maximized dictate the burst type. The burst types fall into four basic categories:

- Surface Burst
- Air Burst
- High Altitude Burst
- Subsurface & Underwater Bursts

Surface bursts maximize the reach of high overpressures and would most probably be used against hardened strategic targets such as missile launch control centers, harbors and submarine pens, and large airports. Destruction of ICBM silos, and deep underground shelters require ground bursts of 300 KT and greater. Ground bursts are also indicated if a planner wishes to maximize residual fallout radiation.

An airburst is defined as an explosion that occurs below 100,000 feet elevation, but high enough so that the fireball of this explosion does not reach the surface of the earth. Airbursts extend the range of lower overpressures. Maximum blast damage of soft targets (such as cities) would occur from airbursts of MT yield weapons. Smaller yield air bursts exploded at optimum height of burst give more targeting flexibility in destroying important targets in a large city while allowing collateral damage to be held to a minimum.

Bursts occurring above 100,000 feet elevation are defined as 'high-altitude bursts'. High altitude bursts are designed to cause an electro-magnetic pulse (EMP). These high altitude radiations interact with the atmosphere and cause rapid EM changes and ionization, which seriously effect radio and radar signals and other critical electrical power dependent equipment.

Most of the shock energy in underground or underwater detonations is contained below the surface. Much of the thermal and nuclear radiation is absorbed within a short distance of the explosion, contaminating the earth or water with radioactive fission products.

Subsurface bursts are generally used during testing to minimize radiation fallout, or in wartime by means of burrowing missiles, which penetrate below the surface to destroy underground facilities.

2.05 Thermal Radiation Exposure:
Within less than a millionth of a second of the detonation, large amounts of energy in the form of invisible x-rays are absorbed within just a few meters of the atmosphere. This leads to the formation of an extremely hot and luminous ionized mass called the fireball or plasma. Even at a distance of 50 miles from a 1 MT burst, this fireball would appear as many times the brightness of the noonday sun.

The heat from the fireball is emitted in the form of thermal radiation or EM in the ultra violet, visible, and Infrared range. The EM pulse travels at the speed of light and can persist up to several seconds, depending on the yield of the weapon, local clouds, and the height of the burst. The thermal pulse from a 1-MT weapon lasts about 8 seconds. If we were far enough away from the blast, and could drop and cover quickly, we would minimize the burns caused by this pulse. At 8 miles from the detonation, only minimal structural damage takes place, but flash burns caused by the thermal pulse at that distance would cause severe burns if people were unprotected. Every effort should be made to limit exposure time. 'Drop and cover' is still a wise exercise to practice during a nuclear attack.

2.06 Thermal Radiation Burns:
Burns are the most far-reaching of any of the immediate weapons effects. Thermal radiation can cause burns through absorption of the energy by the skin, or by ignition of clothing as a result of fires started by the radiation.

Skin burns are classified as 1st, 2nd and 3rd degree. Third degree burns can occur out to 8.5 miles from a 1-MT burst.

Second-degree burns occur at about the same range as the 1.4-psi overpressure level, which is about 10 miles from ground zero for a 1-MT airburst. First-degree burns can occur from 10 to 12 miles from ground zero. Evasive actions are required in order to limit harm.

2.07 Evasive Actions:
Much burn injury from large yield weapons can be avoided in the low overpressure area (1 psi to 2 psi), if protective shielding is found in the first seconds. The evasive action of 'drop and cover' should again be taught and exercised.

If there is any warning of incoming missiles, the best available shelter should be taken. Ditches, culverts, basements, or large structures would provide some shielding against the thermal pulse.

Materials inside rooms of buildings (such as curtains, upholstery, or papers) could be ignited by the thermal pulse of a nuclear blast. If sheltering in the home, efforts must be taken to extinguish fires that may be ignited in the home.

In areas of overpressure less than 2 psi, many residences will remain intact. Test results suggested that if there is adequate warning time, light colored drapes should be closed to shield upholstered furniture and beds from the thermal pulse, and electricity and gas should be turned off to avoid secondary fires.

Experience has shown that ignition, such as would occur in upholstery, might remain smoldering and later rekindled. It is advisable to check for primary fires after the initial blast and then to check again after 15 minutes in order to extinguish any secondary fires that may be rekindled. Fire extinguishers should be supplied in your sheltered area for this purpose.

Care should be taken never to look at the fireball. Because of the focusing action of the eye lens, the eyes can be temporarily or permanently injured and blinding may occur.

Underground shelters will give total protection from the thermal pulse. Of course, this requires an effective warning system to know when to enter the shelter.

f there is an escalating crisis we should enter our shelters and remain there. It is more probable, however, that a nuclear attack would come as a surprise--particularly from a terrorist attack. The only initial warning may come from the electro-magnetic pulse.

2.08 EMP Cause:

All nuclear explosives induce sudden electrical currents and voltages, which can damage or destroy unprotected electrical and solid-state electronic equipment within line-of-sight of the explosion. The size of the area affected by an EMP increases with the height of the burst. In a nuclear explosion 50 miles above the ground, the affected area on the earth will have a radius of about 600 miles. A high altitude EMP (HEMP) from a nuclear explosion detonated at an altitude of 200 miles could produce a rapid electrical energy pulse on the order of 60,000 volts per square meter and could affect and even disable equipment within the entire continental United States. Smaller EMP pulses produced at lower altitudes could cause cascading failures in an already stressed electric power infrastructure (transmission lines, transformers, etc) and also telecommunications.

The affects of this type of weapon would not pose an immediate danger to people. However, it could damage satellites, and computerized ignitions in automobiles disrupt telephone and radio communications, destroy navigational aids and computers, and would most probably cause electrical power distribution to be lost for many months. Transportation would be paralyzed, food refrigeration and distribution would cease and water purification and sewer systems might fail. Financial institutions, hospitals, trade and production of goods and services would cease functioning. Key infrastructures and utilities are interdependent and very vulnerable to electrical power interruption. A recent report to the Congress stated "an EMP could have irreversible affects

on our country's ability to recover". (Report of the Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack; Volume 1: Executive Report 2004).

Terrorist countries and their organizations understand our vulnerability and could use relatively unsophisticated missiles armed with nuclear weapons to produce a high altitude EMP (HEMP).

Many nuclear strategists believe that if our country were attacked in a limited exchange or full-scale nuclear war, the attack would be initiated with a high altitude EMP to disable telecommunications. If this weapon were deployed by a satellite, we would likely have no warning before the explosion occurred. Immediately after the HEMP, missiles would be launched against targets in the United States.

Every occurrence of sudden power failure should be viewed as possibly having been caused by a high altitude nuclear explosion. Certain simple tests will quickly reveal an EMP verses power loss from a natural cause.

2.09 EMP Detection:

If an electrical power drop is detected, immediately check a corded phone to see if the telephones are functioning. If there is no dial tone, you should do a second test using a battery-powered radio. Approximately 5% of the radio stations in the United States have been hardened against EMP and could continue transmitting. However, if you are unable to access several radio stations that normally transmit in your area, you should take shelter immediately. Contact radio stations within your area to locate frequencies that may continue to transmit during this kind of an emergency.

A simple power drop alarm can be constructed in the event the EMP was to occur while you are sleeping. Ask a certified electrician to construct such an alarm using a relay switch, a 12-volt gel-cell battery, and a horn. However, no solid-state electronics should be employed in the construction of this alarm.

2.10 Protection of Equipment:

During an escalating crises and when not in use, all sensitive equipment should be unplugged from the wall outlets. Power cords should be wound into a coil. Wherever possible, electronic equipment should be stored in an encompassing metal cage called a 'Faraday cage'. Metal garbage cans with tight fitting lids make good faraday cages. Insulate your equipment with toweling or cardboard before placing it into the can. It is not necessary or even advisable to ground the can. As a further precaution, fold metal screening material over the lip of the can before closing the lid to assure tight metal-to-metal contact. Do not place the can directly on a concrete floor.

Ammunition boxes make good faraday cages. Remove any gasket material from the lid and sand the painted areas where the lid fits to the body of the can. Do not store the can on metal shelves, which contact a concrete floor.

Microwave ovens (not plugged in to an outlet) also make good faraday cages.
Radios should not be attached to any antenna longer than 30 inches. Remove all removable antennas and push all retractable antennas to the shortest possible length.

2.11 Blast Effect and Overpressure:

In a 1 MT yield weapon, 10 seconds after the blast, the fireball is over a mile wide. In one minute it has grown to 4 1/2 miles from the point of burst.

At the same time the fireball is forming and growing, a high-pressure wave develops and moves outward from the fireball. This blast wave is a moving wall of highly compressed air called a shock wave. In 10 seconds the blast wave has traveled 3 miles. In 50 seconds, it has traveled 12 miles and is then moving at slightly greater than the speed of sound (1000 feet per second).
We measure this pressure in pounds per square inch (psi). Normal ambient atmospheric pressure is about 15 psi. Any pressure over and above this level is considered to be 'overpressure'.

Many unsheltered people can withstand and survive this shock wave and blast effect if they are outside the 5-mile radius of the detonation.

2.12 Dynamic Effect:

High velocity winds are associated with the blast effect, and the effects from the windblast must be added to the effects of overpressure. This effect is called the dynamic pressure. Dynamic pressure is proportional to the square of the wind velocity and the density of the air behind the shock front.

Divers experience about l0 psi of overpressure at a 23-foot depth and 20 psi at a 45-foot depth. If acclimatization to the pressure increase has been gradual, no ill effects will be experienced even though the pressure differential seems amazingly large. Overpressures experienced in a blast, however, are complicated by the sudden dynamic (blast wind) effect.

A 20-psi overpressure is associated with a wind velocity of 500 mph and without proper shelter; overpressures of this strength cannot be survived. Injuries at overpressures under 20 psi are due almost entirely to this dynamic effect. Blast winds at even 1-psi overpressure can cause injury from flying glass fragments and other small sharp objects.

The overpressure from a 1-MT weapon at 4 miles is approximately 5 psi and the wind velocity is about 160 mph. At this distance it is generally believed people could survive outside a hardened blast shelter if they can find adequate sheltering which would give protection from the blast wind. Structures such as culverts, ditches, tunnels, caves, mines and basements could give adequate protection at this overpressure level if the occupants were protected from falling debris. At overpressures over 5-psi, however, a residential basement would not provide adequate blast protection. A discussion of expedient shelters is given in another lesson.
Many thousands of people live and work in areas considered by planners to be under the 5-psi overpressure range, and would be saved if they can seek shelter in their basements.

2.13 Radiation Effect and Fallout:

Radiation is the most far reaching of all the weapons effects. If the fireball of the weapon touches the ground, the blast is defined as a ground burst. In a ground burst, rock, soil, and other material in the area will be vaporized and taken up into the cloud. Strong winds cause dust, dirt, and other particles to be sucked up into the fireball as well. All of this debris is then mingled with fission products and radioactive residues and becomes radioactive itself. As it cools, the debris falls from the cloud onto the ground. This material is what we call radioactive fallout. It has been estimated that for every ton of yield, an equivalent one-half to one ton of matter is vaporized into the fireball. In a one megaton explosion, there could be as much as 500,000 to l million tons of dirt and debris taken into the fireball, which will later fall to the ground as radioactive fallout.

2.14 Protection From Fallout:

Time - Radiation diminishes with time in a process called radioactive decay. Each radioactive isotope has a unique 'half-life'. This is defined as the time required for the radioactivity of that isotope to diminish (or decay) to one half of its original value. The passage of 10 half lives for a given radioactive material reduces its activity by a factor of 1000.

During the fission process in a nuclear detonation, hundreds of isotopes with different decay patterns are produced. It has been found that the average decay rate for these radioactive products can be estimated with the 7 / 10 rule. Simply stated, this rule states that for every seven-fold increase in time after detonation, there is a ten-fold decrease in the radiation exposure level.

7/10 RULE - To estimate radiation levels from fallout by this rule, at 7 hours after the detonation, the level of radiation would be expected to be 1/10th of the original level. At seven times seven hours (49 hours or about 2 days), the level would be 1/100th of the original level. At seven times 2 days (or two weeks) the level would be 1/1000th of the original level.

Distance - Radiation levels diminish with distance as well as time. In a localized event, everyone within the area of radioactive fallout should find shelter or evacuate and move as far as possible from the location of the radioactive material.

Shielding - Shielding also decreases (attenuates) radiation levels. Four inches of soil will attenuate half of the gamma radiation from fallout. This is called the 'half-value' thickness for shielding. One 'half value' thickness gives a protection factor (PF) of 2. This rule is multiplicative. A total of 8 inches of soil will provide additional reduction, or a PF of (2 x 2)=4. Four more inches (a total of 12 inches of soil) will provide 3 halving thicknesses, or a PF of (2 x 2 x 2)=8. The half value thickness for concrete is about 3 inches. Ten layers of the halving thickness for any shield provide a protection factor of over 1000.

2.15 Alpha Radiation:

Alpha particles have a range of about 2 inches in air, and are completely stopped by the outside layers of the skin. Therefore, alpha particles are not an external hazard. However, they can do considerable damage internally. So it is essential not to breathe in or ingest alpha contaminated

materials. Ventilation systems in fallout shelters should be fitted with filters to remove these materials from the breathable air.

2.16 Beta Radiation:

Energetic electrons (called Beta Particles) have a range of up to 12 feet. Most fission products are beta emitters. Beta radiation poses a small external hazard if the fission products in the fallout come into actual contact with the skin and remains there for an appreciable time. This contact may result in a skin burn referred to as "beta burn", which causes damage similar to sunburn. Fallout should be brushed and/or washed from the hair and skin as soon as possible.

Beta emitters cause considerable damage if they enter the body. Alpha and Beta particles in fallout can enter the body through the digestive tract (through consumption of contaminated food and water), through the lungs, (by breathing contaminated air), or through wounds.

Some radioactive elements tend to concentrate in specific organs in the body. The body cannot distinguish between the stable chemical element and the radioactive isotope of that chemical element. Radioactive strontium and barium are similar in chemical nature to stable calcium and may be deposited in the bones.

Care should be taken not to eat food, which has been contaminated with radioactive materials. If the food has been carefully washed, however, it can safely be eaten. Potatoes and carrots can be peeled; apples and other hard skinned fruits and vegetables can be washed clean of surface contamination. Soft foods, such as strawberries, lettuce, bread, and such are not easily decontaminated and should be discarded unless they are known to be uncontaminated. Canned food containers should be washed before opening.

Animals, which have been exposed to radiation, may have significant levels of strontium and barium in fur and in their bodies. These animals, if healthy appearing, may be slaughtered and eaten, if the bones and organs are discarded before the meat is cooked.

Iodine-131 generally poses the largest threat to humans because iodine chemicals are deposited in the thyroid. Iodine can enter shelters in a gaseous form. Ventilation systems must have good high efficiency filters to filter this radioactive element from the breathable air.

Thyroid blocking agents (TBA) are available commercially. They are inexpensive and have a long shelf life. TBA consists of iodine in the form of potassium iodide or iodate. The thyroid fills with the healthy iodide and the radioactive iodine is then removed biologically from the body. Regular iodine is poisonous and should not be taken internally. Use only the commercial TBA at its recommended dosages.

TBA agents have an extremely bitter taste and will need to be consumed with other foods in order to cover the taste. Children, in particular, will find the TBA to be distasteful. The tablet form of TBA is more easily consumed than the liquid from the crystalline form.

Iodine 131 has a half-life of 8 days and will be a threat for 10 half-lives, or approximately 3 months. Enough thyroid-blocking agent should be stored for each person in the shelter for a 3-month period. If there is no warning of an attack, TBA should be taken as soon as possible after a nuclear attack. However, TBA is a strong medicine that has some undesirable side affects. It should not be taken unless a nuclear attack has occurred or is believed to be eminent. TBA should be left in its originally packaging whenever possible until needed.

2.17 Gamma Radiation:

Gamma radiation is highly penetrating electromagnetic radiation and poses a sustained exposure threat for the first 2 weeks after a ground burst. Gamma radiation is measured in Roentgens. In a full-scale nuclear attack, over a two-week period, the accumulated radiation dose in some areas can be several thousand Roentgens.

Gamma Radiation is reduced or attenuated by limiting time near the gamma source, distance from the source, and shielding (placing material mass between you and the source). If whole body exposure is limited to less than 175 Roentgens, no medical care should be needed and there will be few if any anticipated deaths. To attenuate the exposure anticipated in a full-scale nuclear attack to this level, a minimum radiation protection factor of 40 would be required. If at any time the dose rate exceeds 10 Roentgens per hour, the total exposure will exceed the 175 Roentgen level. (Note that the value of 1 Roentgen is equivalent to about 1 rad or 1 rem).

TABLE 2.17 RADIATION PENALTY TABLE

Acute Effects	Accum. Exposure 1 Week	Accum. Exposure 1 Month	Accum. Exposure 4 Months
Medical Care Not Needed	150 Roentgens	200 Roentgens	300 Roentgens
Some Need Medical Care Few if Any Deaths	250 Roentgens	350 Roentgens	500 Roentgens
Most Need Medical Care 50% + may die	450 Roentgens	600 Roentgens	600 Roentgens
Lethal Dose	600 Roentgens		

The accumulated exposure should not exceed those in the first row. If radiation levels reach 10/R/hr in the sheltered area, the doses in the first row will probably be exceeded. In this eventuality, the shielding in the sheltered area should be increased. In a full scale attack, about 35% of our population would be expected to exceed the above doses.

EXPOSURE AT 30 MILES DOWNWIND (500 KT surface burst, 15 mph wind)

Time	In Open	In Shelter PF 15	In Shelter PF 40
1 Week	3450 Roentgens	230 Roentgens	86 Roentgens
1 Month	4100 Roentgens	273 Roentgens	103 Roentgens
4 Months	4500 Roentgens	300 Roentgens	113 Roentgens

2.18 Initial Radiation:

Initial radiation exposure is considered to take place in about the first minute after the nuclear explosion. During the fission and fusion process, high-energy neutrons, x-rays and gamma rays are expelled from the fireball.

The threat of this initial radiation exposure from the nuclear explosion is confined to a radius of about 1.5 miles from ground zero. A very small percentage of the surviving unprotected population would be within range of this initial radiation. The blast and thermal effects would be fatal within this radius for unsheltered people. However, in a hardened blast and radiation shelter, people could survive all nuclear weapons effects, including initial radiation, at distances of 1/2 mile or more from ground zero. In the absence of a hardened shelter, any practical, available, expedient shelter should be utilized, since some shielding protection is offered from blast, thermal heating, and nuclear radiation.

Before A Nuclear Event

- Store a one-year supply of water, food, clothing, fuel, medical needs, and other necessities near your intended shelter.
- Prepare as you would for earthquake, fire, high winds, power outage or any other major disaster.
- Prepare a shelter according to proximity to blast and radiation effects.
- Store a 4-week's supply of water. Purchase a water filter and learn alternative water purification methods.
- Prepare buckets with supplies for toilet and sanitation or purchase a chemical camping toilet.
- Purchase a radiation meter and dosimeters and a charger.
- Prepare a 72-hour kit for your car.
- Store Potassium Iodide (TBA) for thyroid protection from radioactive iodine.
- Learn and teach your family about NBC effects including blast, EMP, fire, radiation, & chemical/ biological warfare.
- Purchase or construct a power drop alarm to warn of possible EMP blast.
- Purchase battery powered CB, shortwave, FSR, and/or Ham radios.
- Refuel vehicles before they are half empty.
- Purchase deep cycle RV batteries and keep all re-chargeable batteries charged.

During an Escalating Crises

- Keep radio tuned to emergency frequencies for official information.
- Check 72-hour car kit in the event you must evacuate.
- Pull Blinds. Dig a pit for garbage away from your home.
- If instructed by government officials to do so, start taking Potassium Iodide (TBA) tablets or drops.
- Stay close to your shelter. If you have no shelter, go to your basement and place two feet of heavy shielding overhead, and several feet on each side. Use books, bricks, food supply, dirt, or anything heavy and/or dense for shielding. Place shielding in the window wells of your basement shelter area.
- Gather supplies (include flashlights, battery powered radios, medications, gas masks, rubber gloves, & radiation meter).
- Tape and board windows as you would for a hurricane.
- A loss of power may indicate an EMP attack. Check phones & radio for transmission. If there is no dial tone or you cannot receive regular radio frequencies, go immediately to your shelter.
- If nuclear attack is eminent, turn off all utilities and enter your shelter. If the crisis passes, do not turn natural gas back on to your home. Natural gas must be turned on by your utility company.

During a Nuclear Event

- At home: If you have not done so, go immediately to your shelter.
- At work or school: Drop and cover under desk or other heavy object. Do not lean against the wall. If there is time go to a basement or a pipe chase. Stay away from windows, and take a face down fetal position, shielding your face.
- In your car: If time permits, drive to the nearest basement, culvert, tunnel, parking garage, etc. Shield from the thermal pulse below ground or behind heavy structures. Take your 72-hour kit with you. Place as much shielding overhead as possible.
- Do not look at the fireball, as the light may blind you.
- If at home, prepare to stay sheltered for at least two full weeks. Nuclear detonations may continue to occur.
- After 2 days, turn on battery powered radios for short periods for further directions.
- Monitor radiation levels. If in expedient shelters, prepare to take water from water heaters, storage, etc. Drink only water stored in covered containers for first 2 weeks.

After a Nuclear Event

- Do not leave your sheltered area for two weeks.
- Filter all water exposed to fallout. Do not drink swimming pool water as chemicals, acids, and salts cause kidney damage. Use this water for sanitation purposes, only.
- Eat perishables first, frozen foods second, and canned foods third.
- Cook with a pressure cooker to conserve fuel.
- Run generators only to charge batteries.
- Use battery power for lights and communications, only. Use mini-amp lights to conserve batteries.
- Continue to monitor radios periodically for instructions and indication of biological contamination.
- Wash and peel all fresh fruits and vegetables that have been exposed to radiation. Wash the cans of canned foods before opening.
- When slaughtering animals for food, strip the meat from the bones before cooking.

Continue to monitor radiation levels. Sleep in your shelter.

TACDA ACADEMY – CIVIL DEFENSE BASICS

3. ALL HAZARD SHELTERING

3.01 Disaster Shelters:

Shelter designs are based on disaster threat. Disaster shelters, however, all have common requirements.

1. Clean, breathable air
2. Protection from heat and cold
3. Food and water storage
4. Protection from the perceived threat

3.02 Risk Assessment:

Every locality has potential disaster threats. A proper risk assessment must take both probability and consequence into consideration. We invite each of you to take time to fill out a threat assessment. What are the threats to you and your loved ones? What is the probability of their occurrence? What is the consequence to you and your family if these threats were to occur? During this threat assessment, consider both man-made and natural disaster. A good NBC shelter will provide protection for most all man-made and natural disaster.

3.03 NBC Targets:

When considering threat from nuclear disaster, you should also list your prime and secondary NBC target areas. Prime targets are facilities that an enemy would perceive as being 'retaliatory' in nature. Facilities of consideration would be airports with runways over 7,000 ft. (they could provide access to tankers that would refuel bombers and fighter planes), military bases, munitions storage areas and submarine pens.

An enemy would consider 'secondary targets' if their strategy was to destroy our infrastructure. Targets such as reservoirs, seaports, power plants, refineries, large cities and transportation hubs are all examples of secondary targets.

Primary and secondary targets that are within 10 miles of your locality may dictate that you consider constructing a hardened, blast resistant NBC shelter. This type shelter must provide protection from all the effects of weapons of mass destruction (blast, fallout, initial radiation and chemical/biological warfare agents).

Fallout patterns generally follow a west to east direction. If your locality is between 10 and 80 miles downwind of a prime or secondary target, you may choose to construct a shelter with only fallout and chemical/biological protection.

3.04 Sheltering in Place vs. Evacuation:

Terrorist attacks are usually localized in nature. If you have an NBC shelter at home, by all means 'shelter in place'. If you don't, it may be more prudent to evacuate in the event of a localized terrorist attack, than to prepare a 'safe room'.

FEMA has long advocated 'Sheltering in Place' by the 'duct tape and plastic' method. If you have been instructed to stay at home, retreat to an inner room with as few a number of windows and doors as possible. Turn off all heating and air conditioning vents. Seal all windows and doors with heavy mill plastic, secured with duct tape. Your 'safe room' should be on an upper floor, if possible, because biological or chemical agents are heavier than air and will settle to the lowest point.

You require 88 cubic feet per person (about 11 sq. feet of floor space) of free air space to keep your CO2 levels below the critical 3% level for a period of 4 hours. To assure your ability to stay for longer periods, you should purchase a ventilator/gas filter for the room. This should be installed well before any event. Make sure the ventilator has both electric and manual function, as you may loose power to your home. It may take longer to secure your room than it would to evacuate. Choose your options carefully.

If you are told to evacuate, take your 72-hour kit with you in your car. Your car, then, becomes your shelter. Turn off all heating and air conditioning vents. Do not travel down wind of the disaster site. If possible, travel away from the disaster and perpendicular to the wind. You may wish to purchase and store Tyvek coveralls (sold at all industrial supply stores) and a gas mask for this purpose. You can suit up faster than it would take you to secure a room with duct tape and plastic.

3.05 Sheltering against Pandemics:

In other than full scale war, it is unlikely that small pox or other contagious diseases would be spread by any other means than by person to person. Evacuation is a poor solution, as you cannot be assured there will not be others with the disease when you arrive. 'Self quarantine' may be the only solution.

Our homes will be almost as secure as our hardened NBC shelters. In order to self-quarantine, you must have the capability to become totally self sufficient with long term food and water storage, prescription medicines, and communication. *Please refer to our chapter lessons #8 and #9 on 'Food Storage' and 'Water Filtration and Purification'.

3.06 Fallout Shelter Design:

If you are more than 80 miles downwind of a nuclear blast, you may be able to survive the effects of the fallout in your basement or interior rooms. There is a natural protection factor (PF) of 5 on the main floor of one story buildings and 10 or greater in most basements. This is because of the heavy shielding provided by the ceiling of the basement and the roof of the home. You must, however, stay away from windows. If you are closer than 80 miles from a nuclear event, you should seek shelter from the fallout.

If at any time within your shelter, you are receiving more than 5 Rads per hour, you will need to seek an area with more shielding. *Please refer to our chapter lesson entitled 'Radiological Monitoring'.

3.07 Attenuation Formulas for Basement Shelters:

Every 4 inches of sand or dirt will provide a protection factor (PF) of two. Each time you add another four inches of sand to the shielding, the PF value can be multiplied by two.

All entrances to shelters should have a 90-degree turn. The 90-degree turn into the entrance will stop (attenuate) about 90% of the gamma radiation from the entering the shelter.

- **Question:**
  How much shielding is need in a basement shelter in medium fallout risk areas?

- **Answer:**
  Six layers of 4 inches (24 inches) will provide a PF of approximately 64; (2x2x2x2x2x2=64). There is already a PF of 10 in the basement. The PF of 64 from the shielding can be multiplied by the PF of 10 from the basement, resulting in a total PF of 640. This will be adequate in most areas of medium risk to fallout.

3.08 Underground Fallout Shelters:

Underground fallout shelters provide much better protection than basement shelters. Four feet of soil overhead will provide a PF greater than 1000. Good underground fallout shelter entrances should be between 30 and 48 inches in diameter and should have a total length of 22 feet or more. The best attenuation is reached if each leg of the L shaped entrance is 11 feet in length or greater.

3.09 NBC Shelters:

Blast shelters should be built with arched ceilings. Flat-topped shelters will not carry the dirt load at those depths, and could fail catastrophically under the additional load from large overpressures. Shelters in areas near heavy blast targets should be buried at twice their diameter. This depth of cover provides an 'earth arching' effect. The full earth arching effect will provide the shelter with approximately 200 psi of overpressure protection. A 10-ft. diameter shelter should be placed into a 20-ft. deep hole. A 9-ft. diameter shelter should be placed into an 18 ft. deep hole. This level of protection provides survivability at 1/2 mile from ground zero of a one-megaton yield ground burst.

The concept of building shelters from corrugated steel tanks was conceived by scientists and engineers at Oak Ridge National Laboratory (ORNL), and actually tested under blast conditions to 200 psi.

This type blast shelter would also provide protection from the 'initial radiation' which otherwise is lethal within 1 1/2 mile range of the detonation. Shielding, however, must be placed into the horizontal runs of the entrances to capture the neutrons from the initial radiation. The overhead shielding for initial radiation requires 8 ft. of cover.

Outside of the 1½-mile radius of the blast, initial radiation is not an issue. Residual radiation (fallout) is easily attenuated with as little as 4 ft. of dirt cover overhead.

3.10 NBC Shelter Entrances:
Documentation from the ORNL tests indicates that entrances must have both a vertical and a horizontal component. The entrances should be no greater than 48 inches in diameter and should be constructed in an L configuration (incorporating a 90-degree angle). The two legs should have a total minimum length of 22 feet with the 90-degree turn near the mid point. Most shelter's designed today have not considered this aspect of design and have entrance runs that are far too close to the shelter body. Basic radiation attenuation formulas demand this aspect of design for the attenuation of both fallout and initial radiation entering from entrances.

3.11 Attenuation Formulas for Entrances:
Radiation is attenuated by time, distance and shielding. The entrances pose a unique problem, because shielding cannot be placed on top of the door. Entrances, therefore, must follow the 'distance' attenuation formulas. All entrances should be kept to diameters of 48-inches or less. Small entrances such as these will follow a 'point source' formula.

- **Question:**
  What is the PF found in a proper entrance.

- **Answer:**
  The PF is found by multiplying the length squared by a factor of 8 and dividing by the diameter squared ($8L^2)/D^2$). If the length of the entrance is 22 feet and the diameter is 4 ft, the PF would be: $8x22^2/4^2$ or 8x22x22/4x4 which equals 242.

3.12 Shelter Temperatures:
Shelters placed in harsh environments stabilize their temperature with a dirt cover in the 8 to 10 ft. range. This depth of cover guarantees the temperature will not fall below 45 degrees F, or rise above 68 degrees F. Shelter supplies (nor occupants) will ever freeze or become over heated. In areas of permafrost, this temperature range may not hold true.

3.13 Concrete Shelters:
Concrete shelters are comfortable and can be designed to accommodate large numbers of people. The Swiss, almost exclusively, build concrete shelters. These shelters are placed in deep underground basements of homes, schools, hospitals, public buildings, hotels, and most all other buildings. The entire population of Switzerland can reach a shelter in a matter of minutes.

Swiss shelters for private homes must are built to a minimum code of 1 atmosphere (15 psi), and government civil defense shelters are built to a 45-psi code. Military and critical mission personnel in Switzerland are assigned to heavy blast shelters in the 200-psi plus level.

Governments that mandate a national shelter program can afford the luxury of building large population concrete shelters. They build in mass and tax their citizens accordingly. They build and install these shelters to last for long periods of time. When people move and purchase

another home, they can be assured that the shelter in the new home will be built to the same code as the shelter they have evacuated.

People in America mistakenly believe that shelter ceilings and wall slabs of an 8-inch thickness will protect them from the effects of radiation and blast. They have been miss-informed. Eight inches of concrete, with no building overhead, will give a radiation PF of less than 8. Even in low radiation risk areas, this level of protection is not adequate to save lives. The accumulated dose for one week would reach between 300 rads and 600 rads, with an expected probable death rate between 50% and 100%. The minimum blast and radiation requirement, with no building overhead, is 22 inches.

Concrete shelters built under a building, however, have an automatic PF of approximately 15, because of the mass of the home and roof above. An eight-inch slab roof under a building may be adequate for radiation protection, but that thickness will not support the home. The minimum thickness for concrete shelters under buildings is 14 inches.

3.14 Earthen Shelters (Cresson Kearney):

Earthen shelters, such as are found in the book, 'Nuclear War Survival skills', can be built very inexpensively. They would offer good tornado protection. They give fairly good radiation protection and some blast protection, but no protection from initial radiation, bio-warfare, and heavy fire.

