LESSON PLAN

PART I
COVER SHEET

LESSON TITLE: Nuclear Warfare Defense Actions

TRAINING METHOD: Lecture

REFERENCES: The Effects of Nuclear Weapons (1977 Reprinted by the Federal Emergency Management Agency)
AFI 32-4001, Disaster Preparedness Planning and Operations
AFP 161-3, NATO Handbook on Medical Aspects of NBC Operations

AIDS AND HANDOUTS: DPTV "C Block" (Wartime Threat/Protective Actions/Procedures) PIN 606038
Attachment 1 Illustration of Effects of a Nuclear Weapon
Attachment 2 Illustration of Energy Dispersed from a Nuclear Detonation
Attachment 3 Illustration of an Expedient Shelter
Attachment 4 Illustration of How Protection Factors Work
Attachment 5 Chart of Estimated Effects From Exposure to Gamma Radiation

LESSON OBJECTIVE: Given a lecture on nuclear weapons effects and personal protective measures, the student, during the final course exam, will correctly answer questions that demonstrate mastery of at least four of the samples of behavior listed below.

SAMPLES OF BEHAVIOR:

1. Identify the four types of nuclear bursts.
2. Describe the effects of nuclear weapons.
3. Explain personal protective measures against nuclear weapons effects.
4. Identify symptoms of radiation sickness.
5. Describe radioactive fallout contamination avoidance measures used to protect equipment and people.
6. Describe the concept of operation for immediate and operational radioactive fallout decontamination.

ORGANIZATIONAL PATTERN: Topical

SUGGESTED COURSE(S) OF INSTRUCTION: NBC Defense Training
Shelter Management Team (Nuclear Threat)
Emergency Preparedness Orientation Training

STRATEGY: Most students believe there is no hope of survival in nuclear warfare. Naturally, the chances of survival assume that one is away from ground zero and can find adequate blast and thermal protection. However, protection against the effects of radioactive fallout is quite possible. RTP C7 also provides information on the characteristics of alpha, beta, and gamma radiation. Emphasize that radioactive fallout contamination avoidance is, by far, the best course of action. Radioactive fallout decontamination may not be necessary if you follow sound fallout contamination avoidance measures. The information provide in Base Populace training should correspond to any increase in threat.

LESSON OUTLINE:

MAIN POINT 1. TYPES OF NUCLEAR BURSTS
- A. High Altitude
- B. Air
- C. Surface
- D. Subsurface

MAIN POINT 2. EFFECTS OF NUCLEAR WEAPONS
- A. Blast
- B. Heat
- C. Radiation
- D. Individual protective measures

MAIN POINT 3. RADIATION SICKNESS
- A. Symptoms of radiation sickness
- B. Countering radiation sickness

MAIN POINT 4. RADIOACTIVE FALLOUT CONTAMINATION AVOIDANCE
- A. Avoidance
- B. Protection (equipment)
- C. Shelter (personnel)

MAIN POINT 5. RADIOACTIVE FALLOUT DECONTAMINATION
- A. Immediate decontamination
- B. Operational decontamination
- C. Be selective
- D. General equipment

PART II
TEACHING PLAN
INTRODUCTION

ATTENTION: Nuclear weapons are the most destructive man-made force on the face of the earth. Following a nuclear attack, fallout that contains lethal amounts of radioactive debris may be all around us. What is radioactive fallout? What can you do to minimize exposure to this radiation?

MOTIVATION: The information you receive in this lesson may save your life. Survival may depend upon your ability to survive the initial attack, avoid radioactive fallout, and decontaminate yourself and your equipment.

OVERVIEW: We will cover nuclear warfare defense, survival, and the use of nuclear weaponry including:

- ⇒ types of nuclear bursts
- ⇒ effects of nuclear weapons
- ⇒ radiation sickness
- ⇒ radioactive fallout contamination avoidance
- ⇒ immediate and operational radioactive fallout decontamination

TRANSITION: First, let's look at the different nuclear weapons bursts and their general characteristics.

BODY

MAIN POINT 1. TYPES OF NUCLEAR BURSTS

Nuclear weapons are similar to conventional types so far as their destructive action is due mainly to blast or shock.

All nuclear detonations create blast, heat, and nuclear radiation. Their relative effects are largely determined by the yield (strength) of the weapon and the altitude at which the weapon detonates. Therefore, nuclear bursts are divided into four categories: high altitude, air, surface, and subsurface.

A. HIGH ALTITUDE

A. A high altitude burst occurs at an altitude greater than 30,000 meters or about 100,000 feet above sea level.

EMP

A high energy electromagnetic pulse (EMP) can damage electrical, solid state, and unprotected electronic components. Wide range communications interruptions result and may last for many hours due to the EMP generated during the burst.

FLASH

The light or "flash" from the weapon's fireball may produce eye injuries to personnel witnessing the burst even though they are many miles away.

B. AIR

B. An air burst occurs at an altitude below 30,000 meters, but its fireball does not contact the earth's surface.

SECONDARY FIRES CAUSE GREAT DAMAGE

The fireball and blast will destroy nearly everything at ground zero. Further out, some of the greatest damage will be from secondary fires.

Initial radiation from any type of burst is emitted for about the first minute following detonation. However, there is essentially no fallout generated from an air burst. While the fireball is still glowing, a tremendous amount of radioactive energy is released.

The blast destroys buildings, overturns vehicles, shatters glass, and can splinter wood creating a lethal shower of debris for anyone caught in its path.

The blast wave can cause broken bones, head trauma, or internal injuries with a high potential for sudden death.

C. SURFACE

C. A surface burst detonates on or slightly above the surface of the earth. The fireball will actually touch the land or water. A large crater is formed on land.

DARK, DIRTY "MUSHROOM CLOUD"

The fireball carries tons of earth from the crater into the air forming a "mushroom" shaped radioactive cloud. This mushroom cloud will be black or very dark from the debris. This distinction can easily separate a surface from an airburst because the cloud from an airburst would be almost white.

The heaviest amount of fallout occurs in the immediate area of ground zero and returns to earth within 24 hours.

RESIDUAL RADIATION IS OUR GREATEST POST-ATTACK PROBLEM

The radioactive cloud creates a residual radiation hazard that can extend hundreds of kilometers downwind. This type of burst causes the most severe post-attack problems for us.

D. SUBSURFACE

D. A subsurface burst occurs beneath the surface of land or water. Cratering will generally result.

HEAVY GROUND OR WATER SHOCK AND LOCAL FALLOUT

If the fireball does not penetrate above the surface, the prime hazard is heavy ground or water shock. If the burst is shallow enough to vent to the surface then blast heat, ground shock, and very heavy local radioactive fallout will be present.

MAIN POINT 2. EFFECTS OF NUCLEAR WEAPONS

The "yield" of a nuclear weapon is a measure of the amount of explosive energy it can produce. It is the usual practice to state the yield in terms of the quantity of TNT that would generate the same amount of energy when it explodes.

YIELD = TNT

For example, a 1-kiloton nuclear weapon is one which produces the same amount of energy as does 1 kiloton of TNT. One kiloton equals 1,000 tons.

Regardless of yield, a nuclear detonation produces blast, heat, and radiation.

A. BLAST

A. The blast effect occurs very quickly and can cause significant amounts of damage and personal injury. The force of the blast can be much greater than any force experienced in the strongest hurricane.

INSTRUCTOR'S NOTE: Attachment 1, in Part IV, can help to visualize the direct effects of a nuclear weapon.

LUNG DAMAGE AND EARDRUM RUPTURES ARE COMMON

You could be seriously injured by flying debris or by being blown into other objects. Lung damage and eardrum ruptures will be common.

B. HEAT

B. Thermal or heat injuries occur from direct thermal absorption and from indirect causes such as flash fires or flame.

Unless it is scattered, thermal radiation from a nuclear explosion, like ordinary light travels in straight lines from the fireball. Any solid, opaque material. For example, a wall, a hill, or a tree between the object and the fireball will act as a shield and provide protection from thermal radiation.