They would be very cold in the winter and hot in the summer. They must be re-built almost every year and have dirt floors and walls. These shelters are not recommended for families with small children. They are designed for short-term survival for very hardy folks.

3.15 Expedient Shelters:

Building home shelters is not possible for all people, especially for those living in apartments. It could also be the case that after building a home shelter, a nuclear event would occur when we are not at home. There are many natural fallout and blast shelters in our neighborhoods. If we plan ahead, these shelters could be accessed quickly and easily.

A small survival kit (72 hour kit) should be placed in the trunk of every car. Supplies should also be stored at our workplaces. If early warning is taken from a loss of electrical power, we could have as much as 25 minutes warning of a possible event.

Radiation decays very quickly. Ninety percent of the gamma radiation decays after the first 7 hours. Ninety percent of the remaining 10 percent decays after two days. In most areas, after two days, we could leave our expedient shelter and go quickly to our homes. However, if possible, we should stay sheltered for two full weeks. After two weeks there is only one, one thousandth of the gamma radiation remaining.

A home basement is not adequate protection in itself, even in areas of light fallout. However, shelter could be taken in the basement under a strong table. Two feet of books or other heavy

objects should be placed on and around the table. A hose could be attached to the water heater and run to the shelter for drinking water. A 5-gallon bucket with plastic bags could be used for sanitation. These options, however, must be initiated well before hand.

If caught away from your home and shelter, other options should be considered:

- Service Garages (Service pit area)
- Churches (Pipe chases from boiler rooms)
- Banks (Basement vault or safety deposit areas)
- Hospitals (Usually have massive basements and are well built. Some hospitals have underground tunnels between buildings)
- Residential homes (Look for basements with maximum soil coverage)
- Schools (Most schools have pipe chases and some have good basements)
- Mines (Stay well back from the entrance). Possible danger from gas, falling timber, rocks, or shafts
- Caves (Stay well back from entrances)
- Tunnels (Consider rail road, car and walking tunnels)
- Subways
- Culverts (Look for long runs under highways…possible danger from rats or water runoff)
- Boiler Rooms (In churches, schools, and other large buildings)
- Underpasses (There is good blast protection (10 psi) high up under over passes, however there is no radiation protection)
- Community swim pools or equipment rooms (Possible danger from chlorine gas which is often stored in pressurized containers)
- Armories (are usually well built)
- Fire Departments
- City and County Buildings (Many have underground tunnels between buildings)
- Underground parking garages (Provide both blast & radiation protection…there is danger that the upper floors may fall and trap you)
- Boats (Covered boats in a lake provide good radiation protection, but little blast protection…must have capability to wash fallout from cover)
- State or County E.O.Cs (Usually well built and well stocked)
- Root Cellars (Offers better radiation protection than blast protection)

3.16 Shelter Supplies:

Shelter supplies are based on individual needs. This is a list of supplies for your consideration. Think in terms of basic survival. In the event of a long-term power loss (such as from an EMP Weapon or full scale war), the United States could set us back to a 19th century existence. Remember, however, that we can come back quickly because we have a knowledge base on which to build.

If we are prepared, we can continue to live full and satisfying lives. If we are not, we will suffer grave consequences.

SHELTER SUPPLIES

Food per adult person

- 8 lbs salt
- 60 lbs milk (non-fat)
- 21 lbs Oil
- 65 lbs sugar
- 375 lbs grains (wheat, rice, corn, etc.)
- 60 lbs legumes (beans, peas, lentils, etc.)
- 365 tablets multi-vitamins (with minerals)
- Leavenings (3/4 lb yeast, 1 lb baking powder)
- Seasonings
- 1 kg. Vitamin C (only in the form of crystalline ascorbic acid)

(Provides 2600 calories, 100 grams protein, and 35 grams fat pper adult for one year)

Food Preparation

- Water Purification
- Knives & Can Openers
- Eating Utensils
- Hardy plates & cups
- Paper Towels
- Paper Plates & cups
- Plastic Bags
- Zip lock bags
- Alcohol cooking stove
- Pressure cooker
- Hunting Supplies

Water & Storage

- Plastic 55 & 30 gallon drums
- Store 55 gallons per person
- Liter soda pop bottles
- Water pump for 55-gallon drums
- Amish hand pump for deep wells if necessary
- Water filter
- Iodine crystals
- Bleach

Communications

- CB Radios
- HF Amateur Radio
- Purchase material for emergency antennae
- AM/FM transistor radio with D cells

Light
- Mini 12 volt lights
- Kerosene & Lamps
- LSD lights run with D cells
- Flashlights with extra bulbs
- Matches
- Candles

Heat
- Coal & wood-burning stove
- Coal (dig pit & cover with straw)
- Foam clothing & boots

Alternative Power
- 12-volt battery system (6-volt gel-cell or golf cart in series)
- Battery charger
- Diesel (500 gallons)
- Stabilizer for Diesel
- Cooking alcohol
- Generator, 2K Brushless Diesel
- Water generator (if near stream)
- Extra parts
- Solar Panels (stored and protected from EMP)
- Batteries, (D, AA, AAA),
- Rechargeable batteries with solar charger

Transportation
- Car constructed before 1969 (without computerized ignition)
- Bicycles, wagons, carts, motor bikes
- Learn to make fuel
- Consider keeping Llamas & goats (they eat anything & pack well)
- Snow-shoes & cross-country skis

Farming
- Tools (Shovels, Hoes, Rakes, Ax, Hatchet, etc.)
- Large rolls of plastic (to cover garden spot)
- Non-Hybrid Seeds
- Rabbits (for meat)
- Chickens (for meat & eggs)
- Goats (for milk)
- Hay and feed (stored under cover)

Clothing
- Underwear & socks

- Walking shoes
- Extra Shoe laces
- Irrigation boots
- Winter boots & coats
- Foam liners

Infant Care
- Milk / Formula
- Disposable diapers
- Cloth diapers & pins
- Plastic diaper cover
- Bottles / Nipples
- Clothing
- Odorless Diaper Pail

Shelter
- Underground with min. 8 ft. dirt cover
- Low water table
- Out of flood plain
- Angled entrances
- Arched ceiling

Toilet Facilities
- Everything needed to build an 'outhouse'
- Toilet seat
- Disinfectant
- Chemical Camping toilets
- Toilet tissue (lots)
- Feminine Supplies

Medicine
- Special Prescription medicines
- Reading glasses
- Extra prescription glasses
- Over the counter medicines
- TBA tablets
- First Aid Kit

Sanitation
- Toilet Paper
- Soap
- Toothbrush & Paste
- Garbage bags
- Chemical camping toilets

- Fly poison
- Wasp poison
- Sticky spider traps
- Mouse traps
- Buckets

Bedding

- Sleeping bags, pillows
- Air mattresses
- Mattress covers
- Foam mattress pads
- Cots, hammocks

Laundry Supplies

- Detergent (lots)
- Bleach
- Clothesline & pins
- Washtub & Scrubbing board

Cleaning Supplies

- Kitty Litter
- Cleaning Supplies & bucket
- Detergent
- Liquid Bleach
- Wash Tub & Scrub board

NBC

- Rain Coat, Shower Cap
- Disposable Chem/Bio Suit
- Gas Masks
- Radiation Meter, Dosimeters & Chargers

Library

- Scriptures
- Skill books (electrical, plumbing, building, etc.)
- Schoolbooks
- Paper & pencil
- Staples & staple gun
- Pencil sharpeners
- Old style typewriter with ribbon

Important papers

- Wills

- Genealogy
- Diaries
- Family pictures
- Pictures of home & content
- Birth Certificates, licenses, diplomas, ID
- Deeds

Carpentry Tools

- Assortment of nails, screws
- Tools assortment
- Heavy plastic
- Heavy-duty stapler & staples

Electrical Supplies

- Tools
- Assortment of wire
- Connectors, receptacles, etc.

Sewing Supplies

- Needles, scissors, thread
- Treadle sewing machine
- Duct tape

Home Site or Alternate Site

- Out of flood plain
- Not too wooded
- Garden area
- Small city, rural
- Near small stream
- Near large game
- Water table below 50 ft.
- West of major targets

4. CHEMICAL/BIOLOGICAL WARFARE

4.01 Terrorist Attack:

Terrorism takes many forms. Our government acknowledges that the potential for an attack using chemical or biological agents is very large. Most of these agents are scattered and destroyed quickly by wind and sunlight. They can, however, remain an active threat over several hours or days. Anthrax can remain in the soil for many years, but the likelihood of re-dispersion by wind is very small.

Chemical and biological agents are inexpensive, easily dispersed, and many are readily available to terrorist countries and organizations. These agents would most likely be dispersed via vapors, gas or aerosols.

4.02 Limiting your Risk:

Terrorists prefer attacks on densely populated areas or high profile buildings, such as subways, coliseums and government buildings. There would be little, if any, warning of such an attack. Risk is a factor of both probability and consequence. We limit our risk by either decreasing the probability of the event, or mitigating the consequences in these three ways:

1. Limit exposure to potential terrorist targets, such as high profile government facilities, harbors, dams and nuclear power plants.
2. Prepare ahead of time, by building a shelter, stocking supplies and preventative medications, studying evacuation routes and strengthening your immune system.
3. Learn proper responses, such as medical treatments and decontamination methods.

4.03 Biological Terrorist Attack:

The probability of a terrorist biological attack is very large and the consequences of such an attack would be devastating. Aerosol sprays containing biological agents are inconspicuous, inexpensive, and easily used against crowds. It is most likely that the public would not know of this event until someone became symptomatic of the disease 7 to 10 days later. If 50 people were exposed to the smallpox virus in four different parts of the country, the disease would soon overwhelm our emergency medical system. After 10 days the disease would spread from 50 to 500 people. In ten more days there would be 5,000 cases, and by the end of 30 days there could be as many as 50,000 cases in each of the four different areas of exposure. The disease would continue to spread until the population lost enough density that it could no longer sustain the disease growth.

4.04 Small Pox:

Small Pox is extremely contagious and travels through the air. Virus particles become airborne when the host coughs, or even talks. There is good evidence that the virus can even spread from the host's cigarette smoke. The typical incubation period is ten days, and on the average, each infected person will infect between ten and twenty people. The disease then spreads exponentially. It is very unlikely, however, that the virus could penetrate the walls of your homes. There is no need to stay in a safe room or hardened shelter during such an outbreak.

Self-quarantine inside your home will limit the exposure (risk) to near zero. The first case of small pox any place in the country would justify 'self quarantine'.

The spread of smallpox would continue until the population density had decreased to a point that the plague could no longer sustain itself. A year's supply of food and other necessities would allow you to self-quarantine during a pandemic. Take notice of reports of strange illnesses.

4.05 Anthrax:
Anthrax is not contagious, and would not result in a pandemic. However, when symptoms of anthrax occur, the likelihood of death is almost a certainty. Herculean efforts using intravenous antibiotics may save a few, but in widespread outbreaks, there would not be enough antibiotics or hospital rooms available to treat the sick and dying.

4.06 Prophylaxis Treatment:
Prophylaxis refers to any medical or public health procedure that has the purpose to prevent, rather than treat or cure, a disease. Prophylactic measures are either primary (to prevent the development of a disease) or secondary (whereby the disease has already developed and the patient is given a vaccine or antibiotic to protect against the worsening of the process).

Vaccines are considered prophylactic, and may be used in smallpox outbreaks. Be advised, however, that the terrorist may have genetically altered the smallpox virus, and existing vaccines would then be useless. Exposure by large groups of people waiting for the vaccine may prove to be fatal.

If there is an outbreak of plague or anthrax, and you believe you have been exposed, your doctor may prescribe a medication, such as Doxycycline, as a prophylaxis. Prophylactic treatment should not be taken unless you believe you have been exposed to the bacteria.

Doxycycline acts as a prophylaxis (preventive treatment) against the Anthrax bacteria, only if taken BEFORE the symptoms occur. This same prophylaxis may also work against Cholera and Bubonic plague.

Carefully follow your physician's advice for dosage and medication, as many people will have side affects from these antibiotics. Small children and expectant mothers can have adverse effects from Doxycycline and other Tetracyclines. Doxycycline has a short shelf life. If Doxycycline is taken after its expiration date, it becomes toxic. Carefully watch the expiration dates on all your medications. Doxycycline appears to be either the drug of choice or the alternative drug of choice for plague, Anthrax, Brucellosis, Tularemia, Cholera, Q Fever, Glanders and Lyme's Disease. Doxycycline is NOT the drug of choice for Typhoid. Your doctor may choose to use Cipro or Chloramphenicol for Typhoid outbreaks.

4.07 Expedient Sheltering (Self Quarantine):
The probability of a localized terrorist attack against individual homes is near zero. The biological agents will not travel beyond the local area of dispersion.

If disease has not been spread via missile attack, the best protection against the spread of the disease is to stay at home. There is no need to put yourself and your family into a plastic bubble (duct tape and plastic).

If there is not a common ventilation system or common walls (such as found in double homes, apartments or hotels), the disease causing agents will not penetrate into the home from the outside. The virus from smallpox has been known to spread via cigarette smoke, and could enter your home from a nearby open window. Keep your doors and windows closed.

Stay quarantined until the pandemic has ended. If you have proper food, water and supplies, you will not need to leave your home. By staying in your home, you will not contract the disease unless you were previously exposed. Do not allow other people to come into your home unless they have been quarantined in an outer area for a period of 2 full weeks. Take notice of reports of strange illnesses. The first case of small pox any place in the country would justify 'self quarantine'.

Take great care when dealing with the sick. Wear facemasks, glasses, shoe covers, and disposable rubber gloves and clothing. Burn all bedding and clothing contaminated by the sick.

Do NOT burn human or animal carcasses. Bury them with quick lime. The fire will burst the lungs of the carcass and spread the spores.

4.08 Preparations for 'Self Quarantine:

A national pandemic could cause a temporary loss of the infrastructure. In order to 'self quarantine' you must have a one year's supply of food, medicine, fuel and a 2 month's supply of clean, pure drinking water.

In the event that the infrastructure of our country fails, you will need to have the capability to forage for water. Carefully review the lesson on water storage, filtration and purification.

4.09 Terrorist Chemical Attack:

Stay alert and report suspicious packages left unattended or spray trucks or crop dusters in unlikely places. Immediate threat can be recognized in some of the following ways:

- You see people running down the street, choking, falling, and convulsing.
- You are walking through a neighborhood and you smell something odd and there are no human or animal sounds, including birds or insect sounds.
- You enter a neighborhood and you see dead birds or animals, and even more importantly, dead insects.
- You can see a cloud of something moving down the street or a cloud of something spewing from an overturned tanker.

Those contaminated with biological agents may not become symptomatic for days or even weeks. Most chemical agents, however, act very quickly and people become symptomatic immediately.

4.10 Chemical Attack:

If you are involved in a chemical attack, cover your mouth and nose with a cloth, and run from the area. If you are in your car, shut your windows, and leave the scene as quickly as possible. Remember, your car is not airtight. Turn off your heat & air conditioning and put your air on 're-circulate'.

Do not do any of the following, as it may cost your life:

- Do not remove the cloth from your mouth to scream or warn others.
- Do not take time to call 911 until you are well away from the area.
- Do not try to treat the victims. People contaminated with chemical agents are not contagious, but the chemical agents clinging to the victim's clothing or bodies can contaminate others who come in contact with them.
- Do not go into a basement or subway. The chemicals are heavier than air and will move downward.

Do the following:

- If you are near a multi-floor building, run up the stairs to the highest floor. Go into a bathroom, if possible, and shut the door. Make sure the windows are shut.
- Turn of air conditioning and heating. If it cannot be turned off, place a wet towel over the vent.
- Remove your clothing if you think it is contaminated.
- If you think that a chemical is on your skin, shower immediately.
- Call 911 as soon as you are safe, and report your location.
- Remember, the same rules for any sheltering in place apply to a chemical event. However, speed is of the essence.
- When sheltering in place with no air filter, you must refresh your air supply every 2 to 3 hours; otherwise you could suffocate. The door to the inner room may be opened for a few minutes so fresh air will enter. When doing this, wear a scarf or mask. If there is a shower in the room, turn it on before the door is opened and leave it on until the door is closed. This provides a moisture shield, which will help keep chemicals, biological, or radioactive contaminates at a minimum.

4.11 Decontamination and treatment for Nerve Agents:

Store household bleach. For decontamination of nerve agents, the patient's skin should be washed with household bleach diluted 1:10, or with soap and water. Use plain water when washing the eye area. Wash or spray all contaminated objects with 0.5% bleach. Food, not in sealed cans, cannot be decontaminated!

Seek Treatment at a hospital for the following:

- Excessive bleeding
- Trouble breathing or persistent cough
- Trouble walking or using an arm or leg
- Severe stomach, back or chest pains
- Severe headache, blurred vision or burning eyes

- Excessively dry mouth, vomiting or diarrhea
- Rash or burning skin
- Hearing problems
- Injuries that increase in pain, redness or swelling
- Injuries that do not improve after 24 to 48 hours

What to expect at the hospital:

- Long waits To avoid long waits, if possible choose a hospital farther away from the event.
- Triage. Following a large-scale disaster, injuries are generally treated on a "worst first" basis. Triage is not "first come, first served".
- Limited information. In large-scale emergency, emergency officials at hospitals, clinics and evacuation centers cannot track every individual by name. It may be difficult to get information about loved ones.

4.12 If you are at Home:

The probability of a localized chemical attack against our homes is extremely low. Terrorists want large numbers of fatalities for their efforts. They know that sunlight and wind dilute, disperse and destroy these agents; and they would, most likely, not use them in this way. Most biological agents, on the other hand, can be spread person to person. Symptoms do not occur immediately, and it may not be obvious that there has been an attack until the disease is well under way. Biological agents have a great potential for mass loss of life than do chemical weapons.

4.13 Evacuation:

Your risk from an accidental chemical spill becomes greater if your home is near a highway or rail system. Safe rooms must be built well ahead of the exposure, to be affective. If you do not have a safe room or shelter, make preparations for a possible quick evacuation. Keep gas masks and 72-hour kits in an accessible place. Study areas of most likely contamination and map routes away from those areas. Carefully review Lesson # 11 (Evacuation, 72-Hour Kits and Communications Supplies).

4.14 Duct-tape and Plastic:

In the event of an escalating crises or chemical spill, FEMA has given the general public the recommendation to purchase plastic and duct tape for constructing 'safe rooms' for their protection. It would take hours to prepare the room in this manner.
After entering the room, the accumulation of CO2 would occur very quickly and within a short period the people in the room would be forced to open doors or windows. It would take much more time to line the room with plastic than it would take to evacuate.
Israel, on the other hand, has been told to keep a 'safe room' ready at all times. Their country is under constant attack and threat from enemies near their borders. Short-range missile deployment of bio-warfare agents poses a real and present danger. Government officials have instructed their citizens to prepare 'safe room' in their homes with air supplies, filters, food and emergency supplies. They have deployed a system of sirens and emergency communications and the people exercise and understand the warning system. We, in the U.S. on the other hand, have

neither the threat nor the warning system to support such an effort against short-range missile deployment of biological agents.

4.15 Safe Rooms:
Review lesson #11 (Evacuation & Emergency Supplies) and lesson #3, (Sheltering in Place). 'Safe Rooms' are typically built against two threats-home invasion and bio warfare. If you believe your risk from chemical attack or spills is great, prepare an inner room for such an eventuality. Install a reliable air ventilation system and HEPA gas filter. Make sure the system incorporates both manual and electric function. Teach all family members how to use the system. Store food, water and supplies for a 7-day stay.

People often choose to harden these rooms for multi-threat use. Shielding your safe room against radiation provides further protection. Building an airtight room underground mitigates blast and fire. Use your resources wisely. A hardened NBC shelter is an all-hazard shelter.

4.16 Water Supplies:
Botulism or cholera could purposefully be introduced into our water supplies. Word would spread quickly and the causalities would be limited to those infected during the first few days. We could further limit our risk by always 'drinking yesterday's water'. During times of concern, gather water daily. Do not drink that water for one full day. If there have been no reports of wide spread sickness, drink yesterday's water and draw today's water for tomorrow's consumption. During actual crises, drinking water should be boiled or filtered with a good grade water filter.

4.17 Ballistic Missile Attack:
Many authorities believe a bio-weapon attack, via a ballistic missile, would likely follow a full-scale nuclear attack. The area of exposure from missile-deployed bio-weapons would be very large. In an escalating crisis for an NBC attack, evacuation of populations would be of little use, as there are no safe places from missile-deployed bio-weapons. Protection from a full scale NBC attack can only be achieved in hardened NBC shelters.

4.18 Hardened NBC Sheltering:
If you have access to a hardened NBC shelter, stay sheltered for at least one month following a full-scale nuclear exchange. Bio-warfare agents on the ground will quickly be destroyed by sunlight and weather. Most homes, however, would be left uninhabitable, as the aerosols from missile deployment would enter through heating and air conditioning ducts and small cracks in the doors and windows. Those areas would be difficult (or impossible) to decontaminate.

After a nuclear attack, do not re-enter your home until you are sure it is free of contamination. Listen to your short wave radio for news of wide spread disease. If there has been missile deployment of bio-warfare agents, continue to live in your shelter.

FROM THE WEB SITE OF MEDICAL CORPS
Chuck Fenwick, Director
http://www.medicalcorps.org

General Guidelines for Antibiotics:
All antibiotics are not alike. They do their job in different ways.

Trying to remember what guidelines apply to which antibiotic can be confusing. There are, however, general guidelines that can be observed and will take the guesswork out of what to do. Remember, these are "General".

- Antibiotics are NOT good for you. Antibiotics are for killing a living organism--as in a disease. If you do not have a disease, then do not take them.
- Antibiotics will not kill a virus. Antibiotics do not help flu or colds because flu and colds are caused by a virus. Do not take them for colds or flu.
- If you have an allergic reaction, quit taking the antibiotic and, if possible, change antibiotics. Allergic reactions may include one or more of the following: rash, intense itching, hives, vomiting, swelling and other unusual symptoms.
- More is not better. Read the label. If the antibiotic is supposed to be taken 3 times a day then take it 3 times a day. If it says to take 4 times a day then that is what you should do.
- Antibiotics can increase the effect of anticoagulants. Some antibiotics will make the effects of anticoagulants--such as Coumadin—more intense.
- Unless specifically directed, two different antibiotics should not be taken together. For instance, the Penicillins and Tetracyclines will cancel each other out.
- Do not take antibiotics with antacids, certain supplements, laxatives or food.
- Certain antibiotics will combine with metals such as calcium, iron, magnesium and aluminum and render the antibiotic useless or less effective. Some supplements contain calcium, magnesium or iron.
- Laxatives may contain magnesium. Food often has calcium such as from animals. Antibiotics should be taken either an hour before a meal or two hours after.
- Antibiotics interfere with birth control pills. Some antibiotics can render birth control pills less effective. If someone starts taking antibiotics while counting on birth control pills then they can become pregnant.
- Antibiotics make humans susceptible to sunburn.
- Antibiotics will give you diarrhea.
- General Guideline "dose" for antibiotics used for preventing symptoms from a biological attack (for prophylaxis). The number of days to take the antibiotic will depend on the agent used—example: Anthrax 60 to 100 days.

Doxycycline (Taken orally):

- Adult (8 years and older or weigh more than 100 pounds--45kg): 100mg by mouth every 12 hours.
- Children (Children under 8 years or less than 100 pounds—45kg) 2.2mg per kg of weight, taken by mouth every 12 hours (1kg equals 2.2 pounds)

Ciprofloxacin (Taken orally):

- Adult (8 years and older or weigh more than 100 pounds--45kg): 500mg by mouth every 12 hours.
- Children (Children under 8 years or less than 100 pounds—45kg) 10-15 mg/kg taken by mouth every 12 hours, not to exceed the total of 1,000mg per day

Amoxicillin Anthrax exposure:
Alternative for allergies to Doxycycline and Ciprofloxacin

- Adult (8 years and older or weigh more than 100 pounds--45kg): 500mg by mouth every 8 hours.
- Children (Children under 8 years or less than 100 pounds—45kg) 80 mg/kg/day divided every 8 hr, not to exceed 500 mg/dose taken by mouth every 8 hours

Note: Amoxicillin is not a drug-of-choice for most biological weapons.

MEDICAL CORPS
http://www.medicalcorps.org

You will note that Doxycycline is either the drug of choice or the alternative drug of choice in prophylaxis of these agents as well as others like Malaria. Sometimes it is taken in conjunction with another drug like rifampin. Nine disease agents are included in this study:

1. **Plague Prophylaxis:**
   http://www.bt.cdc.gov/Agent/Plague/plague-biological-weapon-abstract.asp

2. **Anthrax prophylaxis:**
   http://www.bt.cdc.gov/DocumentsApp/Anthrax/10312001/han49.asp

3. **Brucellosis:**
   http://www.fas.org/nuke/intro/bw/agent.htm#b04

4. **Tularemia:**
   http://www.bt.cdc.gov/agent/tularemia/tularemia-biological-weapon-abstract.asp#5

5. **Cholera:**
   http://www.rehydrate.org/dd/su52.htm

6. **Q Fever:**
   http://www.cdc.gov/ncidod/dvrd/qfever/

7. **Glanders:**
   http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=10837435&dopt=Abstract

8. **Lyme's Disease:**
   http://www.hopkins-arthritis.som.jhmi.edu/news-archive/2001/doxycycline.html

9. **Typhoid:**
   Doxy is not the drug of choice for Typhoid. Cipro is one of the drugs of choice for Typhoid as is Chloramphenicol and some others. Typhoid will be a problem if we have a breakdown of our medical social infrastructure. Humans are carriers of Typhoid. As with many diseases, Typhoid is becoming drug resistant to several antibiotics such as Cipro (http://www.cdc.gov/ncidod/EID/vol9no12/03-0230.htm).
   Amoxicillin is a good drug too, but because of its wide use, especially in Dental, we are getting a lot more Amoxicillin resistant infections:
   - http://www.medicalcorps.org/pharmacy/AmoxicillinClavulanate.htm
   - http://www.medicalcorps.org/pharmacy/doxycycline.htm
   - http://www.medicalcorps.org/pharmacy/chloramphenicol.htm
   - http://www.medicalcorps.org/pharmacy/ciprofloxacin.html

Before a Terrorist Attack:

- Be Alert. Take notice of unattended cars and trucks. Report suspicious activities.
- Study family, work and community disaster plans.
- Identify your nearest hospitals.
- Carry proper identification and insurance information
- Keep your car at least half full of gas at all times
- Keep a 72-hour kit in your vehicle
- Other supplies for your vehicle. Fire extinguisher, water, dosimeter or radiation meter, flashlight, gas mask, and family evacuation tags

During a Terrorist Attack:

- Cover your mouth and nose with anything, and run from the danger.
- Stay away from damaged buildings to avoid falling glass and bricks.
- Do not go to a basement or subway.
- If near a multi-story building, go to the highest floor possible.
- Do not return to the scene.

After a Terrorist Attack:

- Avoid crowds. Crowds of people may be targeted for a second attack.
- Avoid unattended cars and trucks. Unattended cars and trucks may contain explosives.
- Call 9-1-1 (after you are safely away from the scene)
- Notify your family, job or managers of your current location.
- Notify the proper agencies & report that you were at the scene of the incident. Terrorist bombings could also contain chemical or biological agents, and you will need to know where to find decontamination & follow-up treatment.
- Decontaminate as quickly as it is safe to do so
- Listen to the radio for further instructions

Before a Chem/Bio Attack:

- Request information from your physician on proper prophylactic measures. (Never use Doxycycline or other forms of Tetracycline after their expiration date, as they become toxic).
- Check all suggested prophylactics, (preventative measures) and anti-biotic dosages with your physician. Some of these medicines (such as Doxycycline) may adversely affect a fetus or small children.
- Smallpox symptoms may not occur for 10 days to two weeks after exposure. Vaccines may help (even when taken after exposure).
- Store household bleach for decontamination of nerve agents.
- Prepare a 'safe room' or shelter with a proper air ventilation and filtration system.

During an Escalating Chem/Bio Crises

- Watch carefully for tampering of packages and lids. Make sure seals are intact.
- Eat only sealed foods. Drink only sealed water.
- Drink yesterday's water. Draw water daily, but don't drink it until the next day. Word of poisoned water spreads quickly. Store water in 55-gallon drums for use in an emergency.
- Avoid crowds. Limit your time in densely populated areas.
- Your car is not airtight, but it may help to keep your car windows closed and to turn off your heater and air conditioning while traveling.
- Keep tuned to an emergency radio station. Chemical attacks, in particular, act very quickly.

During a Chemical Attack

- Run away from panicked or fleeing people.
- Cover your mouth and nose and run from the area. Do not stop to give first-aid or warnings.
- Do not go into a basement or subway.
- If near a multi-story building, run upstairs to the highest floor possible and enter a room (bathroom, if possible), and shut all doors, windows and vents.
- If there is space under the door, force wet towels into the open area.
- Remove all contaminated clothing and wash your body with soap and water.
- Alert authorities only after you are safe.
- If you do not have an air filter and ventilation system, refresh your air supply every 2 to 3 hours by opening a door or window. Turn on a shower to form a vapor barrier. Cover your mouth and nose with a wet towel.

During a Biological Attack

- It is unlikely you will know you have been exposed to a biological agent. If, however, you do know (or suspect) you have been exposed, call authorities for the proper prophylactic treatment, and begin the regimen recommended by your physician.
- During an outbreak, do not leave your home without wearing a gas mask, rubber gloves, protective clothing and shoe covers.
- In case of an actual biological attack, be prepared to stay quarantined inside your home for several months.
- Do not allow anyone into your home, until they have gone through a 14-day quarantine period.
- If there has been a confirmed attack in your area, continue recommended prophylactic treatment for 30 days.

After a Chem./Bio Attack

- Do NOT burn human or animal carcasses. Bury them with quick lime. The fire will burst the lungs of the carcass and spread the spores.
- Treat symptoms with proper antibiotics.
- Take great care when dealing with the sick. Wear facemasks, glasses, shoe covers, and disposable rubber gloves and clothing. Burn all bedding and clothing contaminated by the sick.
- Quarantine yourself and family. Do not allow anyone into your home until they have been quarantined for 10 days and are symptom free. Be prepared to stay in your home or shelter until you hear on an emergency radio station that it is safe to come out. Plague and smallpox can remain a problem for many months.
- For decontamination of nerve agents, the patient's skin should be washed with household bleach diluted 1:10, or with soap and water. Use plain water when washing the eye area. Wash or spray all contaminated objects with 0.5% bleach. Food cannot be decontaminated!

TACDA ACADEMY – CIVIL DEFENSE BASICS

5. EMP & POWER FAILURE

5.01 Short & Long Term Power Failures:
Many disasters, both man-made and natural, will cause a failure of our power system.

Local power failures are manageable, as outside help should arrive within hours or days. In the event of short-term outages, few, if any, deaths would be expected from starvation. Extreme weather, however, is an immediate threat. Other associated factors from the disaster may also complicate the problem.

Widespread power failures, on the other hand, will be devastating for those who have failed to prepare. Help from outside sources may take weeks, months or even years to arrive, depending on the cause of the failure.

5.02 Electro Magnetic Pulse (EMP):
An electromagnetic pulse (EMP) is a strong electrical field, associated with all explosives. Induced currents and voltages from EMP cause malfunctions of electrical equipment. An EMP, the intensity of which is dictated by the yield, type and height of the detonation, accompanies nuclear explosions of all types.

5.03 High Altitude EMP (HEMP):
Any nuclear detonation above 25 miles will cause a high altitude EMP called HEMP. A nuclear weapon detonated at an altitude of 200 miles could affect all unprotected electrical equipment within the continental United States. Nuclear weapons at that altitude could be detonated from a satellite or from an intercontinental ballistic missile. Depending on the location and size of the blast, the effect would be to knock out the power grid across most, if not all, of the continental United States.