C. RADIATION

C. Radiation effects of a nuclear weapon include nuclear and electromagnetic energy. There are two types of interactions that release nuclear energy:

⇒ Fission splits atoms.

⇒ Fusion joins atoms.

We mention these interactions as a precursor to better understand fallout and the types of radiation. We will cover two areas concerned with radiation: energy and types of radiation. Let's begin by covering the energy from a nuclear detonation.

INSTRUCTOR'S NOTE: Attachment 2, in Part IV, illustrates the energy released from a nuclear detonation.

(1) ENERGY

(1) Energy released from a nuclear detonation will be in the form of blast, thermal, and nuclear radiation.

ENERGY - 85% (BLAST AND THERMAL)

⇒ Regardless of the height of burst, approximately 85% of the explosive energy from a nuclear burst produces air blast and thermal radiation. That breaks down to 50% blast and 35% thermal energy.

15% (NUCLEAR RADIATION)

⇒ The remaining 15% of the energy is released as nuclear radiation. The nuclear radiation is categorized as either initial or residual. Initial radiation of 5% is the total fission energy, produced within a minute or so of the explosion. The final 10% represents residual radiation also referred to as delayed fallout that occurs over a period of time.

FALLOUT "DUST" TAKES SEVERAL MONTHS TO FALL

Fallout is composed of radioactive particles from the bomb and material from the surface of the earth carried into the air by the explosion. The larger particles return to earth within 24 hours, but the smaller dust particles take up to several months to fall.

(2) TYPES OF RADIATION

(2) Beta and gamma radiation are the primary nuclear hazards from a detonation. Alpha radiation is present mostly with a nuclear weapons accident.

GAMMA (PENETRATES EVERYTHING TO SOME EXTENT)

⇒ Gamma radiation penetrates everything to some extent. It is present during the nuclear burst and also in the radioactive fallout. Gamma radiation affects your whole body and may cause radiation sickness and death when enough energy is absorbed.

BETA (SIMILAR TO SEVERE SUNBURNS)

⇒ Beta radiation is also found in radioactive fallout. Beta particles which remain on our skin can cause beta burns similar to severe sunburn, but do not penetrate to internal organs as gamma rays can.

ALPHA (MOSTLY ASSOCIATED WITH NUCLEAR ACCIDENTS)

⇒ Alpha radiation is emitted from the actual radioactive material that escaped during the fission process. Because of their greater mass and charge, alpha particles are much less penetrating than beta particles or gamma rays. Alpha radiation is primarily an internal hazard mostly associated with nuclear weapons accidents.

INSTRUCTOR'S NOTE: Additional information on alpha, beta, and gamma radiation and protective action can be found in RTP C7 (Alpha, Beta, and Gamma Radiation Hazards and Protective Actions)

D. INDIVIDUAL PROTECTIVE MEASURES

D. We must protect ourselves from the effects of nuclear radiation, blast, and heat. Let's discuss some measures to minimize the effects of these hazards.

SHELTERS PROVIDE PROTECTION FROM BLAST AND HEAT

Your most important initial action is seeking protection from the blast wave, heat, and flying debris. Seek shelter to provide the greatest amount of safety against these effects.

INSTUCTOR'S NOTE: Attachment 3, in Part IV, gives just one example of an expedient shelter.

TAKE COVER IMMEDIATELY

If you are outside a shelter during a nuclear burst, take cover in a ditch, revetted area, culvert, or a road drainage tunnel. Expedient shelters can be constructed with accessible materials in a relatively short time. If all else fails, immediately take a prone position. Tightly cover your face with both hands. Don't move until the blast wave has passed completely. Completely means that the incident wave and any reflected blast waves must pass.

Preplanning should include protective measures against thermal effects. Anything in direct line of sight to a burst may burn.

Indirect flame burns could easily out-number all other types of injury if a detonation occurs in highly flammable surroundings. Window barriers, shielding, and proper shelter housekeeping is a must. Store or remove flammable materials away from the populated areas of your shelter or work center.