5.04 Risk of HEMP:
Numerous terrorist organizations and countries have the ability to deploy nuclear weapons via smaller range missiles at altitudes capable of causing devastating consequences. Both Iran and North Korea have reported tests describing mid-flight detonations of such missiles. Intelligence analysts have stated they believe these tests were designed to exercise HEMP capabilities. The United States is at significant risk from even moderately sized weapons. A terrorist country or organization might have trouble putting a nuclear warhead "on target" with a Scud, but it could easily launch a missile from a freighter in international waters, and detonate a crude nuclear weapon in the atmosphere high above one of our coastal cities.

In a recent briefing to the congress, Senator Jon Kyl said, "A single Scud missile, carrying a single nuclear weapon, detonated at the appropriate altitude, would interact with the Earth's atmosphere, producing an electromagnetic pulse radiating down to the surface at the speed of light. Depending on the location and size of the blast, the effect would be to knock out already stressed power grids and other electrical systems across much or even all of the continental United States, for months if not years."

5.05 Consequences of a HEMP:

In a recent briefing to the House Armed Services Committee, a congressional commission reported that "HEMP is one of a small number of threats that can hold at risk the continued existence of civil society within the United States, and our ability to maintain national security and project military power anywhere it is needed . . .This threat also places our national economy and worldwide military forces at risk." Another distinguished scientist said, "An electromagnetic pulse (EMP) attack on the American homeland, is one of only a few ways that the United States could be defeated by its enemies – terrorist or otherwise, and it is probably the easiest."

The report stated, "The loss of power beyond emergency power supplies may well cripple financial systems, telecommunication, health care, emergency response, government control, water and food supplies and other critical societal functions -- a potentially escalating rather than diminishing situation".

The commission said a blackout of the power grid would be "virtually certain" following such an attack. Moreover, the briefing states, the panel predicted a "high proportion of computers" and other systems would be affected; major telecommunications would be interrupted; many high-frequency, VHF and UHF receivers would be damaged; and cell phone, satellite and Internet communications would be hindered.

Other infrastructure impacts could include damage to fuel supply and refineries, the transportation system, water supply and sanitation, chemical plants, financial systems, health care, emergency response and "government integrity."

After the briefing Senator Jon Kyl reported, "Few if any people would die right away. But the loss of power would have a cascading effect on all aspects of U.S. society. Communication would be largely impossible. Lack of refrigeration would leave food rotting in warehouses, exacerbated by a lack of transportation as those vehicles still working simply ran out of gas (which is pumped with electricity).

The inability to sanitize and distribute water would quickly threaten public health, not to mention the safety of anyone in the path of the inevitable fires, which would rage unchecked. And as we have seen in areas of natural and other disasters, such circumstances often result in a fairly rapid breakdown of social order…. Not only would there be nobody nearby to help, it could take years to replace destroyed equipment."

5.06 EMP Protective Measures:

Listed below are seven anti-EMP actions that should be considered:

1. Maintain a supply of spare parts for radios and automobile computerized ignitions.
2. Always keep ham radio base stations disconnected from their power source when not in use.
3. Purchase several inexpensive CB and short wave radios and store your radios and other sensitive equipment in a faraday cage such as a metal drum with tightly fitting lid.
4. In an escalating crises, shift to emergency power at the earliest possible time.

5. If radio communication is essential during threat period, use only one system at a time. Disconnect all other systems from antennas, cables and power.
6. Purchase 40 to 80 meter amateur radios. These frequencies do not rely on relay stations and would continue to function if protected in a faraday cage.
7. Protect your generators by placing metal wire screen under and around the generator. Keep the cords wound and inside the wire cage.

5.07 Building a Faraday Cage:
Build a simple faraday cage from a small metal garbage can and lid. The lid must fit snugly over the can. If the lid does not make good metal-to-metal contact, the open area could act as a 'slot antennae' and allow EMP to damage your equipment.

To further protect your equipment, purchase a metal screen about 6 inches wide and as long as the circumference of the can. Fold the metal screen in half-length wise and place it around and over the lip of the garbage can. The lid should then fit snugly against the screen and can, protecting all equipment contained inside the can.

Any metal can act as a Faraday cage. However, good metal-to-metal contact is imperative. Remove all gasket material from the lid. If the can has been painted, make sure to remove the painted area around the lid with sand paper.

5.08 Full-scale Nuclear War with HEMP:
In the event of a full-scale nuclear war, the enemy would most likely initiate the attack with a high-altitude EMP weapon. This type of weapon would be deployed from an ICBM or by satellite. The HEMP from the detonation could affect an area of several thousand miles in diameter. Neither blast nor radiation damage would be associated with the detonation. The obvious purpose of the HEMP attack would be to hinder or cripple our retaliatory capability.

5.09 EMP as an Early Warning System:
The flight time of a missile from a submarine varies with the distance from the coast. Washington D.C. may only have a two minute warning. Mid-continent states would receive about 8 minutes warning time before the first submarine launched ballistic missiles (SLBMs) could arrive. The ICBMs would arrive in that area about 25 minutes later.

These few minutes should be used to find expedient sheltering if away from home, or to quickly access a permanent shelter. Since the end of the cold war, Soviet submarines are seldom seen in our costal waters; therefore, SLBMs would have a flight time similar to the ICBM's. However, all haste should be made to reach shelter as quickly as possible.

An EMP can act as an early warning system. Commercial power is likely to be lost, so every instance of power failure should be suspected as a possible attack warning. Certain simple tests will quickly reveal an EMP:

1. You may see an unusually bright light, which lasts longer than lightning. If this light is associated with a power failure, it should be considered as a possible EMP detonation. Do

not look directly at the light, as it may damage your eyes. Not all areas of the United States would see the light.

2. Check the telephone for a dial tone. A telephone usually does not fail in a simple power failure, but it would most probably fail in an EMP. However, some phones do fail regularly and test #3 should be used to confirm this failure.
3. Only 5 percent of the radio stations in the nation have been hardened against EMP. After an EMP most of the radio stations would loose transmission. Whenever there is a power drop, a battery-powered radio should be used to check for loss of transmission.
   A simple lightning strike could take out one station, but only an EMP would take out a large numbers of the radio stations. This transmission failure would be a good indication that an attack is eminent. Small transistor radios (with antenna down) will most probably survive the EMP, but as an extra precaution, keep the emergency radio wrapped in aluminum foil.
4. If several vehicles on the roadway should quit running at the same time, you should consider the possibility that an EMP has occurred. Vehicles with computerized ignitions could be damaged by an EMP. Older vehicles manufactured before 1965, and most new vehicles manufactured after the year 2000 would probably remain functional, but some models may be affected.
   EMP simulations have indicated that if your car does quit running during an EMP, you may be able to restart your car if you remove the battery cables from the battery for a few moments to allow the computerized ignition to reset itself. Keep a properly sized wrench for removing battery cables in your automobile at all times.

5.10 Power Drop Alarm:

If the EMP were to occur during the night or early morning, people may not be aware of the resulting loss of power. A simple power drop alarm can be constructed from a 12-volt battery, a relay switch and a motorcycle horn.

Do not use any solid-state electronics in the alarm, and store all of the components of the alarm in a faraday cage (such as an ammo box). Keep the alarm plugged into the house current at all times, and check the charge on the battery at regular intervals.

5.11 Consequences of long-term power failure:

- There is no safe drinking water.
- Food is no longer available in stores
- There is no ability to cook or refrigerate food
- Toilets, sinks, & showers do not operate
- No furnace or air conditioning
- No lights
- Computers, radios, televisions and phones may stop functioning. Communication ceases.
- Gas stations stop functioning and transportation ceases.
- The Emergency Medical System would fail and hospitals and doctor's offices would close.
- No Police response

5.12 Consequences of a HEMP

Possible Effects

- No potable drinking water
- Thirst, Disease, Death
- No food
- Hunger, Illness, Death
- No Power to cook or refrigerate food
- Hunger, disease
- No sanitation system
- Filth, Disease
- No furnace or air conditioning
- Discomfort, death
- No lights
- Fear, Danger
- No Communication System
- Frustration, anxiety, danger
- No transportation
- Isolation
- No emergency medical system
- Illness, Disease, Death
- No Police
- Crime, Danger, Injury

5.13 Solutions - Concepts to be taught in coming lessons:

- **Lesson 8 - Food Storage** (Basic food list, alcohol stove, wide mouth thermos, etc.)
- **Lesson 9 - Water & Sanitation** (Importance of water storage, clarification, and purification)
- **Lesson 10 - Cold Weather Survival** (Foam clothing, and making patterns and articles of clothing)
- **Lesson 11 - Evacuation & 72 Hour Kits** (Importance of always having car half-full of gas, basic items for 72-hour kits, etc.)
- **Lesson 12 - Alternative Energy** (Transistor radios, flashlights, etc.)
- **Lesson 13 - Medical Preparedness** (importance of having medical first aid training, extra prescription medicines & eyeglasses)
- **Lesson 14 - Communications** (Amateur (HAM) Radio and anntenas, power supplies, etc.)

5.14 What to do before, during and after a power failure:

Before the Power Outage:

- Learn location of fuse box or circuit breaker
- Store candles, flashlights, extra flashlight bulbs batteries, CB and shortwave radios.
- Know the location of all camping equipment (stove, lantern sleeping bags). Make sure equipment is operable.
- Keep adequate supplies of fuel on hand. Propane, white gas, gasoline or briquettes should not be used in the house or garage, as they are volatile. Kerosene and cooking alcohol may be used in the house with proper ventilation.
- Store cooking alcohol and purchase an alcohol burner.
- Purchase a good pressure cooker to economize cooking fuel.
- Dress warmly to conserve fuel.
- Consider purchasing a generator & use a stabilizer when storing gasoline or diesel.

During the Power Outage:

- If there has been an EMP, retrieve your flashlight and go directly to your shelter.
- Ascertain the safety of your location and leave if necessary.
- If there is no indication of an EMP, turn off all major appliances, as the surge of power that comes when power is restored could damage your appliances.
- Turn off all but one light switch. Do not allow small children to carry candles or lanterns.
- If the power outage persists, call the power company and report your location. Report any downed power lines.
- Start your generator or alternative power systems.
- Retrieve your emergency supplies.
- Use refrigerated food first, frozen foods second, canned foods last.

After power has been restored:

- To prevent an overload on the system, plug in appliances one by one, waiting a few minutes between each one. There may continue to be 'brown outs' for several hours. Wait to turn on major appliances until power is steady.
- Examine your frozen food. IF IN DOUBT, THROW IT OUT! If the meat still contains ice crystals, it may be refrozen. If meat is off-color or has an odd odor, throw it away.

5.15 In conclusion:

The threat of an EMP is a real and present danger. There are irresponsible terrorist organizations and government leaders throughout the world that have both the intent and the capability to initiate a high altitude EMP against the United States. This threat is acknowledged by the highest government agencies.

The consequences of a HEMP would be devastating, creating total and long-lasting power failure of electronics and electronic systems. A HEMP against the United States has the potential to destroy our existence as an independent nation and our capability to support our population with the most basic of needs. There are protective measures that must be taken. It is essential that we plan, equip and prepare for this eventuality.

Practical EMP Protective Measures

By Sharon Packer, TACDA President

The electromagnetic pulse (EMP) is a strong electrical field, associated with all high explosives. These induced currents and voltages cause malfunctions of electrical equipment. Nuclear explosions of all types are accompanied by an EMP, the intensity and duration of which are dictated by the height of the detonation.

The energy from an EMP is collected in any long runs of wire, exposed cable runs, piping or conduit, large antennas, power and telephone lines, or long runs of electrical wiring in buildings and can be of the order of 60,000 volts per meter.

The collectors act to magnify the weak EMP just as a magnifying glass does to sunlight. The longer the collector, the greater the amount of energy collected. The energy collected is sufficient to cause damage to attached electrical and electronic equipment. All unprotected solid- state electronics systems are vulnerable. It is possible that some of the computerized ignitions in our vehicles would fail. Most relay stations required by 2-meter amateur radios and mobile phones would cease to function.

It is likely that a large yield, high-altitude EMP weapon would be detonated during the first minutes of a nuclear attack. It could affect an area of several thousand miles in diameter. This type of weapon could be deployed on a ballistic missile or by satellite. Neither blast nor radiation damage would be associated with a high altitude electro magnetic pulse (HEMP).

It is also possible that a smaller range EMP attack could come via terrorists. Several rogue nations and terrorist groups have or will soon have this capability.

Listed below are seven anti-EMP actions that should be considered:

1. Maintain a supply of spare parts for radios and automobile computerized ignitions.
2. Always keep ham radio base stations disconnected from their power source when not in use.
3. Purchase several inexpensive CB and short wave radios and store your radios and other sensitive equipment in a faraday cage such as a metal drum with tightly fitting lid.
4. In an escalating crises, shift to emergency power at the earliest possible time.
5. If radio communication is essential during threat period, use only one system at a time. Disconnect all other systems from antennas, cables and power.
6. Purchase 40 to 80 meter amateur radios. These frequencies do not rely on relay stations and would continue to function if protected in a faraday cage.Protect your generators by placing metal wire screen under and around the generator. Keep the cords wound and inside the wire cage.

Build a simple faraday cage from a small metal garbage can and lid. The lid must fit snugly over the can. If the lid does not make perfect metal-to-metal contact, the open area will act as a 'slot antennae' and allow EMP to damage your equipment. To further protect your equipment,

purchase a metal screen about 6 inches wide and as long as the circumference of the can. Fold the metal screen in half-length wise and place it around and over the lip of the garbage can. The lid should then fit snugly against the screen and can, protecting all equipment contained inside the can.

Any metal can will act as a Faraday cage. However, good metal-to-metal contact is imperative. If the can has been painted, make sure to remove the painted area around the lid with sand paper.

EMP can act as an early warning system. Commercial power is likely to be lost, so every instance of power failure should be suspected as a possible attack warning. Certain simple tests will quickly reveal an EMP.

1. You may see an unusually bright light, which lasts longer than lightning. If this light is associated with a power failure, it should be considered as a possible EMP detonation. Do not look directly at the light, as it may damage your eyes. Not all areas of the United States would see the light.
2. Check the telephone for a dial tone. A telephone usually does not fail in a simple power failure, but it would most probably fail in an EMP. However, some phones do fail regularly and test #3 should be used to confirm this failure.
3. Only 5 percent of the radio stations in the nation have been hardened against EMP. After an EMP most of the radio stations would loose transmission. Whenever there is a power drop, a battery-powered radio should be used to check for loss of transmission. A simple lightning strike could take out one station, but only an EMP would take out a large numbers of the radio stations. This transmission failure would be a good indication that an attack is eminent. Keep a small transistor radio wrapped in aluminum foil for this purpose.

The flight time of a missile from a submarine varies with the distance from the coast. Washington D.C. may only have a two minute warning. Mid-continent states would receive about 8 minutes warning time before the first submarine launched ballistic missiles (SLBMs) could arrive. The ICBMs would arrive in that area about 25 minutes later. These few minutes should be used to find expedient sheltering if away from home, or to quickly access a permanent shelter. If time permits, gas lines to the home should be turned off and curtains or drapes closed to protect against the thermal pulse. Since the end of the cold war, indications are that the Soviet submarines are no longer at close range and the SLBM's would have a flight time similar to the ICBM's. However, all haste should be made to reach shelter as quickly as possible.

If the EMP occurs during the night, it would be difficult to observe. A simple power drop alarm can be constructed from a battery and horn to awaken those who are sleeping. Look for directions for this alarm in coming issues of the JCD.

[Source: The American Civil Defense Association (TACDA)]

Unready For This Attack

Senator Jon Kyl
Saturday, April 16, 2005; Page A19
Washington Post

Recently a Senate Judiciary subcommittee of which I am chairman held a hearing on a major threat to the American people, one that could come not only from terrorist organizations such as al-Qaeda but from rogue nations such as Iran and North Korea.

An electromagnetic pulse (EMP) attack on the American homeland, said one of the distinguished scientists who testified at the hearing, is one of only a few ways that the United States could be defeated by its enemies -- terrorist or otherwise. And it is probably the easiest. A single Scud missile, carrying a single nuclear weapon, detonated at the appropriate altitude, would interact with the Earth's atmosphere, producing an electromagnetic pulse radiating down to the surface at the speed of light. Depending on the location and size of the blast, the effect would be to knock out already stressed power grids and other electrical systems across much or even all of the continental United States, for months if not years.

Few if any people would die right away. But the loss of power would have a cascading effect on all aspects of U.S. society. Communication would be largely impossible. Lack of refrigeration would leave food rotting in warehouses, exacerbated by a lack of transportation as those vehicles still working simply ran out of gas (which is pumped with electricity). The inability to sanitize and distribute water would quickly threaten public health, not to mention the safety of anyone in the path of the inevitable fires, which would rage unchecked. And as we have seen in areas of natural and other disasters, such circumstances often result in a fairly rapid breakdown of social order.

American society has grown so dependent on computer and other electrical systems that we have created our own Achilles' heel of vulnerability, ironically much greater than those of other, less developed nations. When deprived of power, we are in many ways helpless, as the New York City blackout made clear. In that case, power was restored quickly because adjacent areas could provide help. But a large-scale burnout caused by a broad EMP attack would create a much more difficult situation. Not only would there be nobody nearby to help, it could take years to replace destroyed equipment.

Transformers for regional substations, for example, are massive pieces of equipment that are no longer manufactured in the United States and typically take more than a year to build. In the words of another witness at the hearing, "The longer the basic outage, the more problematic and uncertain the recovery of any [infrastructure system] will be. It is possible -- indeed, seemingly likely -- for sufficiently severe functional outages to become mutually reinforcing, until a point at which the degradation . . . could have irreversible effects on the country's ability to support any large fraction of its present human population." Those who survived, he said, would find themselves transported back to the United States of the 1880s.

This threat may sound straight out of Hollywood, but it is very real. CIA Director Porter Goss recently testified before Congress about nuclear material missing from storage sites in Russia that may have found its way into terrorist hands, and FBI Director Robert Mueller has confirmed new intelligence that suggests al Qaeda is trying to acquire and use weapons of mass destruction. Iran has surprised intelligence analysts by describing the mid-flight detonations of missiles fired from ships on the Caspian Sea as "successful" tests. North Korea exports missile technology around the world; Scuds can easily be purchased on the open market for about $100,000 apiece.

A terrorist organization might have trouble putting a nuclear warhead "on target" with a Scud, but it would be much easier to simply launch and detonate in the atmosphere. No need for the risk and difficulty of trying to smuggle a nuclear weapon over the border or hit a particular city. Just launch a cheap missile from a freighter in international waters -- al Qaeda is believed to own about 80 such vessels -- and make sure to get it a few miles in the air.

Fortunately, hardening key infrastructure systems and procuring vital backup equipment such as transformers is both feasible and -- compared with the threat -- relatively inexpensive, according to a comprehensive report on the EMP threat by a commission of prominent experts. But it will take leadership by the Department of Homeland Security, the Defense Department, and other federal agencies, along with support from Congress, all of which have yet to materialize.

The Sept. 11 commission report stated that our biggest failure was one of "imagination." No one imagined that terrorists would do what they did on Sept. 11. Today few Americans can conceive of the possibility that terrorists could bring our society to its knees by destroying everything we rely on that runs on electricity. But this time we've been warned, and we'd better be prepared to respond.

The writer is a Republican senator from Arizona and chairman of the Senate Judiciary subcommittee on terrorism, technology and homeland security.

POWER FAILURE

Potential causes of power failure:

- Power Surges or brown outs
- High Winds, Hurricanes or Tornadoes
- Lightning Storms
- Wild Fires or Floods
- Earthquake
- Pandemics
- Terrorist EMP or War

Effects of long term power outages:

- There is no safe drinking water
- Food is no longer available in stores
- There is no ability to cook or refrigerate food
- Toilets, sinks, & showers do not operate
- No furnace or air conditioning
- No lights
- Computers, radios, televisions and phones may stop functioning…communication ceases
- Gas stations stop functioning and transportation ceases
- The Emergency Medical System would fail and hospitals and doctor's offices would close
- No Police response

Solutions:

- Water storage & purification methods
- Food Storage & hunting skills
- Solar Ovens & Alcohol Stoves
- Outhouses, septic tanks and hand pumps for wells
- Ability to survive cold or hot weather and to find safe shelter from the elements
- Flashlights, batteries, generators, solar panels, kerosene or oil lamps & alternative fuel sources
- Ham Radios, CBs, Shortwave (all battery powered)
- Bicycles, horses, scooters
- First Aid Training, storage of medicines
- Home and personal security measures

6. RADIATION

6.01 Fallout:

Nuclear fallout is the most far reaching of all the weapons effects. Nuclear explosions occurring near the surface of the earth cause huge amounts of debris and dirt to be drawn up into the fireball where they are vaporized and fused with fission products and radioactive residues.

As the fireball cools, the vaporized material begins to condense into liquid droplets, which eventually solidify into glasslike particles. These particles constitute what we call 'fallout'.

We can see fallout as an accumulation of dust and small particles falling onto the ground and buildings. We cannot, however, see, feel, hear or taste the radiation that is being emitted from the fallout.

6.02 Distribution of Fallout:

Fallout is carried in the nuclear cloud and is moved by winds. The direction of fallout is determined by winds up to at least 80,000 feet and the velocity of the wind governs how far the cloud will travel. The United States has a variety of upper air winds. They are predominantly from west to east during the fall, winter and spring. In the summer, the winds are more variable. Surface winds cannot be used as an indication of direction for the flow of high atmosphere winds.

In addition to the wind, precipitation will affect the radioactive deposition. Rain and snow "wash "or "scrub" the air of the radioactive particles. Contaminated material, which would normally be spread over a much larger area by the dry weather patterns, is rapidly brought down in local rain or snow areas. This is referred to as "rainout".

Terrain features also play a part in deposition. Large mountains or ridges could cause significantly more fallout on the sides facing the surface wind.

Nuclear fallout from areas across the oceans will not pose a large threat to the United States. Small yield weapons deposit most of the fallout locally. The radioactive isotopes from larger yield weapons remain in the stratosphere until the short-lived isotopes decay, and the longer-lived isotopes are significantly reduced.

6.03 Radiation:

The basic building blocks of the atom are protons, neutrons, and electrons. Nuclear radiation is an 'eruption' or' emission' of these particles from the nucleus of the radioactive elements. These high-energy emissions constitute radioactive 'decay'. Fallout from fission type nuclear weapons carries these radioactive particles to the ground where they continue to decay.

Radiation from a nuclear explosion consists of gamma rays, neutrons, beta particles and a small portion of alpha particles.

Alpha particles:
Alpha particles are positively charged and relatively large, consisting of two protons and two neutrons. Alpha particles are completely stopped by a sheet of paper or the outside layers of our skin and are not an external hazard. Internally, however, they will dissipate their entire energy within a small volume of body tissue, causing considerable damage.

Beta Particles:
The beta particle is very small compared to an alpha particle, and is spontaneously emitted from the neutron of certain radioactive elements. It is identical to a high-energy electron and has a negative charge.

Most fission products are beta emitters. Beta will pose a small external hazard if fallout comes into actual contact with the skin and remains for an appreciable time. This causes a burn referred to as "beta burn". Fallout should be brushed or washed from the hair and skin as soon as possible. Beta will, however, do considerable damage if it enters the body.

Certain chemical elements tend to concentrate in specific cells. The body cannot distinguish between the pure element and the radioactive isotope of that element. Radioactive strontium and barium are similar in chemical nature to calcium and will seek the bones. These elements pose a small hazard if inhaled but care should be taken not to eat food contaminated with fallout. Animals that have been exposed to radiation may have significant levels of strontium and barium in their bones. These animals, if healthy appearing, may be slaughtered and eaten if the bones and organs are discarded before the meat is cooked.

Foods contaminated with fallout should not be eaten unless they can be washed or peeled. All cans containing food should be washed before opening. Please see last month's issue of the JCD for additional information on foods and farming in a post war environment.

Iodine 131, which poses the largest threat, will seek the thyroid. Thyroid blocking agents (TBA) are available commercially. They are inexpensive and have a long shelf life. Iodine 131 has a half-life of 8 days and would be a threat for 10 half-lives or approximately 80 days. Enough thyroid-blocking agent should be stored for each person for a 3-month period. Care should be taken to keep fallout contamination from the lungs, eyes, and open wounds and to wash any food that is to be ingested.

Gamma rays:
Gamma rays have no measurable mass or charge. They travel at the speed of light and originate from inside the nucleus. The emission of an alpha or beta particle from the nucleus of an atom will almost invariably be accompanied by the emission of gamma rays.

Gamma radiation will penetrate through the body and does pose an internal danger for two weeks after a nuclear detonation. In most areas, after two weeks there is no appreciable level of gamma radiation remaining.

Neutrons:
Neutron radiation is part of the 'initial radiation' that occurs in the first moments after the detonation. Neutrons are not contained in fallout. Neutrons have a range of 1-½ miles from the detonation and are very penetrating. The blast levels at that range are fatal if people are not in hardened shelters. All shelter entrances must contain 6 feet of shielding if the shelter is within that range of a target, and the dirt cover on top of the shelter must exceed 6 feet.

6.04 Radioactive Half-Life:
Radioactive elements vary greatly in the frequency with which their atoms erupt. Some have only infrequent emissions (decay) while others are very active and radiate frequently. The rate of radioactive decay is measured in half-lives. The half-life is the time required for the radioactivity of a given amount of a particular material to decrease to half its original value. The half-life of a radioactive material may range from fractions of a second up to millions of years. After 10 half-lives, radioactive elements decay to a level that is no longer considered to be a human hazard. Radioactive Iodine-131 has a half-life of 8 days. After 80 days, Iodine-131 is not longer considered to be a hazard.

6.05 Fallout Protection Factors (PF):
The fallout protection factor (PF) is a ratio of the fallout exposure rate that would be measured by a meter at a height of 3 feet above a surface, to the exposure rate that could be expected in a given location in an area below that surface. A PF 50 would indicate that the radiation level above the surface is fifty times the value of the radiation level below the surface. Protection factors are a function of distance, geometry and shielding, but not of time.

6.06 Principals of Protection:
The three basic principals, which give protection from radioactive fallout, are time, distance and shielding.

Time:
All radiation decays with time. During the fission process in a nuclear detonation, many isotopes with different decay patterns are produced. It has been found that the average decay rate behaves exponentially and can be estimated with the 7 / 10 rule.

Simply stated, this rule says that for every seven-fold increase in time after detonation, there is a ten-fold decrease in the exposure rate.

This rule can be used to roughly estimate the future exposure rates. As an example, if the exposure rate were found to be 1000 R/hr. at 1 hour after the explosion, if there were no other explosions, the forecast for the future would be a rate of 100 R/hr after 7 hours; 10 R/hr after 49 hours (roughly 2 days); and 1 R/hr after 2 weeks. In all but the highest radiation levels, this decrease should allow for activities outside the shelter during much of the day. People should be taught to stay inside the best shelter that can be found for at least two weeks.

Distance:
The dose rate of radiation falls off with increasing distance in air, even though attenuation by air is negligible. The' inverse square law' states that the dose is inversely proportional to the square of the distance in air from a point of a gamma-ray source. The importance of this law will become apparent later in this lesson, in our discussion of sheltering.
This law is not applicable to other than a point source. However, fallout does act as a point source in long, narrow entryways.

Children are more vulnerable to the affects of radiation because of their rapidly dividing cells. Heavy people are somewhat protected by layers of fat. With this fact in mind, it would be wise to put small children and thin adults at the lowest point of the shelter during high radiation levels.

Shielding:
The damaging effect of gamma rays comes from their ability to ionize. Shielding materials containing large numbers of electrons will filter (attenuate) gamma rays. The more massive the material, the greater will be the attenuation factor.

It has been found that certain amounts of shielding material will attenuate half the gamma radiation. This amount is referred to as the "half value thickness" for that particular material. The material is said then to give a protection factor (PF) of 2. The protection factors are multiplicative. Two half-value thicknesses will give a PF of 4. Three half-value thicknesses will give a PF of 8. It takes 10 half-value thicknesses to reach a PF of slightly greater than 1,000.

APPROXIMATE EFFECTIVE HALF VALUE THICKNESSES

Material	Density (lb / cu ft)	Half Value Thickness (inches)
Steel	490	1
Concrete	146	3.3
Earth	100	4 to 4.8
Water	62.4	7

Good radiation shelters should have a PF of 1000. Ten half-value thicknesses of earth will give a PF of 1,000 and will require about 48 inches of earth cover.

6.07 Biological Effects:
Large exposures to nuclear radiation can cause acute sickness or death, whereas small daily exposure may be tolerated without causing radiation sickness.

An exposure of 600 Roentgens (R) will usually be lethal when received as a brief exposure. The same exposure accumulated over a number of years would have no recognizable effect.

Doses occurring during a 24-hour period are considered 'acute' doses. If the exposure is over longer lengths of time, it is considered 'chronic' exposure.

Ionizing radiation may cause an increase of the permeability of the cell membrane, alter or destroy cells, inhibit the process of cell division ('mitosis') and break chromosomes.

Radiation Sickness:
The symptoms of radiation sickness are nausea, vomiting, headache, dizziness, and a generalized feeling of illness. There is an initial stage of these symptoms that lasts 1 to 2 days, followed by a latent stage with few if any symptoms that lasts between 2 and 4 weeks. The final phase is characterized by a recurrence of the symptoms noted during the initial phase, and in higher doses the individual may experience skin hemorrhages, diarrhea, loss of hair and seizures. The final stage lasts between 1 to 4 weeks and results in either recovery or death.

The symptoms of the initial phase are similar to symptoms of stress and fear. If you have been well shielded, do not assume radiation sickness to be the cause of these symptoms.

Penalty charts have been developed to show the consequences in expected number of deaths of radiation exposure. Most of these deaths will occur from the very young, the frail and the elderly. Survivors will see an increase in cancer deaths, as well as some mutations in progeny.

In a full-scale attack, almost all areas of the country would be affected by high, medium or low levels of radiation. Charts showing required protection factors show very little difference in the number of survivors in these three risk levels. Sheltering indoors in a one level home would provide a PF of about 5. There would be no expected survivors in a medium or high fallout risk area with a PF of 5, and very few in low risk areas. Unexposed basements offer a protection factor between 16 and 20. These charts should impress us for the need of shelters throughout the entire nation with PF's of 500 to 1,000 and more. Acceptable peacetime levels of radiation are set by governing agencies to be less than 1 R per year. Why should we settle for any less during wartime, when the technology is there for our protection?

Shelter design must incorporate protection from all weapons effects-blast; thermal pulse, radiation and EMP. All of these effects will eventually be covered in various chapter lessons.

The main function of fallout shelters is to shield from gamma rays. Alpha and beta particles are not an issue in a sheltered environment. Proper fitting doors and high efficiency particulate air filters will protect the occupants, equipment, food, water and the air you breathe from the alpha and beta particles.

Gamma radiation is attenuated by mass. Most people understand the need to cover the shelter body with at least 4 feet of dirt (or equivalent) to protect the occupants from the effects of gamma radiation. The exposure, therefore, will not come from the top of the shelter—it will come from the entrances. One of the least understood design concepts is the crucial role that proper geometry of entrances plays in radiation attenuation.

The importance of the proper size and geometry of entrances was affirmed by scientists and engineers during early nuclear weapons tests. Underground corrugated-steel shelters were used to prove and document these concepts. The engineers discovered that radiation entering small diameter entrances followed the' inverse square law' that we spoke of earlier, and that every 90-degree turn attenuates (decreases) the gamma radiation by a factor of 10 (PF10). It was their recommendation that entrances should be no more than 48 inches in diameter, and that they should have a length of at least 22 feet, incorporating a 90-degree turn near the half-way mark. Entrances of larger diameter would need to be significantly longer and the design stipulated by an engineer.

Initial radiation, as discussed earlier in this lesson, and the prompt neutrons associated with this effect will not follow the same rules and formulas as those for the attenuation of gamma rays. Neutrons have a range of 1 ½ miles and are very penetrating. Shelters near targets that may be within a radius of 1 ½ miles from a potential blast should have at least 8 feet of dirt cover and incorporate additional shielding material into the horizontal runs of their entrances.