TIME, DISTANCE, AND SHIELDING

Your best overall protection against residual or delayed radiation hazards is avoidance. Time, distance, and shielding are keys to avoidance. Minimize your time outside of shelter. Remain inside your protective shelter unless the mission dictates otherwise. If you must work outside, do so as quickly as possible and get back inside without delay.

PROTECTION FACTOR

Shelters, such as massive concrete structures with few or no windows, allow much less radiation to penetrate them reducing exposure to the people inside. This is an important factor in the exposure control program. For example, even a simple shelter such as a wood frame structure can reduce your exposure by a factor of 10 or more.

INSTRUCTOR'S NOTE: Attachment 4, in Part IV, provides an illustration of how protection factors work.

Protect your bare skin from fallout. As a minimum, keep your buttons closed. Radioactive fallout exposure will be minimized by wearing gloves, field jacket and hood, blousing your pants, and taping openings in your uniform. Cover open cuts or wounds and avoid breathing fallout. Wear a handkerchief tied over your mouth or use your protective mask.

MAIN POINT 3. RADIATION SICKNESS

When fallout occurs radioactive material may enter the body through inhalation, ingestion, or absorption. Radiation sickness can result from a single exposure to high energy radiation, exposure to high-levels of fallout, or from repeated exposures to both.

In most circumstances, exposure to gamma rays from early fallout will represent the major external hazard from nuclear radiation. Other hazards include radioactive material present on exposed sources such as food and water.

INSTRUCTOR'S NOTE: Attachment 5, in Part IV, provides a chart that estimates the effects from exposure to gamma radiation.

RADIATION SICKNESS IS NOT CONTAGIOUS

Remember, radiation sickness is not contagious. It's caused by radiation destroying cells within our bodies at a rate the body cannot overcome.

A. SYMPTOMS OF RADIATION SICKNESS

A. Early symptoms of radiation sickness are nausea, vomiting, loss of appetite and illness. Subsequent symtoms producing severe body fluid loss, internal hemorrhaging and diarrhea indicate high levels of radiation.

B. COUNTERING RADIATION SICKNESS

B. In most cases, affected people will require medical treatment such as whole blood transfusions and antibiotics to control infections. Increased fluid intake may also be necessary. Medical treatment in your shelter may be extremely limited. Rest and relaxation may be your only treatment until medical assistance becomes available.

TRANSITION:

We have covered the fundamentals of nuclear warfare defense. Now let's focus our attention on radioactive contamination avoidance.

MAIN POINT 4. RADIOACTIVE FALLOUT CONTAMINATION AVOIDANCE

Radioactive fallout contamination avoidance measures are for your benefit. We will discuss several options to minimize contamination. The first topic is avoidance.

A. AVOIDANCE

A. Always try to avoid unnecessary exposure to radiation. If the mission permits, avoid handling objects suspected of being contaminated with fallout.

If your mission does not require you to enter a contaminated area, stay out.

B. PROTECTION (EQUIPMENT)

B. Protect equipment by covering with plastic sheets, tarps, or anything else to minimize the chance of fallout contamination. Park vehicles in hangars, garages, or under covered areas. Keep all doors, windows, or canopies closed to keep the fallout out.

C. SHELTER (PERSONNEL)

C. Shelters protect us from radioactive fallout. If possible, take shelter prior to the arrival of fallout. Any sort of overhead cover is better than nothing. A poncho, paper, cardboard, or any other expedient cover may be your only available shelter if you are outside when fallout arrives.

TRANSITION:

Some fallout contamination is unavoidable. You must be able to function and accomplish mission objectives after fallout arrives. One way of doing this is by performing immediate or operational radioactive fallout decontamination.

Accomplish these levels of decon to get most of the contamination off in the least amount of time. The highest level of decon, called thorough decontamination, is the job of the contamination control teams.

MAIN POINT 5. RADIOACTIVE FALLOUT DECONTAMINATION

Common sense plays the greatest role in expedient radioactive fallout decontamination. Pre-planning eliminates trial and error and includes knowing what, where and how to decontaminate yourself and equipment.