Ninety-degree turns provide very little additional protection against neutrons. One entrance should contain a full 6 feet of shielding at all times. Rice, wheat, water and anything with high hydrogen content make good neutron shields. In high-risk areas for initial radiation, we suggest that sacks of rice be left inside the shelter near the entrance, ready to put into place after everyone has entered. If you are within this neutron range, there may be some 'neutron activation' of the shielding materials. Your low-range milliroentgen meter should then be used to test any foods in the entrances that have been used for shielding. If there is a reading above the level found in the shelter, the foods should be discarded and not eaten.

In most areas, after the first two weeks from the time of the detonation, gamma radiation is no longer a threat, and people can leave their shelters. At that point, alpha and beta contamination (though they still persist in small amounts) is only an issue of proper hygiene techniques and careful preparation of food.

THINK:
FEMA documents have stated that hole body exposure must be limited to 175 rems to save more than 50 percent of the population. To attenuate the exposure anticipated in a full scale nuclear attack to this level, a minimum protection factor of 40 would be required. A protection factor (PF) of 40 can be achieved with 24" of dirt cover for shielding. This 50% level of fatalities may be acceptable to FEMA, but it is not acceptable to TACDA. Dirt is 'dirt cheap'. Use 40-inches of cover and you will achieve a PF of 1,000, and expect 'zero' fatalities. Each 4 inches of dirt will provide one doubling. Forty inches of dirt will give the required 10 doublings for a PF of 1,000. Blast becomes a major factor within 5 miles of a target. If you are near a prime target, you will need a shelter with an 'arched' top and dirt cover that is double the diameter of your shelter. We will write more concerning blast in a future lesson.

Most basements with minimum exposure will provide a PF of 16 (four doublings) or better. If you are constructing a fallout shelter in the basement of your home, you will need 6 more doublings, as the mass of your home above will provide the extra 4 doublings required for a total PF of 1,000.

OBSERVE:
Become aware of your surroundings. A nuclear event may occur while you are away from your shelter. Areas such as caves, tunnels and high-rise buildings provide good shielding from radiation.

Contact your state comprehensive emergency office for information on targets in your area. If you are near a prime target you will not be able to survive in a basement shelter.

PREPARE:
We hope you will use the information we have provided to you to further prepare against the effects of radiation. Information becomes 'knowledge' when you put the information to use.

Don't wait until you can afford a deep, underground hardened shelter. Start now with whatever assets you have at hand. If you live in an apartment, make friends with people in your neighborhood who have a good basement or shelter. Ask them if you can store some of your food, clothing and supplies at their home; and offer to contribute with time or finances in preparing their shelter. If you are able to reach their home in the emergency, you are a helping hand and an asset. If you don't make it to their home, they have extra food. Very few people will turn you down if they think through that scenario.

6.09 Measuring Radiation:

When dealing with exposure levels from fallout, radiation is normally measured in rads or rems. Some dosimeters and meters will measure in Roentgens. Numerically, the rad is very similar to the Roentgen. We will be using these terms interchangeably in this discussion.

Radiation meters are used to monitor radiation exposure rates. Like the speedometer in a car, which tells how many miles per hour the car is traveling, a survey meter would tell how many roentgens per hour are being received. Dosimeters are used to measure the accumulation of radiation, just as your odometer would measure the accumulation of miles traveled in your car. Both instruments are very helpful in a radioactive environment. Good metering devices are invaluable in a nuclear environment.

Wartime rate meters must measure in rads or (roentgens) up to a level of 500 rads per hour, and wartime dosimeters must measure to a total accumulation of 200 rads (or roentgens).

Some meters and dosimeters measure only in milliroentgens (mr). A milliroentgen is 1,000th of a roentgen. These meters and dosimeters are useful in a post-war situation to monitor contamination of food and equipment. The most useful of these low-rate meters will have a 'wand' capable of reading beta contamination.

RADIATION DETECTION INSTRUMENTS

Survey Meters

Survey meters are used to monitor radiation exposure rates. Like the speedometer in your car, which tells you how fast you are going, the survey meter tells you how fast you are receiving radiation.

a. **Geiger meuler tubes**. The geiger meuler tubes are normally used for low range radiation detection. They are quite sensitive, but not very accurate. We sometimes call them geiger counters and they were widely used for hunting uranium ore. They are also used for training purposes where low radiation exposure rates will be encountered.

   On the outside of the box you often find a probe about 3/4 inch in diameter and 4 inches long connected to the box with a cord. When opened, the probe gives the meter the capability of reading beta radiation. Sometimes there is a headphone supplied with this instrument.

   Inside the box, you will find a tube. Typically this tube is about the diameter of a pencil and 3 or 4 inches long; or the size of the diameter of a dime and about 3 inches long.

   There are a number of the ANTONE 106-101 CDV-700 around that have been declared surplus by the government. They are a highly sensitive, low range instrument. They can measure gamma radiation and discriminate between beta and gamma radiations.

   They have the larger (dime size) meuler tube. They have a range (full scale deflection) of only 0 to 50 miliroentgens. Don't believe anyone who says they can be adjusted to read roentgens. The tube will saturate at 1000 milliroentgens (one roentgen). This means the reading on the scale will reach the full length of its range and stick at the far end of the scale until turned off. We then say that it has "pegged out" or "jammed". It will recover shortly after being turned off.

   To increase the range of this unit, a smaller diameter tube or a lead shield probe must be installed. This is very expensive, and the reliability is questionable. In a war time situation, we must have a reliable unit.

   By using a potengeometer, you can adjust the scale to read as much as 3 X scale (150 milliroentgens). Even this, however, is not large enough a reading for war time purposes. You could use this unit for checking food, clothing, etc. for beta contamination, but I believe your money would be better spent on a unit with a wider range capability.

   I would not recommend this unit. You need the capability to read 50 or even 500 roentgens per hour for war time purposes.

b. **Ion Chambers**. The other basic detecting instrument for a survey meter is an ion chamber. With the lid of the meter opened, the ion chamber looks like and is about the size of a can of chewing tobacco-- approx. 2 inches in diameter and 1 inch thick. An ion chamber has the capability of reading roentgens, and is the meter we want for our shelters.

This unit only reads gamma radiation, and is designed for post attack operational use. It typically has a full scale deflection of 0 to 500 roentgens. To reach these levels of detection there would probably be four multiplying scales of .1, 1, 10 and 100.

Currently, the government is using the CD V-715. There are a few of these for sale, but the government, in some cases, may claim them as stolen property. Question where this meter was obtained before buying it.

The CD V-710 is now obsolete and can be bought legally. If in doubt about any meter offered for sale call the state Comprehensive Emergency Management Office.

Always question whether the meter for sale has been hardened against EMP and if it will function in an electromagnetic field.

Dosimeters

Dosimeters come in many sizes and shapes. The dosimeters used by the government look like a short, fat yellow pen. They are designed to tell you your continual exposure. Like the odometer on your car, which tells you how many miles you have driven, the dosimeter tells you how much radiation you have accumulated.

Dosimeters measure gamma radiation.

For post attack use, don't purchase a dosimeter that has a range in milliroentgens. It would be useless to you. The dosimeters in that range are used for training purposes, only. A dosimeter in the range of from 0 to 200 Roentgens would be the most desirable in the eventuality of a nuclear attack.

Dosimeters do not need to be commercially calibrated. Purchase a charger with your dosimeter, and store extra batteries for the charger.

TABLE 6.07.1 RADIATION PENALTY TABLE

Acute Effects	Accum. Exposure 1 Week	Accum. Exposure 1 Month	Accum. Exposure 4 Months
Medical Care Not Needed	150 Roentgens	200 Roentgens	300 Roentgens
Some Need Medical Care Few if Any Deaths	250 Roentgens	350 Roentgens	500 Roentgens
Most Need Medical Care 50% + may die	450 Roentgens	600 Roentgens	600 Roentgens
Lethal Dose	600 Roentgens		

The accumulated exposure should not exceed those in the first row. If radiation levels reach 10/R/hr in the sheltered area, the doses in the first row will probably be exceeded. In this eventuality, the shielding in the sheltered area should be increased. In a full scale attack, about 35% of our population would be expected to exceed the above doses.

EXPOSURE AT 30 MILES DOWNWIND (500 KT surface burst, 15 mph wind)

Time	In Open	In Shelter PF 15	In Shelter PF 40
1 Week	3450 Roentgens	230 Roentgens	86 Roentgens
1 Month	4100 Roentgens	273 Roentgens	103 Roentgens
4 Months	4500 Roentgens	300 Roentgens	113 Roentgens

6.08.3 RISK AREAS

One-Week Dose Range in Rads

Protection Factor Using Shelter	High Fallout Risk Area	Med. Fallout Risk Area	Low Fallout Risk Area
PF 5	1200-3000	600-1200	600 rads or less
PF 10	600-1500	300-600	300 rads or less
PF 20	300-750	150-300	150 rads or less
PF 30	200-500	100-200	100 rads or less
PF 40	150-375	75-150	75 rads or less
PF 60	100-250	50-100	50 rads or less
PF 80	75-188	38-75	38 rads or less
PF 100	60-100	30-60	30 rads or less
PF 200	30-75	15-30	15 rads or less
PF 500	12-30	6-12	6 rads or less

Estimate the Risk Levels in each of your surrounding counties by potential prime and secondary targets.

County	Risk Level	County	Risk Level

Individual Radiation Exposure Record

Name of individual _____ Local _____

Low range (m/R) dosimeter # _____ High range (R) dosimeter # _____

Name of person or agency maintaining record _____

low range (m/R)					high range (R)				
date	time (circle am or pm)	dosage (m/R)	total m/R	daily total	date	time (circle am or pm)	dosage (R)	total R	daily total
	am pm	start				am pm	start		
	am pm	final				am pm	final		
	am pm	start				am pm	start		
	am pm	final				am pm	final		
	am pm	start				am pm	start		
	am pm	final				am pm	final		
	am pm	start				am pm	start		
	am pm	final				am pm	final		
	am pm	start				am pm	start		
	am pm	final				am pm	final		
	am pm	start				am pm	start		
	am pm	final				am pm	final		
	am pm	start				am pm	start		
	am pm	final				am pm	final		
accumulated weekly dose					accumulated weekly dose				

Use the back of the form for notes and comments.

RADIATION GLOSSARY

- **Acute Doses:** Radiation Doses occurring during the first 24 hours of exposure.
- **Attenuation:** Decrease in radiation level
- **Alpha particle:** Positively charged radiation particle emitted from the nuclei of a radioactive element, consisting of 2 protons and 2 neutrons.
- **Beta particle:** Negatively charged radiation particle identical to an electron, but originating from the nucleus.
- **Chronic Doses:** Radiation doses occurring over extend lengths of time.
- **Decay:** Decrease of activity of radioactive material due to the emission of an alpha or beta particle from the nuclei.
- **Gamma Rays:** Radiation with no measurable mass accompanying alpha and beta emissions. Identical to an x-ray, but originating from the nucleus.
- **Half-Life:** The time required for the activity of a radioactive species to decrease to half of its initial value due to decay.
- **Half-Value Thickness:** The thickness of a certain material that will absorb half the gamma radiation incident upon it.
- **Protection Factor:** Ratio of measured radiation levels 3 ft, above surface to the radiation level below the surface.

TACDA ACADEMY – CIVIL DEFENSE BASICS

7. NATURAL DISASTERS

7.01 Introduction:

The world as whole regularly experiences natural disasters that result in tragic physical, emotional and economic loses. Windstorms and floods account for the majority of these losses, and it appears we are currently in a cycle of a greater severity of these weather related disasters. Many reasons are given for this trend; some based on good science and some driven by political or other agendas.

There is indication that the world is naturally warming as it comes out of the last 'little ice age'. Some scientists have very convincingly argued that this warming trend is a result of cyclical sun spot activity. For whatever reason, in the last few years the global community has experienced a great increase in the loss of life and property from weather related disasters.

Natural disasters include earthquake, drought, epidemic, extreme temperatures, famine, flood, insect infestations, slides, volcanoes, waves/surges, wild fires, lightning storms and wind storms (hurricanes, tornadoes, etc.).

Most natural disasters give little, if any warning. However, cautionary notices often precede weather related disasters. We should always heed these warnings and make preparations accordingly.

In TACDA's estimation, the ultimate preparation for all mega-disasters (except flood) is the installation of underground all-hazard shelters. TACDA is actively encouraging a federally funded national shelter program. Disasters act as a catalyst for public policy changes. The United States has experienced enough disaster in recent history to justify and support such a policy change.

7.02 Earthquake:

Earthquakes in 3rd world countries have resulted in massive numbers of fatalities. Most of these fatalities result from catastrophic building collapse. In the United States, however, most buildings are built to strict building codes that resist catastrophic collapse. For many years, the Federal Government has advised that the 'Duck and Cover' survival strategy be used during an earthquake. Recently, a new survival technique called 'The Triangle of Life' has emerged.

Doug Copp, Rescue chief and Disaster Manager of the American Rescue Team International (ARTI), remains firm in his belief that the safest place to take refuge during an earthquake is in a triangular shaped area next to a large, compact object. Mr. Copp has worked at every major disaster in the world since 1985.

The 'Structural Engineers Association of California (SEAPC), on the other hand, supports the 'Duck & Cover' survival technique. They maintain that the greatest danger from earthquakes in the United States is injury from falling hazards such as bookshelves, filing cabinets, chimneys, and portions of ceilings, exterior facades, and window glass; --not from overall building collapse.

From 1990 to 2006, approximately 230,000 people have died in earthquakes in 3rd world countries. During that same period, only 68 people have died in earthquakes in the United States. Statistical information from the International Data Base http://www.em-dat.net verifies this information.

In October 6, 2004, The Structural Engineers Association of California wrote:

> "Sacramento, CA - The Structural Engineers Association of California (SEAOC) has recently learned of the 'Triangle of Life' theory and 'Ten Tips on Surviving a Building Collapse' put forth by Doug Copp which has been circulating via the Internet. The theory assumes complete building collapse and rather than the currently accepted survival strategy of 'duck and cover" under a substantial object like a desk or bed, it calls for curling up next to the object which, when it compresses under the weight of the collapse, will form a triangular survival void around it. However, this theory does not appropriately address the typical earthquake hazard that exists in the United States. The duck and cover protection approach was developed to protect occupants from falling hazards. The greatest danger to the U.S. population in the event of an earthquake is injury from falling hazards such as bookshelves, filing cabinets, chimneys, portions of ceilings, exterior facades, and window glass; not overall building collapse. Following Mr. Copp's tips puts one in greater danger from these falling hazards. And, in the rare occasions that buildings do collapse during an earthquake in the United States, survivable voids do not necessarily fit the descriptions presented by Mr. Copp."
>
> In SEAOC's considered opinion, the "duck and cover strategy" still represents the best way to protect one's self in an earthquake. We highly recommend visiting the Federal Emergency Management Agency's web site at http://www.fema.gov/hazards/earthquakes/equakes.shtm."

TACDA's conclusion, after researching the number and types of deaths in the United States from earthquakes in the last 10 years, is that both the "Duck and Cover" and the "Triangle of Life" philosophy should carefully be considered when teaching earthquake survival techniques. Sixty of the 68 deaths reported in the United States in the last 12 years occurred in the California earthquake of 1994. Most of these victims were crushed inside their cars during the collapse of the freeway bridges. Many of these crushed vehicles formed a 'Triangle of Life' area. Some of the victims may have survived if they had exited their vehicles and taken cover within that area. On the other hand, many of the injured inside buildings may have ultimately been more severely injured or even killed if they had not taken the "Duck & Cover" approach. Each situation must be carefully analyzed. 'Study', 'Think', 'Observe' and 'Prepare' accordingly.

The remaining material for this lesson has been taken from the FEMA website; <http://www.fema.gov/index.shtm>.

What to do Before an Earthquake

Earthquakes strike suddenly, violently and without warning. Identifying potential hazards ahead of time and advance planning can reduce the dangers of serious injury or loss of life from an earthquake. Repairing deep plaster cracks in ceilings and foundations, anchoring overhead lighting fixtures to the ceiling, and following local seismic building standards, will help reduce the impact of earthquakes.

Six Ways to Plan Ahead

1. **Check for Hazards in the Home**
    - Fasten shelves securely to walls.
    - Place large or heavy objects on lower shelves.
    - Store breakable items such as bottled foods, glass, and china in low, closed cabinets with latches.
    - Hang heavy items such as pictures and mirrors away from beds, couches, and anywhere people sit.
    - Brace overhead light fixtures.
    - Repair defective electrical wiring and leaky gas connections. These are potential fire risks.
    - Secure a water heater by strapping it to the wall studs and bolting it to the floor.
    - Repair any deep cracks in ceilings or foundations. Get expert advice if there are signs of structural defects.
    - Store weed killers, pesticides, and flammable products securely in closed cabinets with latches and on bottom shelves.
2. **Identify Safe Places Indoors and Outdoors**
    - Under sturdy furniture such as a heavy desk or table.
    - Against an inside wall.
    - Away from where glass could shatter around windows, mirrors, pictures, or where heavy bookcases or other heavy furniture could fall over.
    - In the open, away from buildings, trees, telephone and electrical lines, overpasses, or elevated expressways.
3. **Educate Yourself and Family Members**
    - Contact your local emergency management office or American Red Cross chapter for more information on earthquakes. Also read the "How-To Series" for information on how to protect your property from earthquakes.
    - Teach children how and when to call 9-1-1, police, or fire department and which radio station to tune to for emergency information.
    - Teach all family members how and when to turn off gas, electricity, and water.
4. **Have Disaster Supplies on Hand**
    - Flashlight and extra batteries.
    - Portable battery-operated radio and extra batteries.
    - First aid kit and manual.
    - Emergency food and water.
    - Non-electric can opener.
    - Essential medicines.

- Cash and credit cards.
- Sturdy shoes.

5. **Develop an Emergency Communication Plan**
   - In case family members are separated from one another during an earthquake (a real possibility during the day when adults are at work and children are at school); develop a plan for reuniting after the disaster.
   - Ask an out-of-state relative or friend to serve as the "family contact." After a disaster, it's often easier to call long distance. Make sure everyone in the family knows the name, address, and phone number of the contact person.
6. **Help Your Community Get Ready**
   - Publish a special section in your local newspaper with emergency information on earthquakes. Localize the information by printing the phone numbers of local emergency services offices, the American Red Cross, and hospitals.
   - Conduct a weeklong series on locating hazards in the home.
   - Work with local emergency services and American Red Cross to prepare special reports for people with mobility impairments on what to do during an earthquake.
   - Provide tips on conducting earthquake drills in the home.
   - Interview representatives of the gas, electric, and water companies about shutting off utilities.
   - Work together in your community to apply your knowledge to building codes, retrofitting programs, hazard hunts, and neighborhood and family emergency plans.

What to do During an Earthquake

Stay as safe as possible during an earthquake. Be aware that some earthquakes are actually foreshocks and a larger earthquake might occur. Minimize your movements to a few steps to a nearby safe place and stay indoors until the shaking has stopped and you are sure exiting is safe.

If Indoors

- DROP to the ground; take COVER by getting under a sturdy table or other piece of furniture; and HOLD ON until the shaking stops. If there isn't a table or desk near you, cover your face and head with your arms and crouch in an inside corner of the building.
- Stay away from glass, windows, outside doors and walls, and anything that could fall, such as lighting fixtures or furniture.
- Stay in bed if you are there when the earthquake strikes. Hold on and protect your head with a pillow, unless you are under a heavy light fixture that could fall. In that case, move to the nearest safe place.
- Use a doorway for shelter only if it is in close proximity to you and if you know it is a strongly supported, load-bearing doorway.
- Stay inside until shaking stops and it is safe to go outside. Research has shown that most injuries occur when people inside buildings attempt to move to a different location inside the building or try to leave.
- Be aware that the electricity may go out or the sprinkler systems or fire alarms may turn on.
- DO NOT use the elevators.

If Outdoors

- Stay there.
- Move away from buildings, streetlights, and utility wires.
- Once in the open, stay there until the shaking stops. The greatest danger exists directly outside buildings, at exits, and alongside exterior walls. Many of the 120 fatalities from the 1933 Long Beach earthquake occurred when people ran outside of buildings only to be killed by falling debris from collapsing walls. 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.

If in a Moving Vehicle

- Stop as quickly as safety permits and stay in the vehicle. Avoid stopping near or under buildings, trees, overpasses, and utility wires.
- Proceed cautiously once the earthquake has stopped. Avoid roads, bridges, or ramps that might have been damaged by the earthquake.

If Trapped Under Debris

- Do not light a match.
- Do not move about or kick up dust.
- Cover your mouth with a handkerchief or clothing.
- Tap on a pipe or wall so rescuers can locate you. Use a whistle if one is available. Shout only as a last resort. Shouting can cause you to inhale dangerous amounts of dust.

What to Do After an Earthquake

First of all, expect aftershocks. These secondary shockwaves are usually less violent than the main quake but can be strong enough to do additional damage to weakened structures and can occur in the first hours, days, weeks, or even months after the quake.

- Listen to a battery-operated radio or television. Listen for the latest emergency information.
- Use the telephone only for emergency calls.
- Open cabinets cautiously. Beware of objects that can fall off shelves.
- Stay away from damaged areas. Stay away unless your assistance has been specifically requested by police, fire, or relief organizations. Return home only when authorities say it is safe.
- Be aware of possible tsunamis if you live in coastal areas. These are also known as seismic sea waves (mistakenly called "tidal waves"). When local authorities issue a tsunami warning, assume that a series of dangerous waves is on the way. Stay away from the beach.
- Help injured or trapped persons. Remember to help your neighbors who may require special assistance such as infants, the elderly, and people with disabilities. Give first aid where appropriate. Do not move seriously injured persons unless they are in immediate danger of further injury. Call for help.
- Clean up spilled medicines, bleaches, gasoline or other flammable liquids immediately. Leave the area if you smell gas or fumes from other chemicals.
- Inspect the entire length of chimneys for damage. Unnoticed damage could lead to a fire.
- Inspect utilities.

- Check for gas leaks. If you smell gas or hear blowing or hissing noise, open a window and quickly leave the building. Turn off the gas at the outside main valve if you can and call the gas company from a neighbor's home. If you turn off the gas for any reason, it must be turned back on by a professional.
- Look for electrical system damage. If you see sparks or broken or frayed wires, or if you smell hot insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in water to get to the fuse box or circuit breaker, call an electrician first for advice.
- Check for sewage and water lines damage. If you suspect sewage lines are damaged, avoid using the toilets and call a plumber. If water pipes are damaged, contact the water company and avoid using water from the tap. You can obtain safe water by melting ice cubes.

7.03 Tsunami:

Tsunamis are a series of enormous waves created by an underwater disturbance such as an earthquake, landslide, volcanic eruption, or meteorite. A tsunami can move hundreds of miles per hour in the open ocean and smash into land with waves as high as 100 feet or more.

What to do Before and During a Tsunami

- Become familiar with local emergency siren alerts.
- Turn on your radio to learn if there is a tsunami warning if an earthquake occurs and you are in a coastal area.
- Move inland to higher ground immediately and stay there.
- 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 to escape it.
- CAUTION - If there is noticeable recession in water away from the shoreline this is nature's tsunami warning and it should be heeded. You should move away immediately.

What to Do After a Tsunami

- Stay away from flooded and damaged areas until officials say it is safe to return.
- Stay away from debris in the water; it may pose a safety hazard to boats and people.
- Save yourself - not your possessions

7.04 Tornadoes:

Tornadoes are nature’s most violent storms. Spawned from powerful thunderstorms, tornadoes can cause fatalities and devastate a neighborhood in seconds. A tornado appears as a rotating, funnel-shaped cloud that extends from a thunderstorm to the ground with whirling winds that can reach 300 miles per hour. Damage paths can be in excess of one mile wide and 50 miles long. Every state is at some risk from this hazard.

Some tornadoes are clearly visible, while rain or nearby low-hanging clouds obscure others. Occasionally, tornadoes develop so rapidly that little, if any, advance warning is possible.

Before a tornado hits, the wind may die down and the air may become very still. A cloud of debris can mark the location of a tornado even if a funnel is not visible. Tornadoes generally occur near the trailing edge of a thunderstorm. It is not uncommon to see clear, sunlit skies behind a tornado.

The following are facts about tornadoes:

- They may strike quickly, with little or no warning.
- They may appear nearly transparent until dust and debris are picked up or a cloud forms in the funnel.
- The average tornado moves Southwest to Northeast, but tornadoes have been known to move in any direction.
- The average forward speed of a tornado is 30 MPH, but may vary from stationary to 70 MPH.
- Tornadoes can accompany tropical storms and hurricanes as they move onto land.
- Waterspouts are tornadoes that form over water.
- Tornadoes are most frequently reported east of the Rocky Mountains during spring and summer months.
- Peak tornado season in the southern states is March through May; in the northern states, it is late spring through early summer.
- Tornadoes are most likely to occur between 3 p.m. and 9 p.m., but can occur at any time.

Familiarize yourself with these terms to help identify a tornado hazard:

Tornado Watch
Tornadoes are possible. Remain alert for approaching storms. Watch the sky and stay tuned to NOAA Weather Radio, commercial radio, or television for information.

Tornado Warning
A tornado has been sighted or indicated by weather radar. Take shelter immediately.
Preparing a Safe Room

Guidelines and instructions for building a safe room:
Extreme windstorms in many parts of the country pose a serious threat to buildings and their occupants. Your residence may be built "to code," but that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection.

You can build a safe room in one of several places in your home.

- Your basement.
- Atop a concrete slab-on-grade foundation or garage floor.
- An interior room on the first floor.

Safe rooms built below ground level provide the greatest protection, but a safe room built in a first-floor interior room also can provide the necessary protection. Below-ground safe rooms must

be designed to avoid accumulating water during the heavy rains that often accompany severe windstorms.

To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed. Consider the following when building a safe room:

The safe room must be adequately anchored to resist overturning and uplift.

- The walls, ceiling, and door of the shelter must withstand wind pressure and resist penetration by windborne objects and falling debris.
- The connections between all parts of the safe room must be strong enough to resist wind.
- Sections used as walls of the safe room must be separated from the structure of the residence so that damage to the residence will not cause damage to the safe room.

What to do Before a Tornado

- Be alert to changing weather conditions.
- Listen to NOAA Weather Radio or to commercial radio or television newscasts for the latest information.
- Look for approaching storms
- Look for the following danger signs:
- Dark, often greenish sky
- Large hail
- A large, dark, low-lying cloud (particularly if rotating)
- Loud roar, similar to a freight train
- If you see approaching storms or any of the danger signs, be prepared to take shelter immediately.

What to Do During a Tornado

If you are under a tornado WARNING, seek shelter immediately!

If you are in a structure (e.g. residence, small building, school, nursing home, hospital, factory, shopping center, high-rise building):

- Go to a pre-designated shelter area such as a safe room, basement, storm cellar, or the lowest building level.
- If there is no basement, go to the center of an interior room on the lowest level (closet, interior hallway) away from corners, windows, doors, and outside walls. Put as many walls as possible between you and the outside. Get under a sturdy table and use your arms to protect your head and neck. Do not open windows.
- A vehicle, trailer, or mobile home Get out immediately and go to the lowest floor of a sturdy, nearby building or a storm shelter. Mobile homes, even if tied down, offer little protection from tornadoes.

If you are outside with no shelter:

- Lie flat in a nearby ditch or depression and cover your head with your hands. Be aware of the potential for flooding.

- Do not get under an overpass or bridge. You are safer in a low, flat location.
- Never try to outrun a tornado in urban or congested areas in a car or truck. Instead, leave the vehicle immediately for safe shelter.
- Watch out for flying debris. Flying debris from tornadoes causes most fatalities and injuries.

What to Do After a Tornado

- Listen to a battery-operated radio or television. Listen for the latest emergency information.
- Use the telephone only for emergency calls.
- Open cabinets cautiously. Beware of objects that can fall off shelves.
- Stay away from damaged areas. Stay away unless your assistance has been specifically requested by police, fire, or relief organizations. Return home only when authorities say it is safe.
- Help injured or trapped persons. Remember to help your neighbors who may require special assistance such as infants, the elderly, and people with disabilities. Give first aid where appropriate. Do not move seriously injured persons unless they are in immediate danger of further injury. Call for help.
- Clean up spilled medicines, bleaches, gasoline or other flammable liquids immediately. Leave the area if you smell gas or fumes from other chemicals.
- Inspect the entire length of chimneys for damage. Unnoticed damage could lead to a fire.
- Inspect utilities.
- Check for gas leaks. If you smell gas or hear blowing or hissing noise, open a window and quickly leave the building. Turn off the gas at the outside main valve if you can and call the gas company from a neighbor's home. If you turn off the gas for any reason, it must be turned back on by a professional.
- Look for electrical system damage. If you see sparks or broken or frayed wires, or if you smell hot insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in water to get to the fuse box or circuit breaker, call an electrician first for advice.
- Check for sewage and water lines damage. If you suspect sewage lines are damaged, avoid using the toilets and call a plumber. If water pipes are damaged, contact the water company and avoid using water from the tap. You can obtain safe water by melting ice cubes.

7.05 Hurricane:

A hurricane is a type of tropical cyclone, the generic term for a low pressure system that generally forms in the tropics. A typical cyclone is accompanied by thunderstorms, and in the Northern Hemisphere, a counterclockwise circulation of winds near the earth’s surface.

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes or tropical storms. Parts of the Southwest United States and the Pacific Coast experience heavy rains and floods each year from hurricanes spawned off Mexico. The Atlantic hurricane season lasts from June to November, with the peak season from mid-August to late October.

Hurricanes can cause catastrophic damage to coastlines and several hundred miles inland. Winds can exceed 155 miles per hour. Hurricanes and tropical storms can also spawn tornadoes and microbursts, create storm surges along the coast, and cause extensive damage from heavy rainfall.

Hurricanes are classified into five categories based on their wind speed, central pressure, and damage potential. Category Three and higher hurricanes are considered major hurricanes, though Categories One and Two are still extremely dangerous and warrant your full attention.

Saffir-Simpson Hurricane Scale

The Saffir-Simpson Hurricane Scale is a scale classifying most Western Hemisphere tropical cyclones that exceed the levels of "tropical depression" and "tropical storm" and thereby become hurricanes; the "categories" it divides hurricanes into are distinguished by the intensities of their respective sustained winds. The classifications are intended primarily for use in gauging the likely damage and flooding a hurricane will cause upon landfall. The Saffir-Simpson Hurricane Scale is used only to describe hurricanes forming in the Atlantic Ocean and northern Pacific Ocean east of the International Date Line. Other areas label their tropical cyclones as "cyclones" and "typhoons", and use their own classification schemes.

The scale was developed in 1969 by civil engineer Herbert Saffir and Bob Simpson, at that time the director of the U.S. National Hurricane Center (NHC - www.nhc.noaa.gov). The initial scale was developed by Saffir while on commission from the United Nations to study low-cost housing in hurricane-prone areas. While performing the study, Saffir realized there was no simple scale for describing the likely effects of a hurricane. Knowing the utility of the Richter magnitude scale in describing earthquakes, he devised a scale based on wind speed that showed expected damage to structures. Saffir gave the scale to the NHC, and Simpson added in the effects of storm surge and flooding.

The Saffir-Simpson Hurricane Scale is a 1-5 rating based on the hurricane's present intensity. This is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall. Wind speed is the determining factor in the scale, as storm surge values are highly dependent on the slope of the continental shelf and the shape of the coastline, in the landfall region.

The scale does not take into account rainfall or location, which means a Category 2 hurricane that hits a major city will likely do far more damage than a Category 5 hurricane that hits a rural area.

Only 3 Category Five Hurricanes have made landfall in the United States since records began:

- The Labor Day Hurricane of 1935 struck the Florida Keys with a minimum pressure of 892 mb--the lowest pressure ever observed in the United States.
- Hurricane Camille (1969) struck the Mississippi Gulf Coast causing a 25-foot storm surge, which inundated Pass Christian.
- Hurricane Andrew (1992) made landfall over southern Miami-Dade County, Florida causing 26.5 billion dollars in losses--the costliest hurricane on record.

Saffir-Simpson Hurricane Scale

Scale # (Category)	Sustained Winds (MPH)	Damage	Storm Surge (above normal)
1	74-95	Minimal: Damage primarily to unanchored mobile homes, shrubbery, and trees. Some damage to poorly constructed signs. Some coastal road flooding and minor pier damage.	4-5 ft.
2	96-110	Moderate: Some roofing material, door, and window damage of buildings. Considerable damage to shrubbery and trees. Considerable damage to mobile homes, poorly constructed signs, and piers. Coastal and low-lying escape routes flood 2-4 hours before arrival of the hurricane center.	6-8 ft.
3	111-130	Extensive: Structural damage to small residences and utility buildings. Damage to shrubbery and large trees blown down. Mobile homes and poorly constructed signs are destroyed. Low-lying escape routes are cut by rising water 3-5 hours before arrival of the center of the hurricane. Flooding near coast destroys smaller structures. Larger structures damaged floating debris.	9-12 ft.
4	131-155	Severe: More roof structure failures on small residences. Shrubs, trees, and all signs are blown down. Complete destruction of mobile homes. Major damage to lower floors of structures near the shore. Terrain lower than 10 ft above sea level may be flooded requiring massive evacuation of residential areas as far inland as 6 miles (10 km).	13-18 ft.
5	More than 155	Extreme: Complete roof failure on many residences and industrial buildings. Small utility buildings blown over or away. All shrubs, trees, and signs blown down. Complete destruction of mobile homes. Major damage to lower floors of all structures located less than 15 ft above sea level and within 500 yards of the shoreline. Massive evacuation of residential areas within 5-10 miles (8-16 km) of shoreline may be required.	18 ft. & greater

Before a Hurricane

To prepare for a hurricane, you should take the following measures:

- Make plans to secure your property. Permanent storm shutters offer the best protection for windows. A second option is to board up windows with 5/8" marine plywood, cut to fit and ready to install. Tape does not prevent windows from breaking.
- Install straps or additional clips to securely fasten your roof to the frame structure. This will reduce roof damage.
- Be sure trees and shrubs around your home are well trimmed.
- Clear loose and clogged rain gutters and downspouts.
- Determine how and where to secure your boat.
- Consider building a safe room.

During a Hurricane

If a hurricane is likely in your area, you should:

- Listen to the radio or TV for information.
- Secure your home, close storm shutters, and secure outdoor objects or bring them indoors.
- Turn off utilities if instructed to do so. Otherwise, turn the refrigerator thermostat to its coldest setting and keep its doors closed.
- Turn off propane tanks. Avoid using the phone, except for serious emergencies.
- Moor your boat if time permits.
- Ensure a supply of water for sanitary purposes such as cleaning and flushing toilets. Fill the bathtub and other large containers with water.

You should evacuate under the following conditions:

- If you are directed by local authorities to do so. Be sure to follow their instructions.
- If you live in a mobile home or temporary structure—such shelters are particularly hazardous during hurricanes no matter how well fastened to the ground.
- If you live in a high-rise building—hurricane winds are stronger at higher elevations.
- If you live on the coast, on a floodplain, near a river, or on an inland waterway.
- If you feel you are in danger.

If you are unable to evacuate, go to your safe room. If you do not have one, follow these guidelines:

- Stay indoors during the hurricane and away from windows and glass doors.
- Close all interior doors—secure and brace external doors.
- Keep curtains and blinds closed. Do not be fooled if there is a lull; it could be the eye of the storm - winds will pick up again.
- Take refuge in a small interior room, closet, or hallway on the lowest level.
- Lie on the floor under a table or another sturdy object.

After a Hurricane:

- Stay away from damaged areas. Stay away unless your assistance has been specifically requested by police, fire, or relief organizations. Return home only when authorities say it is safe.
- Listen to a battery-operated radio or television. Listen for the latest emergency information.

- Use the telephone only for emergency calls.
- Help injured or trapped persons. Remember to help your neighbors who may require special assistance such as infants, the elderly, and people with disabilities. Give first aid where appropriate. Do not move seriously injured persons unless they are in immediate danger of further injury. Call for help.
- Check for gas leaks. If you smell gas or hear blowing or hissing noise, open a window and quickly leave the building. Turn off the gas at the outside main valve if you can and call the gas company from a neighbor's home. If you turn off the gas for any reason, it must be turned back on by a professional.
- Look for electrical system damage. If you see sparks or broken or frayed wires, or if you smell hot insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in water to get to the fuse box or circuit breaker, call an electrician first for advice.

After returning home:
The following are guidelines for the period following a flood:

- Listen for news reports to learn whether the community's water supply is safe to drink.
- Avoid floodwaters; water may be contaminated by oil, gasoline, or raw sewage.
- Water may also be electrically charged from underground or downed power lines.
- Avoid moving water.
- Be aware of areas where floodwaters have receded. Roads may have weakened and could collapse under the weight of a car.
- Stay away from downed power lines, and report them to the power company.
- Return home only when authorities indicate it is safe.
- Stay out of any building if it is surrounded by floodwaters.
- Use extreme caution when entering buildings; there may be hidden damage, particularly in foundations.
- Service damaged septic tanks, cesspools, pits, and leaching systems as soon as possible. Damaged sewage systems are serious health hazards.
- Clean and disinfect everything that got wet. Mud left from floodwater can contain sewage and chemicals.

7.06 Wildfire:
The threat of wildfires for people living near wild land areas, or using recreational facilities in wilderness areas, is real.

Dry conditions at various times of the year and in various parts of the United States greatly increase the potential for wild land fires. Advance planning and knowing how to protect buildings in these areas can lessen the devastation of a wild land fire.

There are several safety precautions that you can take to reduce the risk of fire losses. Protecting your home from wildfire is your responsibility. To reduce the risk, you'll need to consider the fire resistance of your home, the topography of your property and the nature of the vegetation close by.

What to do Before a Wildfire:
If you see a wildfire, call 9-1-1. Don't assume that someone else has already called. Describe the location of the fire, speak slowly and clearly, and answer any questions asked by the dispatcher.

Before the Fire Approaches Your House:

- Evacuate. Evacuate your pets and all family members who are not essential to preparing the home. Anyone with medical or physical limitations and the young and the elderly should be evacuated immediately.
- Wear Protective Clothing.
- Remove Combustibles. Clear items that will burn from around the house, including wood piles, lawn furniture, barbecue grills, tarp coverings, etc. Move them outside of your defensible space.
- Close/Protect Openings. Close outside attic, eaves and basement vents, windows, doors, pet doors, etc. Remove flammable drapes and curtains. Close all shutters, blinds or heavy non-combustible window coverings to reduce radiant heat.
- Close Inside Doors/Open Damper. Close all doors inside the house to prevent draft. Open the damper on your fireplace, but close the fireplace screen.
- Shut Off Gas. Shut off any natural gas, propane or fuel oil supplies at the source.
- Water. Connect garden hoses. Fill any pools, hot tubs, garbage cans, tubs or other large containers with water.
- Pumps. If you have gas-powered pumps for water, make sure they are fueled and ready.
- Ladder. Place a ladder against the house in clear view.
- Car. Back your car into the driveway and roll up the windows.
- Garage Doors. Disconnect any automatic garage door openers so that doors can still be opened by hand if the power goes out. Close all garage doors.
- Valuables. Place valuable papers, mementos and anything "you can't live without" inside the car in the garage, ready for quick departure. Any pets still with you should also be put in the car.

Preparing to Leave:

- Lights. Turn on outside lights and leave a light on in every room to make the house more visible in heavy smoke.
- Don't Lock Up. Leave doors and windows closed but unlocked. It may be necessary for firefighters to gain quick entry into your home to fight fire. The entire area will be isolated and patrolled by sheriff's deputies or police.

What to do During a Wildfire:
Survival in a Vehicle:

- This is dangerous and should only be done if there is no other alternative. You may be able to survive the firestorm if you stay in your car. It is much less dangerous than trying to run from a fire on foot.
- Roll up windows and close air vents. Drive slowly with headlights on. Watch for other vehicles and pedestrians. Do not drive through heavy smoke.
- If you have to stop, park away from the heaviest trees and brush. Turn headlights on and ignition off. Roll up windows and close air vents.

- Get on the floor and cover up with a blanket or coat.
- Stay in the vehicle until the main fire passes.
- Stay in the car. Do not run! Engine may stall and not restart. Air currents may rock the car. Some smoke and sparks may enter the vehicle. Temperature inside will increase. Metal gas tanks and containers rarely explode.

If You Are Trapped at Home:

- Stay calm. As the fire front approaches, go inside the house. You can survive inside. Douse yourself with water. The fire will pass before your house burns down. If your house catches fire, stay low and leave as quickly as it is safe to do so.

If Caught in the Open:

- The best temporary shelter is in a sparse fuel area. On a steep mountainside, the back side is safer. Avoid canyons, natural "chimneys" and saddles.
- If a road is nearby, lie face down along the road cut or in the ditch on the uphill side. Cover yourself with anything that will shield you from the fire's heat.
- If hiking in the back country, seek a depression with sparse fuel. Clear fuel away from the area while the fire is approaching and then lie face down in the depression and cover yourself. Stay down until after the fire passes!

What to do After a Wildfire

- Check the roof immediately. Put out any roof fires, sparks or embers. Check the attic for hidden burning sparks.
- If you have a fire, get your neighbors to help fight it.
- The water you put into your pool or hot tub and other containers will come in handy now. If the power is out, try connecting a hose to the outlet on your water heater.
- For several hours after the fire, maintain a "fire watch." Re-check for smoke and sparks throughout the house.

7.07 Conclusion:

TACDA encourages all members to remember the PEP concept; - PLAN, EQUIP AND PRACTICE. Each one of these natural disasters is survivable if we make the proper preparations. Planning, Equipping and Practicing must be done during the 'Before' stage of the disaster.

Underground shelters, if placed above the flood plane, provide protection for every natural and man-made disaster. Few lives will be lost if shelters are accessible and properly equipped.

Think through the steps of the 'STOP' concept.

- Study the information you have been given. The FEMA web site provides excellent content on these and other natural disasters.
- Think about the consequences for 'non-action'.
- Observe the areas of risk within your proximity.
- Prepare accordingly.

There is no need to fear any of these disasters if we have properly prepared.

8. FOOD STORAGE

8.01 Introduction:

Food, clean potable water and shelter are often compromised in natural and man-made disasters. The proper purchase and storage of food supplies is one of the most important aspects of all-hazard preparedness.

For information about food that can be eaten after a nuclear event, please see 'Food in Post Nuclear War Environment'.

There is not a perfect food storage plan that fits every family's circumstances. Each family has unique dietary needs, based on the age, size and health of the members. Pregnant and lactating women have special requirements. Teenagers eat more than the elderly. Consideration must also be made for the location, climate, space and accessibility of the storage area.

With that in mind, there are some basic guidelines that you may want to consider.

8.02 Long-Term Supplies:

It is difficult and expensive to keep supplies rotated. Many people choose to store an inexpensive basic survival supply of long-term foods that require little if any rotation. People often choose to compliment that supply with other foods that add interest and variety to the diet such as air-dried or freeze-dried fruits and vegetables, herbs, spices, flavorings and condiments. These supplements can become costly, but the ease of creating interesting meals may justify the price. Canned foods from the supermarket are less expensive, but must be rotated on a regular basis.

Much of the following information on basic food supplies is from the FEMA web site (http://www.fema.gov/library/emfdwtr.shtm).

Bulk quantities of wheat, corn, beans and salt are inexpensive and have nearly unlimited shelf life. If necessary, you could survive for years on small daily amounts of these staples. If these staples comprise your entire menu, you must eat all of them together (in proportional amounts) to stay healthy.

Stock the following amounts per person per year:

- Wheat--240 pounds
- Corn--240 pounds
- Iodized Salt--12 pounds
- Soybeans--120 pounds
- Vitamin C --180 grams (must be rotated yearly unless purchased in crystalline form).
- Powdered Milk (nitrogen packed) for babies and infants-- 240 pounds

The wheat, corn and beans should be stored in sealed cans or plastic buckets. The powdered milk should be stored in nitrogen-packed cans. We would suggest that you also add multi-vitamins and minerals to this basic supply.

Dr. Art Robinson, of the Oregon Institute of Medicine, reported that this ration would provide 120 grams protein with good amino acid balance, 45 grams of fat, and 2,700 calories of energy per day. Shop your local preparedness stores for current prices. We have found the price to be under $160 per person.

Dr. Robinson also suggests that the vitamin C be stored only in the form of crystalline ascorbic acid. Vitamin C in that form will store indefinitely.

If using this plan, you may wish to supplement further as follows:

- Purchase the basic survival supply as suggested above, by FEMA.
- Build up your everyday stock of canned goods by purchasing extra canned foods from the supermarket.
- Add freeze-dried fruits, vegetables & meats as you can afford to do so.

The FEMA web site further specifies:
"To avoid serious digestive problems, you'll need to grind the corn and wheat into flour and cook them, as well as boil the beans, before eating. Many health food stores sell hand-cranked grain mills or can tell you where you can get one. Make sure you buy one that can grind corn. If you are caught without a mill, you can grind your grain by filling a large can with whole grain one inch deep, holding the can on the ground between your feet and pounding the grain with a pipe."

8.03 Other Plans:

There are many excellent books on the market featuring food storage plans. We highly recommend the CRISIS PREPAREDNESS HANDBOOK by Jack A. Spigarelli; and THE SENSE OF SURVIVAL by J. Allan South. You may wish to consider this plan (as found in the 'Crisis Preparedness Handbook', p74):

7-PLUS Plan:

- Table salt 4 lbs
- Pickling & Canning salt 4 lbs
- Milk, non fat 60 lbs
- Oil (2 gal liquid, 7 lbs *shortening) 21 lbs
- Sugar 65 lbs
- Grains (wheat, white rice, corn, etc.) 375 lbs
- Legumes (beans, peas, lentils) 60 lbs
- Multi-vitamins (with minerals) 365
- Yeast 3/4 lb
- Baking powder 1 lb
- Seasonings, spices, flavorings & bullion

*Shortening has a very long shelf life. However it is hydrogenated oil and you may wish to store more of the vegetable oil in its place.

8.04 Shelf Life of Foods for Storage:

FEMA has given these guidelines for food rotation

Use within six months:

- Powdered milk (boxed)
- Dried fruit (in metal container)
- Dry, crisp crackers (in metal container)
- Potatoes

Use within one year:

- Canned condensed meat and vegetable soups
- Canned fruits, fruit juices and vegetables
- Ready-to-eat cereals and Uncooked instant cereals (in metal containers)
- Peanut butter
- Jelly
- Hard candy, chocolate bars and canned nuts

May be stored indefinitely (in proper containers and dry conditions):

- Wheat
- Vegetable oils
- Corn
- Baking powder
- Soybeans
- Instant coffee, tea & cocoa
- Vitamin C (in crystalline form)
- Salt
- Noncarbonated soft drinks
- White rice
- Bouillon products
- Dry pasta
- Powdered milk (in nitrogen-packed cans)

8.05 Storage Tips:

- Purchase only high quality foods.
- Keep food in a dry, cool, dark location (below 70 degrees Fahrenheit but above freezing).
- Keep food covered at all times. Store in metal or plastic containers.
- Carefully close food boxes or cans of dried foods close tightly after each use.
- Wrap cookies and crackers in plastic bags, and keep them in airtight plastic containers.
- Empty opened packages of sugar, dried fruits and nuts into screw-top jars or airtight cans to protect them from pests.
- Inspect all food for signs of spoilage before use.
- Periodically check for dented or bulging cans.
- When replacing foods with fresh supplies, clearly date all cans and packages.
- Place new items at the back of the storage area and older ones in front.

8.06 Short-Term Emergency Supplies:

Many emergencies (earthquake, hurricane, tornado, local quarantine) would result in a short-term need for food storage. A one-month emergency food supply is a good start on the one-year supply. You may wish to keep it separate from your long-term storage. Complete the short-term supply by increasing the amount of basic foods you normally keep on your shelves.

The one-month supply rotates easily and can be readily stored by most all households. If you have pets, purchase their food in bulk and keep a one-month supply of food for them as well. If your pets are hungry, you may be tempted to share your food with them.

One-month supply should include the following:

- Three-day supply of food that can be easily moved in the event of forced evacuation. Consider storing this supply in your vehicle as part of a 72-hour kit.
- Three-day supply of water (two liter bottles per person) in small moveable containers as part of the 72-hour kit.
- Two-week supply of MREs or canned foods (soups, stews, meats, vegetables, fruits) that do not need refrigeration, cooking or preparation.
- 14 gallons of water per person.
- Two-week supply of basic foods normally used in typical menus (frozen foods, refrigerated foods, cereals, pasta, mixes, juices, staples).

8.07 Food Consumption When Food Supplies Are Low:

If activity is reduced, healthy people can survive on half their usual food intake for an extended period and without any food for many days. Food, unlike water, may be rationed safely, except to children and pregnant women.

If your water supply is limited:

- Avoid foods that are high in fat and protein.
- Limit salty foods (they will make you thirsty).
- Eat salt-free crackers, whole grain cereals and canned foods with high liquid content.

8.08 Special Considerations:

Make sure you have a manual can opener, paper plates & cups and disposable utensils.

8.09 How to Cook if the Power Goes Out:

- Alcohol Stove (see 8.10 Constructing an Alcohol Stove)
- Fireplace
- Candle warmers
- Chemical warmers
- Chafing dishes
- Fondue pots
- Outside, only (charcoal grill or camp stove)
- Always remove the paper label before heating food in the can.

8.10 Constructing an Alcohol Stove:

Always use this stove in a well-ventilated area, as the flame will use up oxygen. Use caution, as this stove will produce a flame similar to a gas-burning stove. Do not use this stove inside a tent or anyplace a fire could start in the event the burning fluid tips and spills. When cooking inside, use denatured alcohol specifically labeled for marine stoves. If using a lesser grade alcohol, always cook outside in the open air.

The first time you use the stove, there will be some smoke from the lining of the paint can. Outside first use is recommended in order for the smoke to dissipate. Store the alcohol outside, or in an uninhabited building away from your home. The alcohol could act as an accelerant in a fire.

Cooking for two hours a day for one week should consume approximately 1-gallon of fuel. A 55-gallon drum of alcohol should, therefore, provide a one-year supply of cooking alcohol.

Equipment needed:

- 1 qt. paint can (unused) with lid
- 1 roll soft toilet paper with center cardboard removed
- Cooking alcohol* (clean burning denatured alcohol for marine stoves)
- Matches
- Small pressure cooker or pan

Directions:

1. Remove the center cardboard roll from the toilet paper, and place one full roll of toilet paper into the 1-quart paint-can. Use a soft roll that will squeeze into the can.
2. Fill paint-can stove with cooking alcohol to top of toilet paper roll.
3. Place the 1-qt. paint can stove on a flat, fireproof surface.
4. Strike the match and light the alcohol on fire. (The alcohol must be at least 53 degrees to burn).
5. Place a grill over the fire, and place the cooking pan on the grill. The grill should be about 2 inches above the paint can.
6. When finished cooking, loosely place the qt. sized paint-can lid over the stove to smother the fire. Allow the alcohol to cool and then press the lid firmly over the can to protect against spillage and evaporation of the alcohol.

*Cooking alcohol can be purchased at most hardware or marine stores. It is clean burning, produces mostly CO2 and water, and very little carbon monoxide is formed. If handled carefully and with proper ventilation, it can be used for cooking inside homes or shelters.

Isopropyl Alcohol can also be used in alcohol stoves, but it gives off an unpleasant odor and should only be used and stored outside of the home or shelter. It can be found at circuit board manufacturing plants, where they use it to clean off all resins and particulates after soldering and then dispose of it. Talk to the environmental people in charge of disposal of waste products. Ask them if they would allow you to use this as a by-product rather than have them dispose of it. This is a legitimate use. Some members of the Utah TACDA Chapter have purchased the alcohol for approximately $70 for a 55-gallon drum.

FOOD IN A POST-EVENT ENVIRONMENT

Many people are confused about the kinds of food that can be eaten after a nuclear event.

Fallout from a nuclear explosion consists of tiny particles of dirt and debris fused with fission products. Alpha and Beta particles in the fallout can persist for long periods of time and will contaminate all food to which it comes in contact. On the other hand, gamma radiation from the fallout is not a particle and does not contaminate food. Gamma radiation is actually used to purify food. Our challenge will be in differentiating between foods that can and cannot be cleansed and decontaminated of alpha and beta particles. Most gamma radiation will not persist beyond two weeks after the nuclear event.

Fruits and vegetables harvested from fallout zones in the first month post-attack may need to be decontaminated before consuming. Foods can be decontamination by washing exposed parts, removing outer leaves and peeling. FEMA material has stated that most vegetables and fruits that can be washed and pealed can safely be eaten. If the nuclear event were to occur at harvest time, you could still harvest smooth, hard skinned vegetables and fruits such as apples, potatoes, carrots, squashes, and any other fruits and vegetables you could both wash and peal. You should not harvest 'fuzzy' fruits such as raspberries, strawberries or peaches. Cauliflower and broccoli should not be eaten from the garden because of the uneven nature of their outer layers.

People in areas of low fallout accumulation may be able to plant crops the next season. Small plots of land could be scraped of the upper few inches of contaminated soil and planted. The contaminated soil containing the fallout should be moved away from the garden area. It seems unlikely that there would be any large farming activities for some time. People in low fallout areas that have received no blast may have opportunity to cover small plots with plastic before fallout arrives. Storage of large rolls of plastic would be advantageous.

Some plants requiring calcium (such as broccoli and cauliflower) will take up radioactive strontium 90 because of its chemical similarities to calcium. If we eat the food containing the radioactive strontium, the strontium will be deposited in our bones. Liming of acid soil will reduce this uptake. If possible, in areas of significant fallout deposition, plant foods with low calcium content such as potatoes, cereal, apples, tomatoes, peppers, sweet corn, squash and cucumbers.

Storage of non-hybrid seeds is extremely important. Hybrid seeds will not reproduce quality fruit. Seeds last several years if stored covered in airtight containers in a cool, dry area.

Farming implements should be stored in a safe place and protected from blast.

If fallout contamination is suspected, the package or can should be wiped or washed before opening. Dairy products that are wrapped or are kept within closed showcases or refrigerators will most likely be free from contamination. Refrigerated foods should be eaten first, then food from the freezer as it thaws, and then packaged or canned foods.

Crops, which are in the early stages of growth in heavy fallout areas, may absorb radioactive materials through their leaves or roots and would be difficult to decontaminate.

If possible, animals should be put under cover before fallout arrives and should not be fed contaminated food and water. Animals can be slaughtered if they don't appear to be sick. The bones and organs, however, should be removed and disposed of before cooking the meat. The animal may have been foraging on plants and grasses contaminated with Strontium 90. Strontium 90 looks chemically much like calcium. The bone cannot differentiate between Strontium and Calcium and will deposit the Strontium into the bone. If we cook the meat with the bones, the strontium will then be deposited into our bones. Eggs from poultry can be eaten. Fish from streams and lakes, such as trout and perch can be eaten. Bottom feeders such as carp and catfish should not be consumed.

Thyroid Blocking Agents (TBA) tablets should be started as soon after the nuclear attack as possible. Purchase the TBA and consult your physician now, for proper dosages for you and your family. People with thyroid problems may not be able to take TBA, therefore make sure your physician is aware of any thyroid irregularities you may have. The thyroid is always 'looking' for iodine and cannot distinguish between pure iodine and the radioactive isotope. TBA fills the thyroid with healthy iodine and prevents the uptake of radioactive form of the isotope. The thyroid will only accept iodine in certain forms. TBA is formulated with potassium and the proper isotope of iodine. Do not take iodine internally in any other form. TBA is a medicine and has some side affects. TBA should only be taken in the event of a nuclear disaster.

Water can be found in hot water heaters and wells. Hand pumps which will pump from as deep as 200 feet are available through Amish catalogs. Emergency water filtration and decontamination methods will be discussed in a different lesson. Use your imagination and be creative when foraging for water.

A deficiency of vitamin C could cause symptoms of scurvy within 4 to 6 weeks. Store a year's supply of vitamin C as well as other multi vitamins and minerals. A good expedient way to provide vitamin C is to eat sprouted seeds or beans. Instructions are given in the book, Nuclear War Survival Skills.

We cannot overly express the importance of storing a year's supply of food. The basic storage items, as suggested by Dr. Robinson, are easily and inexpensively purchased. After acquiring this basic supply, add items that will complete a more interesting menu. Each month consider purchasing a few extra items such as dried beans, canned tomatoes, catsup, spices, honey, canned soups or canned stews, and freeze-dried fruits and vegetables.

Many disasters, both natural and man-made, could cause a shortage of food or famine. Good God-fearing people will often loose all moral values when their children are starving. Be prudent and alert. Study, Think, Observe and Prepare.

TACDA ACADEMY – CIVIL DEFENSE BASICS

9. WATER PURIFICATION

9.01 Introduction:
During times of emergency, when normal sanitation methods of food, water, garbage, trash, and sewage may be disrupted, it is critical that rules and procedures be established to safe guard proper health or disastrous results may be experienced. Water storage and purification is essential.

9.02 Water:
It is impractical to attempt to store a year's supply of potable water. An emergency supply for two or three weeks, however, is an achievable goal for most people. Store two gallons of water per person per day for emergency use - one gallon for drinking and cooking, and the other for bathing and other needs. Store the water containers in a cool dark area on pieces of wood (not directly on concrete or dirt). Record the date of storage on the water container.

When rotating your water supplies, rinse and purify the containers before re-filling.

A good water filter is quite expensive, but is essential to survival. Do not purchase inexpensive filters. They most likely will not produce quality water. Choose a brand that will filter to .2 micron or less. Look for the quality that Katadyn First-Need or Seagull filters provide. Ultraviolet light units require electricity, and cannot guarantee effectiveness against certain spores and viruses.

9.03 Storage containers:
Containers should stack well and have a lining that won't rust or affect flavor. Containers of Choice are:

- 30-55 gallon FDA approved food grade plastic barrels
- 5-gallon plastic jugs
- Two-liter soda pop bottles (preferably tinted)

Plastic milk cartons should not be used for water storage.

A good water container is airtight, breakage resistant, and heavy enough to hold water. Bacteria growth will be discouraged if the container is both airtight and opaque, as bacteria needs both air and light to grow.

Water weighs over eight pounds per gallon; do not store more than fifteen gallons (about 125 pounds) in any container meant to be portable.

Before placing water in the container, carefully wash and rinse the container. After draining the rinse water, rinse the container with full strength bleach, making sure to role and tip the container to reach every area. Leave the lid slightly loose to reach around the bung and threads. Leave the bleach in the container for about 20 minutes. Wear rubber gloves, old clothing and eye protection during this process. Use about 1-quart bleach for a 55-gallon drum. Recover the bleach into a bucket and use for the next drum. Lightly rinse the bleach from the container with water.

9.04 Water Storage:
Add household bleach (5.25 percent hypochlorite with no additives) to the fresh water in the container. This is not meant to purify the water, but to keep bacteria from later growing in previously purified water.

The following amounts should be added to the full clean container:

- 1- teaspoon bleach for 5 gallons
- 4 Tablespoons bleach for 55 gallons
- 8 drops bleach for two-liters

Purchase a good water filter to be used when obtaining drinking water from unproven sources. Obtain a three-day supply of water per person for 72-hour kits in small, portable containers. If stored in clear containers, rotate the water monthly.

Large water barrels are great for water storage, and can be purchased from 15 gallon to 55 gallon sizes. Please note a 55 gallon barrel will weigh several hundred pounds and be unrealistic to tip even slightly to access the water. Obtain a siphon pump designed for your barrel to remove the water when needed.

All water obtained outdoors (lakes, streams, etc.), is subject to pollution and contamination from dirt, bacteria or other pollutants, and requires purification consisting of a two-step process. It must first be clarified or cleansed of all physical impurities such as dirt and debris. After clarification it must be disinfected (sterilized) or made biologically safe to drink.

Please understand that NO home method of water treatment can guarantee the safety of the water. Certain water treatment methods described below can reduce the risks involved, but emergency treatment of water cannot guarantee the same quality water as normally comes into our homes.

9.05 Water Forage:
Once the stored water has been depleted, people will be driven to forage for more supplies. Storage supplies can be temporarily stretched by utilizing the water in the hot water heater, toilet tanks (not the bowl) and water lines.

Open faucets on the upper floors and drain water from the pipes from the lower faucets. An anti-siphon should be installed on the water inlet to keep the water from flowing back out of the house when water pressures fall.

Hot water heaters should be drained on a regular basis to eliminate the rust and sediment from the bottom of the tank.

Fortunate are the families that live near natural water sources or have access to wells. Wells less than 300 feet deep can be hand-pumped. Amish catalogs feature well built hand-pumps.

9.06 Water Clarification:

Water foraged from natural sources is often contaminated with dirt, debris and suspended particles. Water should be clarified before placing it into the water filter or purifying it by other methods.

Settling: Settling is the easiest method for clarifying and removing debris and suspended particles from the water. If the water is muddy or murky, settling it before filtering will extend the life of the filter. To let water settle merely let it stand in a large container, totally undisturbed for 12 to 24 hours. This will allow any sediment (including radioactive particles) to sink to the bottom. A handful of clay soil in each gallon of water will help speed this process. After settling is complete, pour, dip or siphon the clean water into another container, being careful not to stir up the sludge at the bottom.

Can Filters: Clean a large can (#10 or a large juice can, etc.), and using a nail, punch several holes in the bottom of the can near the center (avoid making holes near the edges of the can). Place an inch or two of washed, crushed charcoal in the bottom of the can (purchased at any pet shop or taken from a fire). Cover the charcoal with 3 or 4 inches of glass wool or polyester aquarium filter. In an emergency, paper towels, toilet tissue, pieces of cloth or even dried grass will suffice. Be sure to pack the material tightly against the sides of the can so that no water can leak around it without being filtered. Suspend the can above a clean container. Pour the polluted water into the can, and allow it to drip into the clean container below. This type of filter will clarify up to 2 gallons of water per hour.

Earthen Filters: Clay binds to radioactive particles. If radioactive fallout has contaminated the water supplies, earth filters utilizing clay type soil, will effectively remove the radioactive particles from the water. This method is better than distillation, ion-exchange filters, or charcoal filters for this purpose.

Perforate the bottom of a 5-gallon can or wastebasket with holes punched within 2 inches of the center. Place a two-inch layer of washed pebbles on the bottom of the can. Cover the pebbles with one thickness of terry cloth towel or other porous cloth. Scrape the top 4-5 inches of soil off the ground to get below the fallout, and dig enough clay-type soil to fill the can to a depth of 8 inches, packing it tightly against the sides. Cover the soil in the can with another thickness of toweling and another one or two inches of pebbles. Suspend the can over a clean container and pour the contaminated water into the top. Clear (but unpurified) water will come out the bottom at the rate of about 6 quarts per hour.

Hose Siphoning: Take a six to eight foot section of garden hose and push two cotton balls into the end. Place that end of the hose into a bucket or

container of muddy water. Suck on the other end until water begins to come through. Place the free end of the hose into another container placed below the muddy container. Gravity will pull the water from the higher container into the lower container while trapping the sediment in the cotton balls and allowing only clear water to flow through the hose. When the cotton balls become clogged, simply remove them and replace with clean ones. This filter will clean approximately one quart of water in thirty minutes. However, if the water is very muddy, the cotton balls will have to be replaced very frequently.

Capillary Siphoning: This filtration method will eliminate most particles and silt from the water. Elevate a container of polluted water above another container and run a piece of braided yarn, strips of cloth (cotton works best), or terry-cloth towel between the two containers as a filtering medium. It helps to soak the material in clean water first, to get the process started. Dirt and debris will not be pulled into the filter, but will remain in the top container. Clean water will pass through the medium and drip into the container below. Capillary action filters are quite effective, but are very slow, clarifying only about one cup of water per hour.