YOU CAN NOT NEUTRALIZE (ONLY REMOVE) RADIOACTIVE CONTAMINATION

Remember, you cannot neutralize radioactive contamination; you can only remove it. Also, items exposed to fallout do NOT become radioactive themselves. Simply remove the fallout and the item is safe to use. You can do this by washing your vehicles equipment and yourself.

A. IMMEDIATE DECONTAMINATION

A. Immediate decontamination is defined as decon that people perform after being exposed to life-threatening, hazardous materials to save lives and minimize casualties.
It may include decontamination of personal clothing or equipment. A simple example would be a person wiping off his clothes before entering a shelter.

B. OPERATIONAL DECONTAMINATION

B. Operational decontamination performed on specific parts of operationally essential equipment, material, or working areas in order to minimize contact with and transfer of hazards. This may be something similar to a team sent from the shelter to sweep or shovel the dirt and fallout off the roof of the building.

C. BE SELECTIVE

C. Also, know which sensitive or fragile equipment components cannot be decontaminated in the normal manner. This is common sense items like not using soap and water to clean your computer.

INSTRUCTOR'S NOTE: Specific radiological decontamination procedures are listed in RTP F16 (Wartime Radioactive Fallout Decontamination).

D. GENERAL EQUIPMENT

D. Many things can be used to decontaminate radioactive fallout. No specific equipment is issued to you for this purpose. Use any of the following items to perform expedient decontamination:

WATER

⇒ Pressurized water from hoses may be used to remove radioactive fallout. As a rule, the higher the pressure, the greater its effectiveness.

SOAP AND WATER

⇒ The best general decon solution is soap and water. It's available, safe, and it works. Greasy or oily surfaces that attract and hold radioactive dust may require soap and water to flush it away.

Remember, regardless of what you use, you can only move radiation from one place to another. You can't neutralize it.

BROOMS, MOPS, AND BRUSHES, ETC.

⇒ Brooms, mops, and brushes used with soap and water significantly increase the effectiveness of decontamination. Damp rags may be used to wipe off most fallout except for deep cracks, crevices, and depressions.

VACUUM

⇒ A vacuum cleaner can remove most fallout particles from equipment and personnel. After vacuuming your equipment wipe it down with a damp rag. Vacuum your outer clothing before removing it. When you're finished, keep the vacuum, or at least the bag, outside the shelter.

If a vacuum is unavailable, you can brush-off your clothes or equipment to minimize the contamination.

CONCLUSION

SUMMARY: In summary, we have covered the following topics relating to nuclear warfare defense.

1. The four types of nuclear bursts: High Altitude, Air, Surface, and Subsurface as well as the distinguishing characteristics.

2. Effects of nuclear weapons - specifically the blast, heat, and radiation to include types of radiation and individual protection.

3. Symptoms such as nausea, vomiting, loss of appetite, and illness as well as counter measures for radiation sickness.

4. Radioactive fallout contamination avoidance including protecting equipment, and personnel shelters.

5. And finally, we talked about radioactive fallout decontamination.

REMOTIVATION: The information covered today may help save your life. This information is basic to your knowledge of survival skills.

CLOSURE: This concludes the lesson on nuclear warfare defense actions.

TRANSITION: (Develop locally to transition to the next topic.)

PART III
EVALUATION
STUDENT PERFORMANCE STANDARDS

TEST ITEMS

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1. LESSON OBJECTIVE: Identify the four types of nuclear bursts.

QUESTION: (Multiple Choice)

Which of the following is NOT one of the four basic nuclear weapons bursts?

a. Surface
b. Subsurface
c. High altitude
d. Medium altitude

Key: d

REFERENCE: Main Point 1.

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2. LESSON OBJECTIVE: Describe the effects of nuclear weapons.

QUESTION: (Multiple Choice)

85% of the energy released from a nuclear weapons burst is in the form of:

a. Blast, heat, and fallout.
b. Thermal radiation only.
c. Initial and residual radiation.
d. Air blast and thermal radiation.

Key: d

REFERENCE: Main Point 2.

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3. LESSON OBJECTIVE: Explain personal protective measures against nuclear weapons effects.

QUESTION: (True or False)

Your best protection against radiation hazards is avoidance. The keys to avoidance are: time, distance, and shielding.

a. True
b. False

Key: a

REFERENCE: Main Point 2.