Coffee Filters: Coffee filters are an excellent filtering medium. Place three or four of them (one inside the other) into a mason jar and let the edges protrude over the rim of the jar. Screw on a jar ring to hold them in place and pour the muddy water into the filters. The water will pass through the filters and drip into the jar. When the filters become clogged, simply replace them. This type of filter will clarify approximately one quart of very muddy water in two hours.

9.07 Purification of Water:

After the water has been clarified, it is ready for step #2, purification. Water should not be consumed until it has been purified.

Boiling: Water sterilization by boiling is preferred over ANY method of chemical disinfection, because disease-causing microorganisms cannot survive the heat from a sterilizing boil. If the water is cloudy, heat sterilization is the only method that can be fully relied upon to assure complete destruction of these organisms. These organisms can "hide" by burrowing into the microscopic particles that cause cloudiness in water, thereby escaping the action of disinfecting chemicals, and remaining capable of producing disease. Water that is boiled vigorously for five minutes will usually be safe from harmful bacterial contamination. One additional minute should be added for each 1,000 feet of altitude. The use of a pressure cooker (bring the water up to 15 pounds and then remove from the source of heat), conserves the most amount of fuel, if that is a concern. This guarantees that all bacteria, protozoa, and viruses have been killed. To improve the taste of boiled water,

add a little charcoal from the fire to absorb odors. Pour it back and forth between two clean containers to mix the water with air.

Chemical Sterilization: Regardless of the method of chemically disinfecting water, always double the dosage amount if the water is not absolutely clear. If the water temperature is cold (below 45 degrees), wait one hour to allow the disinfectant to work before drinking the water.

- **Iodine Crystals:** Crystalline iodine is the most effective method of chemically purifying contaminated water. In the crystallized form, iodine has an infinite shelf life and is very inexpensive. Great care should be exercised, however, when handling crystalline iodine.

  DO NOT TOUCH IODINE CRYSTALS!! They can cause severe skin burns and can be fatal if swallowed in sufficient quantity. Add 4 to 8 grams of USP Grade Re-sublimed Iodine Crystals to a one-ounce glass bottle with a leak proof bake-lite cap. Plastic bottles are not acceptable, since they allow staining and can leak.

  After placing the crystals in the bottle, fill the bottle with water, close the cap and shake vigorously for one minute. Allow the bottle to sit for one hour to allow the iodine to dissolve, before adding the solution to the water. Add 3 teaspoons of this solution (1/2 ounce) to a quart of clear water, and let it stand for 30 minutes before drinking. Only a small fraction of the crystals will dissolve.

  Take care that NO crystals escape into your drinking water, as they will cause burns to your mouth and digestive tract. Double the amount (6 teaspoons of solution), if the water is cloudy. When the solution in the bottle is used up, just add more water and let it stand one hour before using the solution to treat additional water. Four to eight grams of crystalline iodine should be sufficient to treat up to 1,000 quarts of water.

  It is currently difficult to purchase iodine crystals in bulk form. Iodine crystals in small containers, however, can be purchased for approximately $10.50 from the Polar Pure Equipment, Inc., Saratoga. CA. Ask for the 'Polar Pure Iodine Crystal Kit'. The iodine in this kit is packaged in the proper glass bottle and has a screen fitted over the opening to keep the crystals from escaping when the solution is poured into the drinking water. This particular kit contains enough iodine crystals to purify 2,000 quarts of water.

The following are other options for chemically disinfecting water, listed in order of effectiveness.

- **Iodine Tablets:** Iodine tablets in the form of tetraglycine hyperiodide are very effective against all forms of bacteria. This form of iodine, however, is less effective against the dreaded protozoa, GIARDIA LAMBLIA. Iodine tablets are sold in sporting-goods stores under the names of Coghlan's Globaline, and Portable Aqua. Iodine tablets usually have a relatively short shelf life (losing 20% of their effectiveness in just six months). They are also very sensitive to heat and light. They turn color from grey to yellow as they become less potent. The usual dose is one tablet per quart of clear water, and two tablets for cloudy water. Let the water stand for 30 minutes before using.

- **Tincture of Iodine:** A 2% solution of tincture of iodine, as found in most first-aid kits, can be added to polluted water. Use 32 drops of tincture of iodine per gallon of clear water, or 8 drops for a quart, and let it stand for 30 minutes before using. Double this amount if the water is cloudy. Tincture of iodine is not potent enough to kill GIARDIA.

- **Chlorine:** Hypochlorite must be the ONLY active ingredient in liquid household chlorine bleach intended for use in purifying water. Do not use granular or powdered forms of household bleach, as they are poisonous!! Add 2 drops of liquid bleach per quart of clear water, 8 drops per gallon, or one teaspoon for five gallons. Double this amount if the water is cloudy. Liquid bleach loses strength over time, and in just one year of storage the dosage must be doubled to be effective. Two-year-old bleach must not be used. It is not potent enough to kill disease-causing bacteria. After adding the proper amount of bleach to the water, stir and let stand for 30 minutes before drinking. Liquid bleach will kill most common forms of bacteria, but it is totally ineffective against GIARDIA and other hardy forms of protozoa.

- **Halazone Tablets:** Halazone tablets, the least effective method of chemically disinfecting polluted water, are available at most drug and sporting goods stores. If used, add four tablets per quart of clear water, and eight tablets per quart of water clarified from muddy water. Allow the tablets to dissolve, then shake the water and let it stand for 30 minutes before drinking. The shelf life for unopened Halazone tablets is only 5 to 6 months. If they are left in an opened package, they can lose their effectiveness within only 48 hours.

10. SANITATION

10.01 Introduction:

Proper management of toilet facilities and garbage during times of emergency may have a greater affect on your health than any other single element of sanitation. Bacterial infections such as typhoid and dysentery can be just as devastating as the earthquake or flood that caused the emergency.

10.02 Disposal of Rubbish:

In order to reduce bulk, cans should be flattened and bottles should be broken. Trash and rubbish may be burned in open yard areas or left at dumps established by local authorities. Dry trash and rubbish should be kept in separate containers from garbage.

10.03 Disposal of Garbage:

Garbage may sour, decompose, breed bacteria, or attract insects and small animals; rubbish (trash) will not. Garbage, or any mixed refuse containing garbage, must be carefully stored if odor and insect nuisances are to be prevented.

Store garbage in 20 or 30 gallon cans with tight-fitting lids until it can be properly disposed of.

If collection by authorities is not possible, garbage should be buried in a hole deep enough to cover it with at least 18 inches of dirt.

During times of NBC crises, it may not be practical to dispose of garbage immediately. If liquids are strained away, garbage may be stored for a longer period of time without the development of unpleasant odors. Wet garbage should be drained, wrapped in newspaper and placed in covered cans lined with heavy mill plastic bags.

Do not store garbage or human waste in airtight bags, as decomposing garbage produces gas that could cause the bag to rupture.

10.04 Disposal of Grease:

Grease should be handled separately from other garbage.

Prepare a grease trap in the following manner:

- Place burlap, straw, grass or similar filtering materials in a large box or barrel.
- Strain grease and dishwater containing food particles though the filtering material.
- Change the trap frequently.
- Prepare a pit with wood ashes, sand and gravel for outside use.
- Periodically clean the trap and burn or bury the accumulated grease.

An excellent chapter dealing with sanitation can be found in Crisis Preparedness Handbook, by Jack Spigarelli (available in the TACDA Store – http://www.tacda.org).

10.05 Chemical Toilets:

Camping toilets are fairly inexpensive and offer a good temporary solution for emergency use. Flush toilets require a great deal of water and water is usually at a premium during disasters. Store disintegrating toilet paper for portable flush toilets.

A temporary toilet can be made from a watertight container with a snug-fitting lid or cover (5 gallon plastic buckets work great). Line it with a garbage can liner or leaf bag. Mix one cup of liquid chlorine bleach to one half gallon of water (one to ten ratio - do not use dry or powdered bleach as it is caustic), or mix laundry detergent or other disinfectant with one half gallon of water and pour the mixture into the temporary toilet. Every time it is used sprinkle on a little more pine sol, chlorine, bleach, baking soda, alcohol, laundry detergent, ammonia, insecticide or other disinfectant to keep down odors and germs. Replace the lid tightly after each use.

When the container is one third to one half full, tie the garbage bag liner shut and empty it into a larger, covered container (such as a 10 gallon trash can). Each person requires approximately 5 gallons of waste storage space per week. In the event of most natural disasters, waste storage can be removed from the shelter area by the 2nd day and buried.

Never deposit human waste or garbage on the open ground. If you have no other alternative for disposal it is safe to bury waste in trenches deep enough that the waste is covered with 24-30 inches of dirt.

10.06 Latrines:

Latrines should be placed at least 50 feet downhill from any water source and well away from your living and food preparation areas.

A temporary latrine can be prepared by digging a hole one foot wide, two feet deep and two to four feet long. Place a toilet seat over the hole with privacy blankets or makeshift wooden sides surrounding the area.

To construct an outhouse for use up to two months, an average sized family will require a hole two feet wide, six feet deep and seven to eight feet long. Construct an insect-proof toilet box to cover the hole. Sprinkle lime on the waste before filling in the hole. Insect repellent, deodorizer, toilet paper and lime should be a part of every family's emergency supplies.

Where possible, install a septic tank with proper leech fields to backup the regular sewer system. Septic tanks can service a family for many years.

11. COLD WEATHER SURVIVAL

11.01 Cold Weather:

Winter weather poses many threats to human health and safety. Exposure to cold, vehicle accidents, fires, improper use of heaters and other winter weather hazards injure and kill many people every year.

Heavy snow can collapse roofs, close businesses, kill livestock, stop the movement of food supplies, cut off communications and damage power grids.

Large accumulations of snow can lead to avalanches. Avalanches normally occur within 24 hours of snowfall, and special caution should be taken in avalanche prone areas.

Freezing rain (also known as ice storms) is rain that falls onto a surface that has a temperature, which is below freezing. The cold surface causes the rain to freeze and become glazed with ice. Heavy accumulations of ice can topple utility poles and trees. Bridges and overpasses are particularly dangerous, as ice forms on these open surfaces before it forms on roads.

Cold weather occurs in every season of the year. Hikers, boaters and swimmers often go into the mountains or water unprepared for cool damp conditions, and succumb to hypothermia even during the summer time. Older people, in particular, are vulnerable to the effects of hypothermia.

11.02 Hypothermia:

Remember the STOP concept - STUDY, THINK, OBSERVE, AND PREPARE.

STUDY:

Everyone should be knowledgeable and alert to the signs and symptoms of hypothermia. Symptoms are observations the victim, himself, should recognize, and take action to correct. Signs are observed by others, who then should intercede in behalf of the victim.

Symptoms of hypothermia begin slowly and soon affect the person's ability to move and to think clearly. Once the core body temperature falls below 95 F, outside measures must be used to raise the body temperature to normal levels.

It is essential to keep a hypothermic person adequately hydrated and fueled. Carbohydrates are quickly released into the blood stream for a sudden brief heat surge and are recommended for quick energy intake. Sugars and sweet warm drinks are particularly helpful during the re-warming process.

THINK:

Symptoms you may experience if you are becoming hypothermic:

- Uncontrollable shivering (although, at extremely low body temperatures, shivering may stop).
- Weakness and loss of coordination

- Confusion
- Pale and cold skin
- Drowsiness – especially in more severe stages
- Slowed breathing or heart rate

Symptoms left untreated can quickly result in lethargy, cardiac arrest, shock, coma and even death.

OBSERVE:
Signs of hypothermia that can be observed by others:

- Slowing of pace, drowsiness, fatigue
- Stumbling
- Thickness of speech
- Amnesia
- Irrationality, poor judgment
- Hallucinations
- Loss of perceptual contact with environment
- Blueness of skin (cyanosis)
- Dilation (enlargement) of pupils
- Decreased heart and respiration rate
- Stupor

PREPARE:
Prevention

- Appoint an experienced person to watch the group for signs of hypothermia, and ALWAYS adhere to the hypothermia watcher's decisions.
- Get adequate rest and maintain good nutrition and hydration before and during cold weather activities.
- Consume adequate high-energy foods and liquid during cold weather activities.
- Wear well-insulated, breathable wind resistant clothing.
- Carry emergency bivouac (shelter) equipment
- Make camp early in a storm, or if lost, injured, or tired.
- Exercise to keep up the body's heat function.
- Carry proper clothing, footgear, and emergency equipment for the worst expected conditions.
- Take IMMEDIATE corrective action for signs or symptoms of hypothermia.

Treatment
To reduce heat loss:

- Shelter victim from wind and weather
- Insulate victim from the ground
- Remove any wet clothing and replace with well-insulated, breathable, wind resistant garments
- Place a warm hat or covering around the head and neck areas.

To add heat:
- Increase exercise, if possible
- Put victim in pre-warmed sleeping bag or blankets
- If the patient is conscious, give them warm drinks, followed by candy or other high-sugar foods.
- Apply heat (warm water bottles, heat packs) to neck, armpits, and groin areas.

11.03 Frostbite:

Frostbite often sets in as hypothermia progresses. It most frequently affects fingers, toes, earlobes and the tip of the nose.

Frostbite occurs when blood flow to the outer layer of skin decreases to direct the blood to the brain and other vital organs. If the core body temperature is warm, however, frostbite seldom is a problem, as circulation to the frostbite prone areas is not diminished. If is often said, "If your feet are cold, put on a hat!"

Symptoms of frostbite:
- Gradual numbness
- Hardness to the skin
- Pale color to the affected area
- Pain
- Tingling or burning
- Blisters

Treatment for frostbite:

Minor frostbite can be treated at home, provided no tissue has died or been irreversibly damaged. Mild cases of frostbite will begin to heal immediately. However, if skin color is deep purple or black or skin begins to blister, seek medical attention immediately.

- **NEVER massage an area affected by frostbite.**
- **NEVER use hot water to warm the skin once frostbite is apparent. Hot water will cause further injury.**
- **NEVER walk on frostbitten feet.**
- **DO not use stimulants if you fear frostbite. Nicotine and caffeine will only make tissue damage worse.**
- **Seek shelter.**
- **After reaching shelter, remove clothing from frostbitten areas of skin.**
- **Immerse affected areas in warm water measuring 100 F.**
- **Drink warm fluids with high sugar content.**
- **After warming, cover affected areas with cloth bandages.**
- **Minor pain should be treated with over-the-counter pain relievers, such as acetaminophen.**
- **Keep the damaged area raised.**

11.04 Vehicle accidents:

The leading cause of death during winter storms is automobile and other transportation accidents.

If you are required to travel in hazardous winter weather, check the weather reports regularly and avoid traveling in a winter storm. Plan your trip carefully and notify two people of your destination, your route and your estimated time of arrival (ETA). Plan to travel during the daylight hours and take another person with you if possible.

Make sure your car has been properly winterized

- Good tires (adequate tread)
- Antifreeze
- Snow and ice removal equipment
- Chains for tires
- Full tank of gas
- Bag of sand for traction
- Disaster supply kit (72 hour kit)
- Extra supply of water
- Extra flashlight, lights and batteries
- NOAA radio receiver
- Cell phone or two-way radio (fully charged batteries)
- Extra warm clothing and blankets

If you get stuck, stay with your vehicle

- Display a trouble sign or hang a red cloth from the antenna
- If it is not snowing, raise the hood of the car.
- Clear snow from around the exhaust pipe
- Open a 'down wind' window for ventilation.
- Run the car and heater 10 minutes every hour or 5 min. every half hour to keep warm.
- Turn on an overhead light and blinker while engine is running.
- Avoid overexertion and drink plenty of fluids (avoid alcohol and caffeine)
- Exercises lightly to keep up circulation
- If you are with another person take turns sleeping (one of the first signs of hypothermia is sleepiness-if not awakened periodically to increase body temperature and circulation you may freeze to death)
- Huddle together for warmth

11.05 Prepare to survive severe cold weather and winter storms at home:

Exhaustion and heart attacks: Pace yourself carefully when shoveling walks. Be alert to the needs of elderly or handicapped neighbors.

Hypothermia and asphyxiation: 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: These occur more frequently in the winter because of the lack of proper safety precautions when using alternate heating sources. Fires during the winter present a greater danger because water supplies may freeze and it may be more difficult for firefighting equipment to get to the fire.

11.06 Before, During and After Winter Storms:

Remember the PEP concept - PLAN, EQUIP & PRACTICE

What to do before cold weather or winter storms arrive

PLAN:

- Proper ventilation is very important. Never operate an un-vented fuel burning appliance in any closed room.
- Make sure your home is properly insulated. Add insulation where needed (Attic, walls, etc.).
- Learn the proper procedure for shutting off the main water valves and draining the outside faucets.
- Make a plan to properly care for your pets. They will need a protected food supply and non-frozen water.
- Learn the location of public shelters in case you lose heat or power.
- Plan an evacuation route and alternative routes to your home or shelter.

EQUIP:

- Store food and water supplies for at least seven days (not including 72 hour kit).
- Purchase a battery operated radio or television or NOAA Weather Radio with the Specific Area Message Encoder feature. (SAME)
- Be sure you have an adequate supply of heating and cooking fuel.
- Purchase a warm coat, hat, gloves, boots and extra blankets for each member of the family.
- Install smoke alarms and carbon monoxide alarms.
- Keep a supply of non-clumping kitty litter for walkways and steps. Kitty litter improves traction on icy surfaces and will not damage vegetation and concrete.

PRACTICE:

- Hire a professional to inspect and clean fireplaces and wood burning stoves (chimneys) and keep an ample supply of fuel.
- Inspect your fire extinguishers for function and adequate sizing.
- Check your Disaster Supplies Kit (72 hour kit), and upgrade if necessary.
- Protect pipes from freezing by wrapping them with insulation or layers of newspaper, and then cover them with plastic to keep out the moisture.

What to do Immediately Before & During the Storm

- Listen to NOAA weather radio or local radio or television for updated weather reports. The reports may not be exact for your particular area.

- Bring companion animals inside before the storm starts.
- Eat regularly and drink liquids to keep the body hydrated.
- Conserve fuel. Winter storms can last for days. Electric and gas services may be disrupted when many people demand large amounts at the same time.
- Lower the thermostat to 65 F (18 C) during the day and 55 F (13 C) at night.
- Dress warmly in layers.
- Stay inside if possible and stay informed.

What to do after the storm

- Avoid overexertion. The strain from the cold and hard labor could cause a heart attack. Sweating could lead to chilling and hypothermia.
- If you must go outside, protect yourself. Wear layered clothing, gloves and a hat. Half of you body-heat loss is from the head and neck area.
- Walk carefully on stairs and sidewalks, as they may be icy. Cover your mouth to protect your lungs.
- Check on relatives, friends and neighbors, particularly if they are elderly or live alone.
- Remember the dangers of wind chill. Wind chill is not the actual temperature, but rather how wind and cold feel on the exposed skin. As the wind increases, heat is carried away from the body at a faster rate, driving down the body's temperature. For example, at 2 F, with a 15 MPH wind it will feel and act like minus10 F.
- Use caution if power has been lost. Carefully inspect perishable foods. If in doubt, throw it out.
- Do not re-freeze foods that have totally thawed.
- Refrigerated foods should be eaten first, then food from the freezer as it thaws, and then packaged or canned foods.

11.07 Cold Weather Clothing:

Jim Phillips of Spring City, Utah has designed a system of cold weather clothing, which can easily be constructed from open cell polyurethane foam. This system of clothing has been tested to sub-zero temperatures.

In 1987, former Apollo astronaut James A. Lovell Jr. wore a suit of Jim's design as his primary clothing during a trip to the North Pole, where the typical wind chill was minus 90 F. "It worked very nicely," Lovell reported, "but sometimes it got too warm, especially if I hiked a long way."

Jim has shared his technology with survival minded folks all over the world. Many people make their own clothing and boots.

The foam should be lined with a synthetic material such as nylon or polyester mesh. This lining should cover both sides of the foam. Otherwise, the foam becomes uncomfortable to the skin. Any pattern can be used. Choose a pattern one size larger than normal for the foam. Make sure the sleeve holes are cut generously. The outer shell should be unlined and constructed of a breathable material, which acts as a wind barrier. It should not be waterproofed, as this would

trap moisture inside. Test for waterproofing of the outer shell by holding it to your mouth and breathing through it. You should be able to force air fairly easy if it is not waterproofed.

For most sub-zero winter wear, a 3/4-inch layer of foam is adequate for the body and 1/2 inch for the sleeves. Hats should also be made from 3/4-inch foam. For arctic conditions, Jim suggests a 1-inch layer of foam for the entire body.

Sleeping bags requires 2 inches of foam and must include a closed cell polyurethane mat underneath the open celled layer. These closed cell mats can be purchased in any store where camping items are sold.

Boots should be made of 1-inch foam with the closed cell mat underneath. Old 'moon boots' can be taken apart and the bottom used for the sole. The outer layer is constructed from a tube shaped piece of lightweight canvas. It should reach about 12 inches above the sole. Holes should be punched in the sides of the rubber sole and the canvas should then be hand-stitched to the sole. The lined foam is pushed into the boot and the boot is closed with Velcro straps.

In an emergency, foam mattress pads (egg carton style) can be used. Keep a mattress pad rolled up in your car trunk for cold weather emergencies, with heavy-duty scissors and duct tape to build the emergency clothing.

Open cell polyurethane foam, unlike conventional fibrous insulating materials (which tend to catch moisture wherever neighboring fibers cross each other) allows the escape of moisture from the body. We call this 'the ability to breathe'.

Moisture transfers heat 25 times as fast as dry air. Cotton holds moisture and is the worst available insulation. Wool and down hold moisture. Layers of clothing have a moisture accumulation problem as moisture accumulates between the layers.

Open cell polyurethane is the best possible insulator. Closed cell polyurethane does not breathe. The pockets of still, dry air contained in the foam insulation retain the wearer's body heat while allowing perspiration moisture to escape quickly. This outward flow is driven by a differential vapor pressure that the suit sets up between its warm moist inner lining and its cold, dry outer shell.

12. EVACUATION & 72-HOUR KITS

12.01 Introduction:

There are many reasons it may become necessary to evacuate your home, school or workplace. Some evacuations occur as a result of an escalating crisis, such as for an approaching hurricane. Others occur quickly, as from chemical spills or terrorist threats. Some may be ordered by civil authorities and others may occur by our own volition.

In the event of an evacuation, be prepared to provide for your own bare necessities for at least three days. A properly supplied emergency 72-hour kit would provide comfort, warmth, food, first aid, sanitation and shelter for that three-day period.

In most instances, the crisis will either end, or civil authorities will respond by the end of that time. There are circumstances, however, such as a major national crises, when people might be left on their own for a substantial period of time.

12.02 Choosing not to Evacuate:

Evacuation would almost never be necessary if all-hazard shelters were installed throughout the nation. Countries such as Switzerland do not have Civil Defense evacuation contingency plans, as 100% of their population can reach underground shelters within just a few minutes.

Underground shelters would provide protection from hurricanes, tornados, earthquakes, wild fire, winter storms, high winds, chemical/biological warfare, and nuclear attack. Properly installed shelters should never be placed into a flood zone; therefore, even flooding is not an issue.

The shelters would provide warmth, safety and protection from the elements, and should be stocked with radios, food, water, clothing and medical supplies. Valuables could quickly be brought into the shelter for safekeeping. People in shelters would then become part of the solution, instead of part of the problem.

12.03 Plan, Equip & Practice (PEP):

In order to properly prepare for an evacuation, we must remember our PEP concept- PLAN, EQUIP and PRACTICE.

PLAN:

- Complete a careful risk assessment of the potential disasters that may require an evacuation of your home, school or workplace. Consider both probability and consequence of these events.
- Include your children in the assessment and planning process.
- Plan for both immediate evacuation and longer, more organized evacuation.
- List items that you would want to save if there were time, in the event of an approaching hurricane or wild fire (valuable books, records, deeds, journals, pictures, etc.).
- Plan what routes the children should take if they were sent home in an emergency. You will want to know where to look for them, if they have been detained.

- Request a copy of the emergency plans the school currently has in place for various disasters. Ask if the children will be bussed, or if you need to pick them up.
- Ask two trusted neighbors to pick up your children for you in the event you are not available. Leave these instructions (with their names and contact information) at the school office.
- Prepare a 24-hour pack for your children and ask the teacher to store it at school.
- Choose more than one destination. Homes of friends and family members should be among your first considerations. Ask their permission, and if possible, pre-position supplies at their location.
- Plan alternate routes to your destination.
- Plan stopping places (way points) every 5 to 10 miles along your intended route, to allow stragglers to catch up. Citizen band radios give good coverage for these short distances.
- You may become separated from your companions or family members. Make sure you provide each with specific directions of where to go and who to contact so that you can be reunited.
- Winds: Many disasters (chemical spills, fire and radiation) require that you travel perpendicular to the wind patterns. Chemicals, smoke and radiation from a "dirty bomb" would travel with local winds. Radiation from a nuclear fission weapon would most likely travel with the prevailing winds. Prevailing winds normally flow from west to east, requiring that you evacuate to the north or to the south.
- Teach everyone how to turn off the utilities (with the reminder that this is to be done, only if directed to do so by the authorities).

EQUIP:

- Keep your car at least half full of gasoline at all times.
- Prepare a 72-hour kit for each member of the family, according to their personal needs. Most people keep their kits in their car.
- Prepare other items for specific emergencies, and place them where they can quickly be accessed.
- Keep your 72-hour kit to a size that can easily be carried. People in good shape should be able to carry one-fourth to one-third of their body weight.
- Check and refresh your kit with each change of season.
- Leave a crescent wrench in a pre-determined location, for turning off utilities.
- Place flashlights near each bed and purchase a battery-powered radio. Rotate the batteries twice yearly at the change of daylight savings time.
- Place sturdy shoes, socks, long pants, long sleeved shirt, and appropriate outer clothing for each person in a designated place.
- If you live in an area prone to hurricanes or tornadoes, pre-position wood and tools to board up windows and doors against high winds.
- Purchase an evacuation packet with bar-coded identification bands for your pets and each member of the family.
- Purchase a 2 weeks supply of food for your pets, in the event that they must be left behind.

PRACTICE:

- Walk with your children on their planned route home from school.
- Remove all items from your 72-hour kits and evaluate their usefulness at each change of the seasons.
- Talk about different emergency situations and play "what if".
- Surprise the family with an unannounced evacuation exercise.
    1. Place ID wristbands on each person.
    2. Place ID collars on your pets.
    3. Alert others to your intended destination by phone or written note:
    4. Turn on your radio and act as if you are listening to the latest information on evacuation routes.
    5. Quickly dress in the long pants, long sleeved shirt, sturdy shoes, hat, & jacket that were previously gathered.
    6. In a real emergency, you may be advised to turn off your utilities. Remember, however, when you turn off your gas it must remain off until your local gas company turns it back on for you. If certain safeguards are not followed, there could be a risk of explosion.
    7. Secure your home. Close & lock doors and windows, unplug appliances. In an actual emergency you may need to drain your water lines if there is freezing weather.
    8. In a real emergency you might also need to board up windows and doors in the event of tornados, hurricanes or high winds.
    9. Quickly grab your 72-hour kits and other items you need and leave the home.
    10. Take the pre-planned evacuation route. In an actual emergency, however, follow the direction of the local authorities as they may have routes designated for the evacuation.
    11. Upon return, turn on your utilities (except for the gas). Turn on only one appliance at a time.
    12. Discard thawed foods and check all refrigerated food for spoilage.
    13. Carefully evaluate the exercise, and adjust your plans accordingly.

12.04 72-hour Kits

72-hour kits should match the anticipated crisis. People in areas prone to wild fire would prepare differently from those living in flood-prone areas.

Consider your 72-hour kit for use in the short term to reach long-term survival.

Earthquakes may result in closed and impassable roads. The 72-hour kits should be light enough to carry. Most people can carry one-third to one-fourth of their body weight. The items in the kit, therefore, must be chosen carefully. Commercial kits may not meet your particular needs, and you may need to add or remove items accordingly.

Some disasters result in long-term re-location. People in those potential areas should think well ahead of time, to pre-position supplies at another location.

12.05 Kit Containers

Backpacks make excellent 72-hour kit containers. Boxes or filled buckets would be difficult to carry. An empty bucket, however, can be strapped to a backpack and becomes very useful in a number of situations.

Dress according to the weather. Prepare for the coldest temperatures that you expect. Store foods that can be eaten without cooking.

Do not leave personal information in the car-pack (such as birth certificates, names on pictures, SS numbers, and full names on telephone numbers). Do gather this information and put it in one location in your home so that you can grab it quickly in an emergency.

12.06 Kit Items:

There are some general items that should be considered for the 72-hour kits. Some items (those in **bold**) should be in every kit. Other items can be used by the entire group, and may not need to be duplicated. Use these suggestions only as a guide.

72-Hour Car Kit Suggested Items

- **Purified water (2 liters/person)**
- **Food, (3 day supply requiring no cooking)**
- **Blanket, sleeping bag or emergency metallic space blanket**
- **Large plastic garbage bag, poncho or rain gear**
- **Eating utensils, can opener**
- **2 rolls toilet paper**
- **Compass, mirror, whistle**
- Small 2-man tent
- Small water filter or iodine crystals
- Flashlights (extra batteries & bulb)
- Sharp knife
- Matches, light sticks
- FRS or small transistor radio with extra batteries
- Rope (20 lb test min.), fish line, hooks
- Leather gloves, dust masks
- Personal Items:
    - Shower cap (to keep fallout out of your hair)
    - Chapstick, hairbrush, hand lotion
    - Feminine supplies,
    - Toothbrush & toothpaste
    - Soap, washcloth, small towel, razor
    - Extra eyeglasses (even if you wear contacts)
    - Baby wipes, deodorant
    - Change of clothing, jacket, shoes, socks, underwear, hat
    - Infant needs, if necessary
    - Family pictures

- Important telephone numbers
- Paper, marker, pencil, money
- First aid supplies & essential medications
- Over counter meds (Benadryl, Imodium Calamine lotion, Aspirin, Decongestant
- Insect repellant, sun screen
- Bandages, antibiotic ointment
- Needle, tweezers, scissors
- Triangular bandages, gauze, elastic bandages
- Hot pack, cold pack
- CPR face mask, rubber gloves

This is a fairly complete kit. Items in **bold** are considered necessary.

FROM THE WEB SITE OF MEDICAL CORPS
Chuck Fenwick
http://www.medicalcorps.org

Evacuation Planning
Radiation, Biological or Chemical events (accidents or attacks) may make it necessary to evacuate because of the long-term danger. Your state has an evacuation plan. You should have one too in case theirs becomes unworkable.

How your local or state government will tell you to evacuate:
- You will hear from the local police, emergency management, or other government agency by radio or television that you need to evacuate your area.
- Pay attention, if there is a "severe" terror alert, your area may execute an evacuation order.

How to Respond to Local Evacuation Plans:
- Quickly follow the instructions of the local emergency management. Local authorities could give you specific instructions to follow for a specified situation.
- Emergency Management may direct you to evacuate your home or workplace and go to a designated shelter. If you have children in school, they will either be sheltered at the school or in some other designated shelter.
- Emergency Management will tell you what emergency supplies you may bring. Be sure to bring any medications you are taking. Emergency Management will let you know when it is safe to leave the shelter.

Making Your Own Evacuation Plan
Ultimately, you are responsible for your own safety. If, because of a disaster, local government cannot respond, then you need to make your own evacuation plan.
Where to go?
- You should select more than one place to go in case your number one choice is in harms way.
- You may need help; therefore family and friends should be your destination. Talk it over with them first and find out if they have plans too.

How to get there?
- Roads may be impassable with jammed traffic or because the surface is damaged.
- Get a map and determine what side-roads can be used for your evacuation. You may end up walking so too much gear to carry will be a problem---think light and compact.

Communications:
- You may become separated from your companions or family members. Make sure you provide each with specific directions of where to go and who to contact so that you can be repatriated. Without this contact information it can take months to find your loved ones.
- Radios (if they can still operate) will help from becoming separated. Simple hand-held "walkie talkies" will keep you in communication with companions who might be just out of sight and your communication will keep them from getting lost.

Waypoints:
"Way-points" is a term, which means stopping-places along your intended route. It helps you manage your evacuation AND it is an along-the-way gathering place for stragglers.
- Pre-determined waypoints of 5 to 10 miles along the route are workable for a journey.
- Security is another word for staying safe from harm. Harm can come in the form of humans, or animals.
- At the very least, carry pepper spray. It does no permanent harm. If you are threatened, or feel you are in danger - spray first and apologize later--if you make a mistake!

13. COMMUNICATION

13.01 Introduction:

Reliable information during a disaster or escalating crisis is paramount to survival. People need to know the scope of the disaster. They need information on evacuation routes and where to find food, water and medical help; and they need to know when and if help is arriving. Two-way communication (receiving and transmitting) is necessary in order to facilitate and mitigate the needs of the disaster victims.

Depending on the scope of the crisis, the communication systems we normally rely upon may become unusable. Home phones become overloaded or unusable in many disaster scenarios. Hurricanes and tornados could cause power failures, and without alternative power sources, cell phones and other battery dependent systems could not be recharged. Earthquakes could destroy repeater stations. An electro-magnetic pulse has the potential to destroy all unprotected circuitry.

Many past and recent experiences confirm that we cannot rely on traditional communication systems during emergency situations. We must, therefore, familiarize ourselves with alternative communication equipment and technology.

If we are serious about survival we should consider obtaining an Amateur Radio License (otherwise known as a Ham license), which will provide us with a legal means to "train on the job", for communications skills needed in the future. These skills will help us set up, maintain, protect and operate ham radio equipment. Means other than amateur radio do exist for communications, such as citizen's band radio (CB), GMRS radios and Family Radio Service (FRS). We will visit these options later in this lesson.

13.02 Basic Communications Considerations:

The basic requirements for setting up an amateur radio station are the radio, the power supply and the antenna. Almost all current technology ham radio equipment operates on 12 volts direct current (DC), which is the DC standard voltage.

Ham radio gear is available in many designs and frequencies. The very high frequency/ultra high frequency (VHF/UHF) radios are generally the most inexpensive of the ham radio equipment. They are available in handheld or mobile-portable units.

The benefits are:

1. They are small and compact, and offer the availability of hand held units.
2. They tend to be low in output power and low in power consumption
3. The antennas tend to be smaller in physical size.

They do have limitations:

1. Their range is limited to line of sight, unless a repeater is accessed. Line of sight can give ranges of a few miles to tens of miles.

2. Repeaters are used to extend coverage of VHF/UHF radios. Repeaters may fail due to lack of power or destruction from an EMP, as most of these facilities are generally not hardened to an EMP event.

The alternative to the VHF/UHF radios is High Frequency (HF) radios. They are generally larger and need larger antennas than their VHF/UHF brothers, but have the following advantages:

1. They can have ranges from tens of miles to thousands of miles.
2. They can operate on many frequencies. This enables the signal to reach a variety of distances, depending on the propagation of the signal. (Propagation is the ability for the signal to bounce off of the upper atmosphere).
3. They do not rely on a repeater.

In an EMP event, equipment operating above 100 MHz is theoretically more resistant to the pulse, as most of the electrical energy in an EMP resides below this frequency.

13.03 Power Supplies:
Purchase deep-cycle or gel-cell batteries to power radio equipment. These batteries are designed for multiple charge-discharge cycles, and can be recharged successfully many times from a very low charge state.

Batteries from automobiles, boat's and RV equipment could be used in an emergency for powering radio equipment; however, these starting style batteries do not like to be constantly drained and recharged and were not designed for that purpose.

You will need a power source and a battery charger to maintain your deep cycle batteries. Gel-cell batteries require a special charger and should not be charged from a regular deep-cycle battery charger.

Solar Panels:
Solar panels are often used to charge batteries. They will require a regulator to keep the batteries from being over charged. Solar panels with a charge value of at least 15 watts are needed to maintain a battery reasonably well. The higher the charge rate, the better the charging.

Deep Cycle batteries could also be used to power inverters to enable the operation of equipment on 120 volts AC.

Generators:
Generators are often used to run equipment and charge batteries. Generators require a good stock of fuel. Fuel, however, is usually scarce and not readily available during a disaster. If a generator is used, it must be used sparingly. Operate it for only a few hours a day and limit its use to critical equipment. In major emergencies, generator power should only be used to charge batteries, and batteries should only be used to run communication equipment and emergency lights. Review the lessons on winter survival and cooking with alcohol.

Other power supplies will be discussed in the "Alternative Fuel & Power" lesson.

13.04 Radios:

There are many radios on the market, both new and used. It would be advisable to consult a ham that is familiar with Civil Defense requirements to assist in purchasing your radio. Manufacturers such as Icom, Kenwood and Yaesu provide new and used equipment that is reliable and maintains value. Used equipment should be fully tested to confirm reliability for emergency situations. Be advised that used handheld VHF/UHF equipment may have batteries that are no longer functional, and new rechargeable batteries can be very expensive. Most of the latest HF equipment will operate on multiple frequencies through 30 MHz. This will include all Ham frequencies, the AM broadcast band and shortwave frequencies, enabling you to tune into international shortwave broadcasts for news and information. Also, many HF radios have an antenna tuner, which is very useful when using expedient or problematic antennas. Some of these HF radios can be modified to operate on non-ham frequencies and split frequencies for transmitting and receiving, such as is required by the Military Affiliate Radio System (MARS) and other emergency related services.

Older ham radios utilized vacuum tubes, which are more resilient to the effects of an EMP (Electromagnetic Pulse). They do, however, consume more power than the newer solid-state equipment.

13.05 Faraday Cages:

Faraday cages should be used to protect all emergency radios from the effects of an EMP. Any metal container will act as a Faraday cage. However, good metal-to-metal contact is imperative. Remove all gasket material from the lid. If the container has been painted, make sure to remove the painted area around the lid with sand paper.

Build a simple faraday cage from a small metal garbage can and lid. The lid must fit snugly over the can. If the lid does not make good metal-to-metal contact, the open area could act as a 'slot antennae' and allow EMP to damage your equipment. To further protect your equipment, purchase a metal screen about 6 inches wide and as long as the circumference of the can. Fold the metal screen in half, length wise, and place it around and over the lip of the garbage can. The lid should then fit snugly against the screen and garbage can, protecting all equipment contained inside.

13.06 Antennas:

A radio antenna is a device designed to do two things: It captures radio frequency signals from other radios and sends them to the receiver which converts them into electrical signals that you can hear; and second, it takes electrical signals from the transmitter as you speak and converts these signals into radio-frequency signals to be radiated to other listeners. The antenna works best when the length of the antenna is precisely the same as the wavelength of the radio frequency you are using. This is called the "resonance frequency". Antennas can also be cut to the size of a half-wave or even to a quarter of the wavelength you wish to use.

During an emergency, antennas that have been used for normal operations may become damaged or unusable. Simple emergency antennas such as "Dipoles" and "Inverted V" antennas can quickly be assembled if parts are readily available and the construction concepts are understood.

Dipole Antennas:
The dipole antenna looks like a "T", with the two legs of the antenna forming the top and the feed line forming the base. Two legs are cut to the desired resonant frequency and separated by insulators. The coaxial signal feed line connects to the antenna legs through the insulators. The two legs are placed horizontally and the feed line is placed vertically.

Inverted V Antennas:
An "Inverted V" is similar to a dipole, except that the legs of the antenna form an inverted V with the feed line and extend downwards toward the ground. The mathematical formula to calculate the resonant frequency for these two antennas is 466 divided by the desired frequency in megahertz (MHz). This length, in feet gives the total length of wire required to assemble the antenna. The length is cut into equal halves, which then becomes the 2 legs of the antenna. For example, an antenna for 3.9 MHz would be calculated as follows: 466/3.9 = 119 feet. Cut that length into two equal parts, or 59.5 feet each.

Vertical Antennas:
A vertical antenna can be constructed using the same formula, except use only one "leg" or quarter wavelength. The antenna must extend vertically from the ground. The antenna itself is isolated from the ground, with the center conductor of the coax attached to the metal tube or wire, and the shield attached to a ground rod. See Antenna Diagrams 7.36.

Antennas seem to always work better the higher they are erected. In an emergency situation, the ideal height may not be obtained. Put the antenna feed line as high as possible.

If you choose to get your Ham license, you will learn basic antenna theory.

13.07 Obtaining an Amateur License:
In order to receive your Amateur Radio license, you must have a basic working knowledge of the FCC regulations of communications, equipment and operating procedures. If you are totally unfamiliar with ham radio, it can be a little overwhelming, as you will be required to take a test to verify that you understand the concepts.

The best way to learn this information is to attend ham radio classes sponsored by local ham radio clubs. Another way is to have a friendly ham radio operator (an "Elmer") help you. My "Elmer" sent me to a class sponsored by a ham radio club.

If you are capable of self-study, there are several publications that can assist you. Radio Shack sells a book called "Now you are talking", and the ARRL (Amateur Radio Relay League) publishes various manuals to assist you in your radio quest. The Internet is also a very good resource for ham radio information.

13.08 CB Radios:

Citizens Band radios operate in the 11-meter band range. There is no FCC licensing required for CB radio use. There are 40 channels available for use. Channel 9 is limited for emergency communications or road assistance.

CB Radio operators normally transmit double sideband AM on the first 23 channels. On channels above Channel 23, upper sideband or lower sideband equipment may be used. The FCC limits the carrier power to 4 watts on the AM channels and 12 watts on the SSB channels. You may only use a type-accepted CB Radio transmitter. Any internal modification to a type-accepted CB Radio transmitter cancels the type acceptance, and use of such a transmitter voids your authority to operate the station. Power amplifiers are specifically disallowed for use with a CB Radio.

The 23 AM stations are often used by truckers and are shunned by many people because of the over crowded airways and the static interference. The range of CB radios is about 10 miles, which is significantly longer than the range for FRS and GMRS radios.

The FCC allows CB antennas of a maximum of 23 feet above the highest point of the building or tree on which it is mounted. The highest point of the antenna must not be more than 60 feet above the ground and there are additional restrictions for areas around airports.

An excellent source on FCC regulations for CB users can be found on the internet at http://home.att.net/~wizardoz/cbmw/fccrules.html.

13.09 CB sideband (SSB) radios:

CB sideband radios (SSB) are excellent radios for emergency use. They are very inexpensive and within the budget of most families. Fewer people use the sideband radios and it is easy to find unused airspace. The long range of CB band radios allows for links covering massive areas.

CB Nets:

FCC rules allow for Civil Defense use on CB radios. SSB radios can be used to link stations for organized cb nets. The people in the net cannot all talk to each other, but information can be linked and repeated throughout the area. The net leader should have an amateur radio license with a higher-powered radio that will access the CB bands. The Ham will then transmit on the CB wavelength to the people in the CB net. Many CB nets have chosen upper sideband radio equipment for use in their nets.

CB Net maps:

The individuals on the CB net should all be provided with a special map with grid lines using the alphabet for one direction and numbers for the other (such as m3 or some other set of numbers). The grid numbers for the participants' base location on the map will become their call sign (otherwise known as their "handle") and they will participate in the net using that number. This provides privacy and protection to the participants, as the map will be unique to participants in that chapter and other people listening on those frequencies will not have the same map.

Valuable information (such as blocked evacuation routes, road damage, radiation levels, emergency needs) can then be gathered from many sources that would otherwise be unavailable to the Ham operator. The Ham radio operator can then relay this information to CB nets in other locations. Local CB nets could be linked to other nets throughout the nation using this method.

13.10 FRS Radios:

Family Radio Service (FRS) radios are little handheld radios similar to walkie-talkies. They operate in the ultra high frequency (UHF) band and are not prone to the interference experienced on CB radios. No license is required to use the FRS radios and airtime is free. FRS radios operate on any of 14 dedicated channels (1-14) designated by the FCC expressly for FRS radio usage. FRS radios have a maximum allowable power of 0.5 mill watts (or 1/2 watt). They are very low power, but can be a good source of short distance (one or two miles) communications.

13.11 GMRS Radios:

There are 8 dedicated channels (15-22) designated by the FCC for the GMRS radios. Typical power ratings are between 1 and 5 watts with a maximum allowable power of 50 watts. An FCC operator's license is required for GMRS use. Their range is similar to the FRS radio; however, these radios can be outfitted with optional antennas to extend their range up to 5 miles.

13.12 Broadcasting Stations:

In a major disaster, knowledgeable amateur radio operators may wish to set up a small AM or FM Broadcast Transmitter. This service could provide "broadcast" communications to a group in a small regional area in the event normal communications was off the air. These transmitters are available from electronic hobbyist suppliers. Licensing may be required.

13.13 Review:

1. Significant emergency events will cause communications failures. We must consider means to communicate during an emergency.
    - Amateur Radio is ideal, it requires training, testing and licensing.
    - Citizens Band (CB) and Family Radio Service (FRS) are simple, short-range alternatives to Amateur Radio.
2. Amateur Radio allows the radio operator to select HF-VHF-UHF frequencies.
    - HF frequencies can provide reliable long distance communications frequencies.
    - VHF-UHF can provide reliable short distance communications.
    - Repeaters can extend VHF-UHF range, but are likely to fail during an emergency crisis.
3. Alternative sources of power must be provided to operate emergency communications equipment.
    - Equipment must operate on batteries that can be stocked and replaced, or rechargeable batteries.
    - If equipment runs on 120 volt AC power, a generator must be obtained and maintained.
    - Most modern communications equipment will run on 12 volts DC, storage batteries can be used and charged. Solar panels can be used for charging.

4. There are many options and types of radios.
    - Emergency radios should be procured and protected.
    - A radio should be stored in a metal-shielded container to protect it from possible Electromagnetic Pulse.
    - Tube radios are more likely EMP proof, but consume more power.
    - In order to be prepared, you must purchase a radio, and learn how to use it.
5. Learn how to set up and build an antenna.
    - Keep the components on hand for building an emergency antenna.
    - The dipole-vertical length formula is 466/frequency in MHz.
6. Studying for and testing for an Amateur License will enable you to become proficient in communications.
    - Contact a local "ham" club to find out about classes or help.
    - The Internet is a great resource for amateur radio information.
    - The book, "Now you are talking", sold at Radio Shack is a great resource.
7. Citizens Band Radios and Family Radio Service Radios are an alternative to Amateur Radio.
    - CB, FRS and GMRS radios can provide short-range communications as an option or alternative to Amateur Radio.
    - CB Upper-Sideband radios have better availability to airspace.
    - Upper sidebands can extend the use of Ham nets.
    - TACDA chapters can organize CB nets using upper sideband CB radios.
8. A small AM or FM Broadcast Transmitter can provide "broadcast" communications to a group in a small regional area.
    - Licensing may be required.
    - Mostly only an option after a disaster where conventional broadcast stations may be off of the air.
    - Available usually in kit form from electronic hobbyist suppliers.

14. ALTERNATIVE ENERGY & FUEL

14.01 Energy:

Our access to normal sources of energy can be disrupted by a disaster and we should therefore plan to provide for critical energy needs. Relatively inexpensive and simple equipment and supplies can help us address critical needs when normal sources are disrupted.

14.02 Electricity:

Electricity is probably the most important type of energy we need after a disaster to provide for critical lighting and communication needs. A small DC power system can address most of these requirements.

In order to decide how much energy is needed we must understand how energy is measured when it is produced, stored or used. In order to understand this we will have to define some terms:

- **Amperage (Amps)** - the amount of electricity (electrons) that flow through a given electrical circuit per unit of time
- **Voltage (Volts)** - the energy associated with each electron as electricity flows
- **Wattage (Watts)** - unit of power defined as volts x amps which is a measure of power or energy usage per unit of time
- **Watt - hour** - the amount of energy that is used by powering a one-watt piece or equipment for one-hour. We are normally billed for electricity by the kilowatt-hour which is a flow of 1000 watts for one hour or 100 watts for 10 hours, etc.

To illustrate the previous definitions we will address some practical problems:

Problem 1: How long can a 0.5 amp 12 volt light run on a 100 amp-hour 12 volt lead acid battery?

First of all, we do not want to totally discharge a 100 amp-hour lead acid battery so we will only plan on using 50 amp-hours before charging the battery.

50 amp-hours/ 0.5 amps = 100 hours

The battery will store enough energy to power a 0.5 amp light for 100 hours.

Problem 2: How long can the same battery operate a 50 watt light bulb?

50 amps hours x 12 volts = 600 watt (amp x volts) hours capacity
600 watt hours/50 watts = 12 hours

The battery could only power a 50-watt bulb for twelve hours.

Problem 3: What size solar panel would be required to power a 50 watt bulb for 4 hours each night?

A solar panel can be expected to provide its rated output for an average of 6 hours per day when cloudy day's indirect lighting during morning and evening hours and seasonal variations are taken into consideration. This varies with climate and latitude.

50 watts x 4 hours = 200 watt-hours
200 watt-hours/6 hours = 33.3 watt solar panel

When inefficiencies in battery storage and power conversion are taken into account, a 40 watt solar panel would be required.

Critical needs for electricity would be for lighting, communication, and even entertainment. Small rechargeable batteries are ideal for most lighting and communication needs. With the current availability of light-emitting-diode (LED) lighting a personal flashlight can operate hundreds of hours on a set of 2000 milliamp-hour (mAh) batteries with one charge. Small AM, FM or shortwave radios can operate many hours on a set of similar rechargeable batteries. Ham radios can also be operated in the receive mode on a few watts of power with up to 100 watts being required for transmitting. There are many types of battery operated equipment that might be used. It is up to the individual to choose good quality equipment along with enough redundancy to ensure that critical needs will be met.

14.03 Electrical Generating Equipment:
Small energy requirements can be addressed by relatively small and inexpensive power generating equipment. A small solar panel is a good start for a small system. The panels are relatively light, portable and rugged and produce their rated power output when exposed to full sun. Solar panels can b purchased for roughly $5 per watt of rated power generation capacity and they can last for decades if undamaged. A small wind turbine is also very practical for such applications. They can be mounted on a relatively small pole and produce useable power in winds as low as 5 mph. They cost roughly $1 per watt of rated capacity and are also quite durable and portable. They are prone to mechanical problems since they do have moving parts but a well-built wind turbine should last for many years with relatively little maintenance.

Human powered generators can also be very useful to address low usage electrical generating needs. They are especially useful in emergency shelters where power from the sun and wind are not accessible. An individual can produce over 100 watts of power for an extended period of time. Such generators are available for a few hundred dollars.

A gasoline or diesel powered generator is very useful for short term high power requirements. Such generators vary widely in cost, quality and fuel efficiency but are generally available for roughly $0.20 per watt of rated capacity. They require roughly 0.25 gallons of fuel per kilowatt (1000 watts)-hour of energy produced. They also generate a significant amount of heat and toxic

exhaust. A gasoline or diesel powered generator should never be operated in an enclosed area unless the exhaust is piped outside. A source of combustion air and cooling air is also required.

Diesel powered generators tend to be more fuel efficient, heavier and last longer than gasoline powered generators but they also tend to be more expensive. Again, there is a significant variety of equipment and some time should be invested in researching individual needs and available equipment before a purchasing decision is made.

14.04 Electrical Energy Storage:
Batteries are an essential part of any alternative power system in order to allow storage of electricity energy and to stabilize system voltage for both generating and power using equipment.

Lead-acid batteries are very common and can be used for many years if used properly. Lead-acid batteries vary widely in size, capability and design. We are very familiar with automotive batteries that are used to start cars but such batteries are designed to deliver high amperage for a very short period of time and then receive an immediate recharge. Such batteries do not operate well in alternative power applications. Deep cycle batteries designed for use in industrial or commercial applications such as golf carts or floor scrubbing machines are the best for providing a relatively small amount of power over a long period of time with deep discharge cycles. Even industrial lead acid batteries should not be discharged below 50% of their rated capacity because it will significantly shorten the life of the batteries. Lead-acid batteries should not be charged or discharged at a rate greater than 5% of their rated capacity per hour to prevent damage to the batteries. The batteries should have enough capacity in Amp-hours to provide needed power between charges.

Wet Cell (flooded), Gel Cell and Absorbed Glass Mat (AGM) are various versions of the lead acid battery. The wet cell comes in 2 ways, serviceable and maintenance free, both are filled with electrolyte and I prefer one that I can add water and check the specific gravity of the electrolyte with a hydrometer. The Gel-Cell and the AGM batteries are specialty batteries that typically cost twice as much as a premium wet cell. However they store very well and do not tend to sulfate as easily as wet cell. There is no chance of a hydrogen gas explosion or corrosion using these batteries.

Most Gel-Cell and some AGM batteries require special charging rate, especially the deep cycle models. Careful consideration should be given to the AGM battery technology. Applications such as Marine, RV, Classic and Performance cars just to name a few. If you don't use or operate your equipment daily; which can lead to premature battery failure; or depend on top-notch battery performance then spend the extra money. Gel-Cell batteries still are being sold but the AGM batteries are replacing them in many cases. There is a little confusion about AGM batteries because different manufactures call them different names; a couple of popular ones are regulated valve and dry cell batteries. In most cases AGM batteries will give double the life span and many more deep cycles than wet cell battery.

Battery Maintenance is an important issue. The battery should be clean. Use baking soda and water mix. Cable connection needs to be clean and tightened. Many battery problems are caused by dirty and loose connections. Serviceable battery needs to have the fluid level checked. Use only mineral free water, distilled water is best. Don't overfill battery cells especially in warmer weather. The natural fluid expansion in hot weather will push excess electrolytes from the battery.

To prevent corrosion of cables on top post batteries, use a small bead of silicon sealer at the base of the post and place a felt battery washer over it. Coat the washer with high temperature grease or petroleum jelly (Vaseline). Then place cable on post and tighten, coat the exposed cable end with the grease. Most folks don't know that just the gases from the battery condensing on metal pats cause most corrosion.

Smaller power requirements are addressed with rechargeable nickel-metal hydride (NiMH) or Nickel-Cadmium (NiCd) batteries. In general NiMH batteries last longer and do not develop a "memory" if the batteries are not completely discharged before recharging. These batteries should be discharged completely before recharging to maintain proper operation and to minimize the number of charge cycles. Such batteries have a rated capacity in "milli" or 1/1000 of an amp-hour. A "AA" size battery can be rated as high as 2500 mAh for example. NiMH or NiCd batteries require a specific type of charger as well as lead acid batteries. It is prudent to gather a reasonable amount of information and to select good quality battery charging equipment before purchasing. It is also prudent to operate the equipment before a disaster to ensure that the equipment is functional and that proper operation of the equipment is understood.

14.05 Charge Control Equpment:
Electricity generating equipment such as solar panels and wind turbines can overcharge batteries in hooked to a battery directly. A charge controller should be placed between the battery and the generating equipment to prevent overcharging which can damage a battery. The charge controllers monitor battery voltage and reduce charging rate accordingly until charging is stopped at full charge

14.06 Energy Conversion Equipment:
Electrical appliances and equipment require specific voltages and types of electrical current to operate. For example, most household appliances use 120-volt alternating current (AC) electricity. Small portable electrical equipment use batteries that are much lower in voltage providing a direct current (DC) or constant voltage. Most battery chargers convert 120 volt AC to a lower voltage DC current in order to charge the batteries. There are also inverters that convert 12, 24, 36 or 48 volt DC voltage from battery banks to 120 volt alternating current. Inverters are useful in using DC batteries that are charged by various power generating equipment into a useful form for normal household equipment.

14.07 Space Heating:
It is a significant undertaking to store enough fuel for heating a home for an entire heating season but many individuals do it on a regular basis. The amount of fuel varies depending on climate and

size of the structure. Wood, coal, and home heating oil can be stored for a significant amount of time and function well if the proper stoves or furnaces are available.

There are viable alternatives to heating a large structure in a disaster situation. First of all, underground living spaces do not require heating in most climates and would provide an adequate living space. Second, the proper clothing can provide adequate protection from cold temperatures without requiring any fuel.

14.08 Cooking:

Cooking is accomplished by heating food to a target temperature and holding it for a specified time. If the temperature is higher the cooking time is decreased. An increase of 18 degrees Fahrenheit can halve the cooking time. Steaming, cooking in oil, or using a convection oven decrease cooking time by decreasing the time that it takes to attain the cooking temperature.

There are many different types of cooking equipment and all can be effective. It is important to obtain viable stoves or other types of equipment and to store enough fuel for cooking for an extended period. An individual should practice with the cooking equipment prior to the disaster situation to ensure proper function of the equipment and adequate proficiency of the operator.

Alcohol fueled stoves should be considered due to the clean burning nature of the fuel and long shelf life.

The sun can be used as a heating source for cooking. A solar oven can be constructed using cardboard, aluminum foil, and a piece of tempered glass. The basic function of the oven requires reflecting as much light from the sun into an insulated box as is required to reach the appropriate cooking temperature. There are several commercial solar ovens on the market and detailed information about building a sun oven is available from several sources.

A large cast iron pot with a tight fitting lid known as a "dutch oven" is useful for many types of alternative cooking methods. A pressure cooker can also help conserve fuel by raising cooking temperatures and significantly reduce cooking time.

An insulated box, otherwise known as a "hay box", can also be very useful for conserving cooking fuel. Once a pot is heated to the appropriate temperature it can be placed in an insulated box where it will maintain the cooking temperature for up to 12 hours. A "hay box" can be constructed of any structurally sound box with a relatively tight fitting lid. The box should be large enough to allow placement of at least 3 inches of rigid foam insulation on the bottom, sides and lid. The foam insulation should have foil faced on the inside layer to help reflect radiant heat back into the cooking container. A piece of wood should be placed on the inside bottom of the container to prevent damage to the soft insulation from the cooking container.

A "hay box" works particularly well on stews and soups. Once the ingredients are brought to a boil the pot is placed in the "hay box" for several hours until it is cooked. It will hold the food at serving temperature after it is cooked for many more hours.

TACDA ACADEMY – CIVIL DEFENSE BASICS

15. MEDICAL PREPAREDNESS

Compiled for The American Civil Defense Association by Mary M. Pernicone, M.D.

Disclaimer: The lists, recommended treatments, etc., that are put forth here are never intended to replace the advice, treatment plans, or medications prescribed by a doctor, dentist, or other health care professional. Much of the information provided here is intended to help care for a patient UNTIL more advanced medical care is available.

15.01 First Aid Kits:

Kits should be replenished or replaced each year. Check for expiration dates on any ointments or medications. Keeping a spreadsheet with the medication names and expiration dates helps, as long as you check the roster every couple of months and tend to proper replacement.

Always read instructions for use of prepackaged first aid kits, and for use of medications, in order to be better prepared in case of emergency use. Review instructions with family but be sure to keep all first aid kist out of reach of small children.

- **Where to Keep a Kit**
    1. Home
    2. Automobile / Boat
    3. Travel / Vacation packs
    4. 72 hour Packs
    5. Work

- **Prepackaged Kits:** While prepackaged First Aid Kits are convenient, easy to purchase, and neatly packaged, the same materials can be obtained for a fraction of the price, when purchased separately.

- **Ideas for Kit Cases**
    1. Old shaving kits
    2. Zippered, plastic pouches-like in school pencil kits-handy, because the categories of supplies can be neatly organized in separate pouches and assembled in a thick, ringed binder.
    3. Plastic containers with snap-on lids
    4. Small plastic tackle boxes, since they are lightweight and have handles
    5. Altoid metal tins - for holding tablets or small parts
    6. Zip-sealing plastic bags
    7. Modified Pre-Packaged Kits - Perhaps the easiest way to organize the kit is to buy an inexpensive, prepackaged kit of the size that you want, then add in the extras and replacement parts as you desire. Most prepackaged kits contain a quick-summary sheet of First Aid. The American Red Cross has an online store that has a complete array of kits for purchase (www.redcross.org).

15.02 Lists for 72-hour Kits:

Lists for kits can be as simple or as complex as you personally desire, but the following should serve as a basic outline of a practical, well-supplied First Aid Kit:

Medications:

IMPORTANT NOTE OF CAUTION

You should never take any medication against the recommendations of your physician, or against the recommendations listed on the product.

DO NOT USE medications if you have any known drug allergies that would contraindicate your taking the drug, or if you have certain medical conditions that would contraindicate your taking the drug.

If you have any questions concerning a drug, you should consult with a pharmacist or other health professional before taking any medication. Never exceed the recommended dose of any medication.

Remember, children require smaller doses of medications than adults require and, again, NEVER exceed the recommended doses as listed on the packaging materials of any medication.

In case of accidental overdose, seek immediate medical attention by calling 9-1-1 and then call Poison Control at 1-800-222-1222

A. **Pain Relievers**

1. Acetaminophen (e.g. Tylenol) - Easier on the stomach, especially in those who suffer from gastro esophageal reflux , peptic ulcer disease, bleeding tendencies, or who have a know sensitivity to aspirin or aspirin-like compounds.

   Typical ADULT dose for mild pain, headache, or fever:
   - 325 mg/Regular Strength Tablet/capsule/caplet: 1-2 tablets, by mouth, every 4 hours as needed to relieve the pain or headache
   - 500 mg/Extra Strength Tablet/capsule/caplet: 1-2 tablets, by mouth, every 4-6 hours as needed to relieve the pain or headache.

2. Ibuprofen (e.g. Motrin, Nuprin, Advil, etc.) - Excellent choice to relieve headaches, musculoskeletal and back aches, menstrual cramps, fever, cold and flu symptoms, and toothache.

   Typical ADULT dose for mild pain, headache, or fever:
   - 200 mg/Tablet/capsule/caplet: 2 tablets, by mouth, every 4 hours as needed for relief of symptoms. Prescription strengths of higher doses are available from your doctor.

3. Aspirin - Another choice to relieve headaches, musculoskeletal and back aches, menstrual cramps, fever, cold and flu symptoms, and toothache. Some doctors prescribe one aspirin a day for patients who have known coronary artery disease to reduce their risk of suffering a second heart attack.

   Typical ADULT dose:
   - 325 mg/Tablet/capsule/caplet: 2 tablets, by mouth, every 4 hours as needed for relief of symptoms.

B. **Indigestion Relievers**

1. Antacids (e.g. TUMS, Rolaids, Maalox, Mylanta, etc.) - Help immediately to relieve symptoms of mild indigestion, heartburn, and sour stomach. The doses generally are 2 tablets as needed to relieve the symptoms.

2. H2 Blocking Agents (e.g. Pepsid, Zantac, etc.) - Help to prevent and to relieve symptoms of mild indigestion, heartburn, and sour stomach. The doses generally are 1 tablet/capsule every 12 hrs as needed to relieve the symptoms.

3. Proton-Pump Inhibitors (e.g. Prevacid, Prilosec OTC, etc.) - Help to prevent and to relieve symptoms of mild indigestion, heartburn, and sour stomach, but these generally take a few doses to become effective, generally requiring concurrent antacid consumption until the medication becomes effective. The doses generally are only 1 tablet/capsule every day for 14 days.

C. **Antiseptics**

1. ISOPROPYL Alcohol / Rubbing Alcohol - Serves as an excellent cleanser, disinfectant, and skin-drying agent. CAUTION: this is highly flammable, AND should never be consumed by mouth. Also, rubbing alcohol burns when applied to irritated or broken skin.

2. Antiseptic Soap-Antibacterial soap (e.g. Hibiclens, Dial Soap, Betadine Scrub, etc.) One of the best and most well-tolerated antiseptics is good, old-fashion soap and water.

3. Antimicrobial Hand Wipes-to clean hands well before and after applying first aid.

D. **Ointments**

Apply these using a clean cotton swab or gauze, as touching the end of the tube with a bare finger tip may contaminate the ointment within the tube and/or the wound to which the ointment is applied.

1. Bacitracin Ointment- serves to fight infection in minor abrasions. Apply 3 times a day and/or at dressing changes.

2. Neosporin/Neomycin Ointment-serves to fight infection in minor abrasions. Apply 3 times a day and/or at dressing changes. NOTE: up to 25% of people develop hypersensitivity (a rash) or drug allergy to Neosporin and must stop its use.

3. Lanacaine / Lanabiotic -serves to fight infection in minor abrasions. This has the advantage of also relieving minor discomfort and relieving stinging in insect bites and wounds. Apply 3 times a day and/or at dressing changes.

4. Triple-Antibiotic-serves to fight infection in minor abrasions. Apply 3 times a day and/or at dressing changes.

5. Hydrocortisone Cream-1%-Cortaid -serves to decrease or stop itching and burning from insect bites and stings and from contact dermatitis. May apply as directed on the tube.

Bandages and Bandage Supplies

A. **Latex-free Powder-free Gloves**
2-3 pairs; for personal protection when applying first aid to others, and also for protection against further contamination of wounds

B. **Instruments**
At least one of each:
1. Tweezers - for removing splinters, debris, etc. from wounds

2. Flashlight - can be as simple as a penlight, or as complex as a wind-up (battery-less) flashlight.

3. Safety Pins - 2 large, 4 small

4. Needle - for facilitating splinter removal

5. Wire Clipper / Cutter - for clipping off a fishhook

6. Wooden Tongue Blade - may be used to expose things for closer examination (i.e. holding clothing, tissue, etc. out of the way); may also be used for use as a finger splint.

7. Sterile Saline Irrigation - small bottles are available in any store where Band-Aids and gauzes are sold, but, in a pinch, pure saline contact lens solution will work fine.

8. Lighter or Matches (Strike-Anywhere, Water/Wind-Proof are best)

C. **Band-Aids**
Sterile, in individual packages, and in several sizes and shapes. Butterfly wound-closing Band-Aids and steri-strip wound closing bandages are generally discouraged because most wounds in the emergency setting should NOT be approximated unless managed in a professional setting.

D. **Gauzes**
Sterile, in individual packages. Assemble the following, at a minimum:

1. Gauze Rolls - 2 rolls each of 2" wide and 4" wide

2. Gauze Pads - 6 packages each of 2" and 4" widths
Do not confuse "Gauze Topper Pads" with Gauze pads. Toppers have cotton inside the gauze and are not as versatile as true gauze mesh. Topper gauze is useful in padding a dressing, serving to absorb more fluid/blood into a dressing, and such, but is not the best gauze item for a standard kit.

3. Eye Gauze Pads- at least 6 sterile pads.

4. Cotton Swabs and cotton balls - 6 of each, to help clean wounds, and to apply medications/antiseptics

E. **Bandage Sheers**
The funny looking scissors with a bent nose

F. **1" Paper Tape & 1" Cloth Adhesive Tape**
One roll of each

G. **2" and 4" Ace Wraps**
One of each. These are excellent for gently holding temporary dressings, ice-packs, or splints in place so that adhesive tape does not have to be applied to delicate skin. Also, the ribbed upper half of a sock (with the foot cut off) serves as an alternate means to hold dressings and such in place.

H. **Triangular Bandage (TB)**
Versatile and compact. May be purchased prepackaged or constructed out of any soft material (e.g. pillow case, sheet, large T-shirt, over-sized bandana, etc.) 36" x 36" x 51" is a good template size. Many Uses: SLING, tourniquet, splint binder, ice-pack barrier, etc.

To Make a SLING: Place the longest side of the TB under the arm, and tie the two corners of the long side together at the back of the neck, this "slings" the arm on that side. Tuck/safety-pin the third corner to brace/secure the elbow in the sling.

15.03 CPR and First Aid Certification:

American Red Cross offers training and certification in First Aid and in Cardiopulmonary Resuscitation (CPR). Contact your local Red Cross Chapter online at the following web address:

http://www.redcross.org/services/hss/courses

Skills learned and practiced are VITAL for competency. Guidelines are updated each year or two and it is necessary to renew your CPR certification at least once a year to stay current for the best outcome during an emergency.

15.04 Medical Care:

There will never be a better medical system available than is offered to people in the United States. But, a few points made in general first aid management may prove useful in the future (some knowledge and skills you can tuck in your pocket, as I tell my children).

NEVER let a little knowledge prevent you from seeking proper, professional medical treatment when needed.

Many of the concepts outlined here are to bridge the gap between the time of injury and the time that proper, professional medical help arrives.

In the case of any true emergency, you should always call 9-1-1 immediately to summon emergency help.

A. **Handling an Injured Patient**

1. Obviously, the circumstances are varied-so is the management of these patients, but there are some universally applicable measures to take until the medical help arrives:

2. ABC's of First Aid/CPR: Is the patient responsive and alert?
    a. Airway - does the patient have a clear, safe airway?
    b. Breathing - Is the patient breathing easily or with difficulty?
    c. Circulation - Is the patient pulse less? Initiate CPR.

3. Keep the victim calm, quiet, and safe, until professional help arrives.

4. If a head/neck injury is suspected:
    a. Sandbags, bags of flour, or even rolled up garments, placed on the ground on either side of their head will help the patient keep their head from turning from side to side, until the paramedics can properly immobilize their head and neck.

5. Quietly, gently talking with the patient can help calm them, and can provide you with additional information to relay to the paramedics upon their arrival.

6. **AIM** - Keeping this little memory tool on hand will help you ask 3 important questions:
    a. **A** for Allergies (drug allergies)?
    b. **I** for Illnesses (in the past)?
    c. **M** for Medications (currently taking)?

B. **Wound Management**

1. Stop the bleeding
    a. Fold or roll a couple of gauze or a clean cloth into as small a lump as possible, but large enough to cover the bleeding wound entirely.
    b. Place the mass of the compression gauze/cloth directly on top of the bleeding wound and press as firmly as possible.
    c. Maintain as firm pressure as comfort permits, and DO NOT "check" to see if the bleeding has stopped for at least 3 minutes. If the patient has taken aspirin within 8 days, this initial pressure-holding time should beat least 5 minutes before releasing the pressure to check if the bleeding has stopped. Each time the pressure is released, if bleeding persists, then most of the clot washes away and the process must be started over. BE PATIENT. HOLD PRESSURE---the bleeding will stop. Even if it means that you must hold steady, firm pressure until the paramedics arrive, HOLD IT--Do NOT check it.
    d. Elevating the limb, too, helps to stop bleeding.

    WARNING: do not tie a circumferential dressing around any extremity to hold a compression dressing in place. Pressure from a circumferential dressing that will stop bleeding will also stop the circulation in the affected extremity. Pressure must therefore be applied manually in order to apply it safely and effectively.

2. Once bleeding has stopped, the wound can be examined, cleaned with antimicrobial soap and warm water, and properly tended.
    a. If sutured by a professional, follow their post-procedure instructions. Otherwise, some guidelines to keep a sutured wound clean are:
        - Remove the initial dressing after 24 hrs
        - Gently wipe off the incision with an alcohol wipe three times each day, and after each shower. Tub baths and soaking of sutured wounds is not advisable as this increases the risk of wound infection.
        - Either a dry gauze or no dressing at all may be applied to the clean, dry wound.

3. Observe the wound carefully for any signs of infection:
    a. Increasing redness around the incision.
    b. Increased tenderness and pain at the wound.
    c. Swelling around the wound.

If any signs of infection are noted, contact your health care provider immediately!

4. Special considerations
   PLEASE make sure that everyone has UP-TO-DATE IMMUNIZATIONS.

C. **Wound Care**
If no professional medical care is or will become available.

Some wounds, including deep wounds, contaminated wounds, substantially large wounds, can heal without suture closure. In fact, in grossly and severely contaminated wounds, as found in animal bites, after appendectomy for ruptured appendicitis with peritonitis, and when several hours have passed between the time a laceration happened and the time medical treatment is available, the bacteria counts in the wound are too high to safely close the wound. Also, sometimes the development of infection within a closed wound necessitates that the sutures be removed, the pus and infection be drained, and the wound be packed open to heal.

In these cases, the wound is managed "opened" and allowed to heal from the bottom up, by a process known as Healing by Secondary Intention. The principle is that packing the wound open with saline-moistened clean gauzes (The dressing is known as Wet-to-dry Dressings) allows the healing to proceed. With 3 times a day dressing changes, the wound contracts up over a couple of weeks, and then heals completely.

How to provide wound care:
Wet-to-dry Dressings - cleansing dressings that heal

1. Thoroughly wash your hands and dry them on a clean towel/paper towel.

2. Arrange your supplies now, especially if you are working solo.
   a. Lay out a clean cloth upon which to rest your dressing materials.
   b. Open the gauze packages in a sterile fashion by peeling back the sterile paper packaging, allowing the gauze to remain on top the sterile packaging.
   c. Tear off the tape you will need ahead of time and have it hanging ready
   d. Have dry gauze pads open, too, to ultimately cover the packed wound.
   e. Several gauze may now be moistened by pouring some saline on them. You may buy sterile saline for dressing changes or make your own by mixing 1 teaspoon of salt in 1 quart of hot water in a clean container.

3. With clean, disposable gloves on, pick up a moistened gauze, squeeze out the excess saline, unfold and open up the folded gauze as completely as possible.

4. Lay the gauze into the wound using either your gloved fingers, a cotton swab, or a sterile tweezers. This first gauze layer (The most important) should be applied to

maximize the contact between the surface area of the gauze and the surface area of the wound.

Thereafter, the remainder of the moistened gauze can be gently tucked into the wound. Do not over pack the wound (i.e. do not tightly pack the gauze into the wound The wound should be filled with gauze, but not crammed tightly). Do not overlap the wound skin edges with the moistened gauze as that will chap the skin edges. Allow the packing to touch the inside wound edges, but not to overlap.

5. Apply a dry gauze pad on top, and apply a minimum of tape to hold the dressing in place. On the extremities, a stocking cut to form a tube can effectively hold the dressings in place without the need for tape touching the skin. On the trunk, a velcro abdominal binder can achieve this tape less dressing. Tape irritates some people's skin more than others, so these ideas provide a few tape-less options.

6. Between dressing changes, the saline-moistened gauze dries out somewhat. At a dressing change, the packed gauze is re-moistened by gently pouring a little sterile saline onto the gauze in the wound. The gauze actually cleans the wound surfaces each time it is removed for dressing changes. The wound debris and infectious material stick to the gauze and are removed with each dressing change.

7. Gradually, as the wound heals in, from the bottom outward, the wound will accept less and less gauze. Eventually, only a dry gauze on top is applied at dressing change.

D. **Burns**

Burns are classified into degrees of burns:

1. First (1st) Degree Burns
2. Second (2nd) Degree Burns
3. Third (3rd) Degree Burns

While most 1st and 2nd degree burns do not require emergency medical care, anything more than a simple sun burn should be seen by a health care professional, especially if:

1. The patient is a child.
2. The burn is larger than 2 to 3 inches across.
3. The burn is on the face, hands, feet, or genitals

Burn Classification

1. First (1st) Degree Burns
    a. Red, painful burns, with or without swelling of the involved skin
    b. Usually sunburns are 1st degree burns.
    c. Apply cool water for comfort, not butter or grease, not ice.
    d. Moisturizers may help with comfort

e. Aspirin, if not contraindicated, may help promote healing of a sunburn and reduce the discomfort. Best if taken within the first 24 hours. Thereafter, other over the counter pain medications, like ibuprofen, acetaminophen, or aspirin, may help reduce the pain.
f. Usually heal in less than a week, although the skin may flake and peel.

2. Second (2nd) Degree Burns
   a. Blistered, painful burns; the blister is called a bulla, and is best left in tact for healing to occur.
   b. If the bulla is torn open, trimming the dead flap off is better than leaving it in place because the underlying dermis is more easily kept clean without the flap of dead skin holding bacteria and debris in place.
   c. With clean hands, wash the burned area well but gently with cool water and antimicrobial soap.
   d. Dry with a clean cloth.
   e. Apply antiseptic ointment and a clean dressing of either gauze or a Band-Aid.
   f. Dressing changes as above should be done at least twice a day, but also after getting the dressing dirty or wet.
   g. If any signs of infection appear, a health care professional should be contacted without delay:
      - Increased redness
      - Increased pain and/or swelling
      - Discharge of pus from the wound
      - Usually heal in 2-3 weeks

3. Third (3rd) Degree Burns
   a. Because this level of tissue injury/death is deep, skin involved in a third degree burn will appear white or gray (no blood), or charred, and it will not be painful in the acutely (no sensation).
   b. Are generally life threatening and mandate immediate emergency care
   c. May take months to heal, and even then only with complex medical and surgical treatments.

E. **Fractures / Sprains Management**
Until proper care is available

1. Attendant injuries
   Survey the patient for more significant injuries: ALWAYS tend to the ABC's before addressing an obvious fracture.
   a. If patient is in shock, lay the patient down, loosen his clothing, elevate his feet higher than his head (also supporting his knees if possible), and cover him with a blanket. ALWAYS remember to talk soothingly to him as you go.
   b. Stop bleeding

2. Immobilizing the injured limb
    a. Padding around the injured hand, arm, leg, or foot will help protect it from accidental bumps and movements. Clothing, blankets, pillows, and cushions all make good padding.
    b. AFTER padding is applied, splints can be fashioned out of tree bark, wood, rulers, etc. and secured to the outside of the padding.
    c. Elevating the limb helps with comfort and slows swelling-injured hands and arms are best secured in a sling, made from a Triangular Bandage (see earlier notes).
    d. If ice is available, an ice pack also will help with comfort and reduce swelling.

3. Transport as soon as possible for proper medical attention and treatment.

F. **Head Injuries**
1. **Very complicated set of injuries**
2. **Many are life threatening.**
3. **The patient requires immediate transport to a medical emergency center.**

G. **Eye Injuries**
1. Foreign Body
    a. Imbedded objects must be left in place for removal by an eye specialist
    b. Debris-may be flushed out with sterile saline solution or gently wiped out using the corner of a clean tissue or cloth
    c. Occasionally, a foreign body lodges in the underside of the upper eyelid, necessitating flipping the upper eyelid back over upon itself for exposure and foreign body removal. Flipping the lid over a swab stick or similar object helps achieve this exposure, then the particle may be swept out using a rolled corner of a tissue or cloth.
    d. If the eye is irritated and painful, a corneal abrasion or retained foreign particle may be present. The eye should be bandaged to reduce movement until proper medical care by an ophthalmologist is available.

2. Eye Bandage
    a. Have the patient keep his eyes closed for application of the eye bandage. If no broken skin (i.e. lacerations or abrasions) is present on the forehead and cheek, degrease the skin with an alcohol wipe first, so that the tape will stick and the dressing will be secure.
    b. Place 11/2" stack of sterile gauze pads over the closed eye and tape the dressing securely into place with 5-6" strips of adhesive tape. If concurrent abrasions and lacerations are present, do not tape the dressing in place. Instead, wrap the forehead with gauze rolls to fix the eye gauze pads into place. NEVER wrap the neck circumferential. Wraps may require gauze pads over both eyes (the injured eye and the unaffected eye) in order to apply the wrap securely at the correct level.

15.05 Miscellaneous:

A. Prescription Medications
    1. Keep a 3 month supply (minimum)

    2. Paying out of pocket? Learn alternative ways of managing the disease for more long-range issues, when stores are depleted

B. Necessities - Groceries, supplies, hardware, tools, medications, etc.
    1. Use to barter for things you need in a crisis/disaster situation.

    2. Offer as charity. Help those who may not be able to help themselves in medical care, obtaining materials and medications in a crisis situation, if or until emergency responders are available.
        a. Elderly
        b. Children
        c. Those physically or mentally unable to care for themselves.

    3. Someone who you help in a first aid situation, might help you in another situation.

15.06 Reference Sites, Texts, and Contacts

- 9-1-1
  Remember to call first in an emergency. Teach your children to use properly.

- POISON EMERGENCY HOTLINE 1-800-222-1222

- http://www.redcross.org/services/hss/courses/
  Each course offered at the American Red Cross for First Aid and CPR certification includes a manual.

- http://www.quickmedical.com
  All types of disposable medical supplies.

- http://www.first-aid-product.com
  Whole-sale medical on line. Every Prepackaged First Aid kit contains a complimentary booklet on First Aid.

- McManners, Hugh, The Complete Wilderness Training Book, DK Publishers, New York, New York, 1998.

- Wilkerson, James A., M.D. Medicine for Mountaineering and Other Wilderness Activities, The Mountaineers Books, Seattle, Washington, 2001.

EMERGENCY ORAL REHYDRATION FORMULA

In severe instances of diarrhea or vomiting, water alone will not re-hydrate a patient. In the absence of an IV type rehydration, this formula has been used in many places throughout the world to save lives that would otherwise be lost to dehydration.

International Oral Re-hydration Formula		**Equivalent Common formula:**	
Pure drinking water	**1 liter**	**Pure drinking water**	**1 quart**
Sodium chloride	**3.5 grams**	**Table salt**	**1/4 tsp.**
Trisodium citrate	**2.9 grams**	**Morton Lite Salt**	**1/2 tsp.**
Potassium chloride	**1.5 grams**	**Karo Light Corn Syrup**	**2 Tbs.**
Glucose	**20.0 grams**		

16. TRIAGE & FIRST RESPONSE

16.01 Introduction
What is Triage?

The definition of Traige is "the sorting of, and allocation of, treatment to patients, especially battle and disaster victims, according to a proven system of priorities designed to maximize the number of survivors."

Of course, no one expects to be the first responder to a Mass Casualty Incident (MCI), but at any time we could be the first person on the scene of any type of accident, or find ourselves in the aftermath of a natural disaster (tornado, hurricane, earthquake, etc.), involving numerous victims. Would we be prepared for such an event?

16.02 Psychology Behind First Reponse:

As stated in the Psychology section of the Academy, "People do not like to think about disaster." Until an individual or family is involved or affected by any type of disaster, this statement is very accurate. Once a disaster affects us, though, we feel guilt and remorse, asking why we could do little or nothing about it. As all the sections of the TACDA Academy teach us, being prepared in the event of an incident overcomes this eventual guilt or remorse.

16.03 Professional First Reponse:

In an emergency or disaster, reponse time can be the difference between life and death. On the average, with no obstruction, emergency services (Fire, Police, Paramedic, Ambulance, ect.) can respond to an incident in 7 to 13 minutes. Several things can obviously hinder the time it takes to respond:

- Size of the incident
- Personell available
- Notification of the incident
- Traffic
- Weather

Just think about news of where the response time took hours and even days. It is disheartening to think about the many lives that could have been saved if citizens were prepared to assist victims until professional help arrived.

That is the point of Triage, or First Response, training.

16.04 Training:

From the Psychology section of the TACDA Academy (review this section often):

> "Train as many people from the area neighborhoods as possible in basic civil defense (sheltering, fallout meters, evacuation, etc.), CPR and first aid. Utilize instructors from your city

> or county Emergency Management / Civil Defense Dept., Red Cross, CERT, Community Education, or your own neighborhoods…Choose individuals who have a natural interest and inclination towards first aid, but not professional medical personnel who would be required to work on a state level."

Individual and group training in Triage and First Response is as important as, and can be very helpful with, CPR and first aid training. The key factor for Triage is it focuses on a controlled assessment of the disaster scene and promotes expedient, orderly and documented delivery of victims to professional medical care.

16.05 Maximize Survivors:
The term "Maximize Survivors" is the core in which the METTAG Training System, developed and offered by TACDA, utilizes the most effective triage tool ever developed, the METTAG MT-137 Triage Tag.

Tested and developed under scrutiny of doctors, nurses, firefighters, rescue personnel, industrial safety experts, airport safety directors, and civil defense specialists, the original METTAG MT-137 Triage Tag was launched in 1976. It is the tag most widely used by the US Government and Military, the Fire Departments of New York (FDNY), and has been used in all Olympic Games since its introduction (1980 – Lake Placid, 1984 – Los Angeles, 1996 – Atlanta, and 2002 – Salt Lake City).

The METTAG is so easy and effective to use that anyone can be trained on it with little difficulty. The primary function of the tag is to give professional medical help the necessary information to determine which victims need immediate care, which ones can be delayed, which ones are at minimal risk and could potentially assist with helping others, and which ones are fatalities.

16.06 Triage Priority Levels:
The recognized priority levels of triage are as follows:

- RED (IMMEDIATE) – Critical care needed within minutes
- YELLOW (DELAYED) – Simple care required within hours
- GREEN (MINOR) – Simple care can be delayed until after RED and YELLOW
- BLACK (DEAD or EXPECTANT) – This level should only be determined by professionals

The different priority levels are for evaluating the victims quickly and removing the level of care portions on the tag under the assessed priority. If the victim is YELLOW, remove the GREEN. If the Victim is RED, Remove the GREEN and YELLOW. GREEN victims do not need to have a portion removed, and any dead or expectant to die victims should be evaluated by medical professionals, so do not assume the responsibility of determining who will live and who will die. Just do your best to detemine the victims level.

17. POST EVENT SURVIVAL

17.01 Introduction
Post event survival is dependent upon pre-event preparations.

The consequences of most all disasters can be rolled into the effects from a nuclear or chemical-biological (NBC) attack. People prepared to survive a nuclear attack are prepared for most any other disaster. We are directing this part of the lesson to survival after an NBC event.

All preceding lessons are rolled into this lesson. We are assuming that proper preparations have now been made against NBC warfare, and that shelters, survival equipment, and food and water supplies have been prepared. We are assuming those participating in this lesson have a knowledge of emergency sanitation, winter survival, cooking, alternative power sources and a basic understanding of survival without power and normal infrastructure capabilities.

17.02 Decontamination:
Occupants should remain in their shelters for at least two weeks. Each seven fold increase in time results in a 10 fold decrease in radiation levels. After leaving the shelter area, people should begin the process of reconstructing their lives and decontaminating their living spaces.
Radiological defense manuals, published by the government suggest hosing down or sweeping driveways and sidewalks, plowing and scraping radiation from the garden areas, vacuuming carpets and washing clothing in a washing machine. We question this logic. These procedures may be possible in a limited exchange and if there has been no loss of power by EMP. However, it seems much more likely that there will be no water in our water hydrants, no gasoline for our cars or tractors, and no power or water for our vacuums and washing machines. In a limited exchange, after leaving your shelter we suggest you evacuate the area and leave the decontamination efforts to the trained military experts.

Remember that time, distance and shielding are concepts that work in our favor. Shielding takes precedence during the first two weeks. After shielding for two weeks, a proper length of time has lapsed for you to leave your sheltered area. If you are within 1½ miles of ground zero, the environment may still be radioactive to depths of 5 feet below grade. When it is safe to do so, leave areas within 1½ miles of ground zero of a ground burst.

Fallout from airbursts is minimal. However, radiation from neutron activation may persist up to 5 feet below grade in areas near ground zero of an air burst. If you are within that area, you can either choose to remain in your shelter until further decay takes place, or you can travel to a safer distance from the contaminated area. Make sure before leaving, however, that you have a secure, safe destination with shelter and supplies to facilitate all members of your group.

17.03 Housing:
It would seem likely that there would be mass evacuations from areas of high fallout accumulation. Homes in low blast regions could still be used. Plastic and staple guns would be useful in repairing windows and doors.

Heavy canvas tents, such as are used by the military, would be useful, as they will allow for the use wood stoves. People who camp and have the needed camping supplies would be much more likely to survive. Underground structures would not need heating or cooling. Shelters, as described in Lesson 3 (All Hazard Sheltering), could be lived in indefinitely.

Building materials could be scavenged from damaged homes. Construction will only be possible if tools (not power tools) had been stored in a safe place from blast.

17.04 TBA, Vitamins & Minerals:

Thyroid Blocking Agents (TBA) tablets should be started as soon after the nuclear attack as possible, and taken for 90 days. Purchase the TBA and consult your physician now, for proper dosages for you and your family. People with thyroid problems may not be able to take TBA, therefore make sure your physician is aware of any thyroid irregularities you may have. The thyroid is always 'looking' for iodine and cannot distinguish between pure iodine and the radioactive isotope. TBA fills the thyroid with healthy iodine and prevents the uptake of radioactive form of the isotope. The thyroid will only accept iodine in certain forms. TBA is formulated with potassium and the proper isotope of iodine. Do not take iodine internally in any other form. TBA is a medicine and has some side affects. TBA should only be taken in the event of a nuclear disaster.

A deficiency of vitamin C could cause symptoms of scurvy within 4 to 6 weeks. Store a year's supply of vitamin C as well as other multi vitamins and minerals. Purchase vitamin C in the crystalline form for long-term storage. Use sprouted seeds or beans as an expedient method in providing this vitamin. Instructions are given in the book "Nuclear War Survival Skills."

17.05 Gardening & Farming:

People living in areas of low fallout accumulation may be able to plant crops the next season. Fallout does not penetrate the top layers of the soil unless there has been heavy rain during the first two weeks. Small plots of land could be scraped of the upper few inches of contaminated soil and planted. The contaminated soil containing the fallout should be moved away from the garden area. Before re-entering your shelter, brush the dust off you equipment and clothing and wash exposed areas of your skin with soap and water. It seems unlikely that there would be any large farming activities for some time. People in low fallout areas that have received no blast may have opportunity to cover small plots with plastic before fallout arrives. Storage of large rolls of plastic would be advantageous.

Some plants requiring calcium (such as broccoli and cauliflower) will take up radioactive strontium 90 because of its chemical similarities to calcium. If we eat the food containing the radioactive strontium, the strontium will be deposited in our bones. Liming of acid soil will reduce this uptake. If possible, in areas of significant fallout deposition, plant foods with low calcium content such as potatoes, cereal, apples, tomatoes, peppers, sweet corn, squash and cucumbers.

Storage of non-hybrid seeds is extremely important. Hybrid seeds will not reproduce quality fruit. Seeds last several years if stored covered in airtight containers in a cool, dry area.

Farming implements should be stored in a safe place and protected from blast.

Crops, which are in the early stages of growth in heavy fallout areas, may absorb radioactive materials through their leaves or roots and would be difficult to decontaminate.

If possible, animals should be put under cover before fallout arrives and should not be fed contaminated food and water. Farm animals can be slaughtered if they don't appear to be sick. The bones and organs, however, should be removed and disposed of before cooking the meat. The animal may have been foraging on plants and grasses contaminated with Strontium 90. Strontium 90 looks chemically much like calcium. The bone cannot differentiate between Strontium and Calcium and will deposit the Strontium into the bone. If we cook the meat with the bones, the strontium will then be deposited into our bones.

17.06 Hunting and Foraging:

Eggs from poultry can be eaten. If the bird does not look sick, poultry can be eaten. Strontium, however, will persist in the bones. Deer, elk, and other wild animals can be eaten if they do not appear to be sick. Discard the organs and bones of all animals before cooking. Fish from streams and lakes, such as trout and perch can be eaten. Bottom feeders such as carp and catfish should not be consumed.

17.07 Food in a Post Event Environment:

Many people are confused about the kinds of food that can be eaten after a nuclear event.

Fallout from a nuclear explosion consists of tiny particles of dirt and debris fused with fission products. Alpha and Beta particles in the fallout can persist for long periods of time and will contaminate all food to which it comes in contact. On the other hand, gamma radiation from the fallout is not a particle and does not contaminate food. Gamma radiation is actually used to purify food. Our challenge will be in differentiating between foods that can and cannot be cleansed and decontaminated of alpha and beta particles. Most gamma radiation will not persist beyond two weeks after the nuclear event.

Fruits and vegetables harvested from fallout zones in the first month post-attack may need to be decontaminated before consuming. Foods can be decontaminated by washing exposed parts, removing outer leaves and peeling. FEMA material has stated that most vegetables and fruits that can be washed and peeled can safely be eaten. If the nuclear event were to occur at harvest time, you could still harvest smooth, hard skinned vegetables and fruits such as apples, potatoes, carrots, squashes, and any other fruits and vegetables you could both wash and peel.

You should not harvest ‘fuzzy’ fruits such as raspberries, strawberries or peaches. Cauliflower and broccoli should not be eaten from the garden because of the uneven nature of their outer layers.

17.08 Storage Foods:

If fallout contamination is suspected, the package or can should be wiped or washed before opening. Meats and dairy products that are wrapped or are kept within closed showcases or refrigerators will most likely be free from contamination. Refrigerated foods should be eaten first, then food from the freezer as it thaws, and then packaged or canned foods.

17.09 Water:

Water can be found in hot water heaters and wells. Hand pumps which will pump from as deep as 200 feet are available through Amish catalogs. Emergency water clarification, filtration and purification methods were discussed in a previous lesson. Take particular note in that lesson, of the expedient water clarification method utilizing clay, terry cloth and gravel for the filter. The clay acts to bind the radioactive particles, leaving the clarified water ready for purification. Use your imagination and be creative when foraging for water.

We cannot overly express the importance of storing a year's supply of food. The basic storage items, as suggested by Dr. Robinson, are easily and inexpensively purchased. Use that method as a basis for your storage.

17.10 Emergency Sanitation:

During times of emergency, when normal sanitation methods of food, water, garbage, trash, and sewage may be disrupted, it is critical that rules and procedures be established to safe guard proper health or disastrous results may be experienced.

Proper management of toilet facilities during times of emergency may have a greater affect on your health than any other single element of sanitation. Bacterial infections such as typhoid and dysentery can be just as devastating as the earthquake or flood that caused the emergency. Refer to Lesson 10 (Sanitation) for further details.

17.11 Disposal of Garbage and Rubbish:

Garbage may sour, decompose, breed bacteria, or attract insects and small animals; rubbish (trash) will not. Garbage, or any mixed refuse containing garbage, must be carefully stored and handled if odor and insect nuisances are to be prevented. Since rubbish (trash) alone is fairly easy to dispose of, garbage should be kept separate from trash.

Please review Lesson 10 (Sanitation) for further information on garbage, trash and sanitation methods.

17.12 Communications:

It is likely that most, if not all, of the radio stations would be off the air. Blast and EMP would damage many radios, and power most probably would not be restored for long periods of time. Some small communities (in particular those on hydro power) could restore their power earlier than others.

Amateur radio capabilities would be limited to high frequencies in the 40 to 80 meter range. High frequency radios are not dependent upon relay stations. Relay stations are vulnerable to EMP and would not be functional for relaying information. The very high frequency (VHF), two-meter and FM radios would be limited to 'line of sight' until relay stations could be restored. Hams typically keep spare parts and would have knowledge of EMP protection, which would put them on the air long before commercial units.

Several days after an EMP, interference will be minimal, and radios featuring AM frequencies should pick up stations as far away as Europe.

Underground steel shelters offer good (not perfect) EMP protection, and most radios require outside antennas to receive properly from inside steel shelters. Assuming your shelter is connected to the grid, however, you should receive a signal by holding a transistor radio (AM stations, only) near a power cord, even after the power grid has failed.

Many people have CB capabilities. Some of our chapters currently exercise a monthly for CB and amateur radio operators. Radiation levels and other important information could then be transmitted to other TACDA chapter members.

17.13 Heat and light:

Diesel generators would be useful until the fuel was depleted. A battery system with solar panels for recharging, or a small hydro generator would be a more practical solution for long-term recovery. Wood or coal burning stoves and fuel storage should be part of every home's emergency systems. Coal stores well if placed between a straw blanket and covered with dirt. Please note that wood-burning stoves may not withstand the heat generated from coal. If your stove can withstand coal fuel it will be printed in the stove documentation material.

17.14 Transportation:

Fuel would be difficult to replenish. Vehicles with computerized ignitions could be damaged by the electro magnetic pulse (EMP). EMP simulations have indicated that older cars manufactured before 1965, and newer cars manufactured after the year 2000 would probably remain functional. Bicycles, wagons, horses and carts would become very valuable. Please refer to the chapter lesson on 'Alternative Energy Sources' for further information.

17.15 Survival Skills:

A wonderful source of information on survival skills is found in the before mentioned book, "Nuclear War Survival Skills". Instructions for six different expedient shelters are included along with directions for the construction of an inexpensive fallout radiation meter. Instructions are also given for the construction of an air ventilating pump, shelter furniture, emergency cooking stove, and other protective items.