4. LESSON OBJECTIVE: Identify symptoms of radiation sickness.

QUESTION: (Multiple Choice)

Early symptoms of radiation sickness include:

a. Nausea, loss of appetite, and illness
b. Vomiting, diarrhea, and glowing in the dark.
c. Nausea, severe body fluid loss, and vomiting
d. Loss of appetite, internal hemorrhaging, and illness.

Key: a

REFERENCE: Main Point 3.

5. LESSON OBJECTIVE: Describe radioactive fallout contamination avoidance measures used to protect equipment and people.

QUESTION (Multiple Choice)

Radiological contamination avoidance measure(s) include:

a. Avoiding contaminated areas.
b. Protecting equipment and resources.
c. Sheltering equipment and personnel.
d. All of the above.

Key: d

REFERENCE: Main Point 4.

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6. LESSON OBJECTIVE: Describe the concept of operation for immediate and operational radioactive fallout decontamination.

QUESTION: (Multiple Choice)

Which of the following is a FALSE statement concerning radioactive fallout decontamination.

a. Brooms, mops, brushes, and rags can be used for radioactive fallout decontamination.
b. Pressurized water may be used to remove radioactive contamination from critical equipment or facilities.
c. Radioactive fallout decontamination involves neutralizing the contamination with any available resources.
d. Selective immediate or operational radioactive fallout decontamination involves decontamination of only critical areas and resources that must be handled.

Key: c

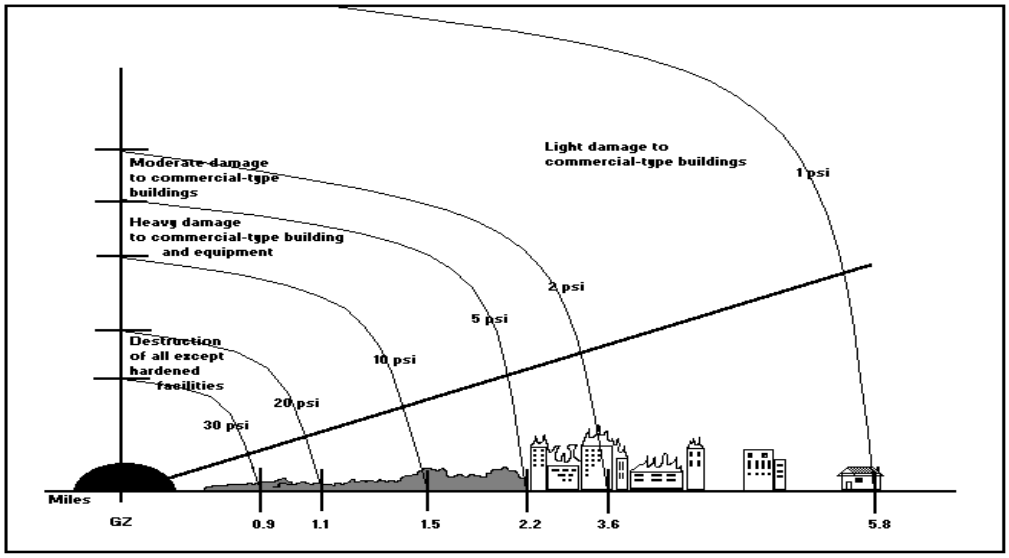
REFERENCE: Main Point 5.

PART IV
RELATED MATERIALS

ATTACHMENT 1 Illustration of Effects of a Nuclear Weapon
ATTACHMENT 2 Illustration of Energy Dispersed from a Nuclear Detonation
ATTACHMENT 3 Illustration of an Expedient Shelter
ATTACHMENT 4 Illustration of How Protection Factors Work
ATTACHMENT 5 Chart of Estimated Effects From Exposure to Gamma Radiation

RTP C7 Alpha, Beta, and Gamma Radiation Hazards and Protective Actions
RTP F16 Wartime Radioactive Fallout Decontamination

Additional Reading: Nuclear Attack Environment Handbook (Federal Emergency Management Agency)

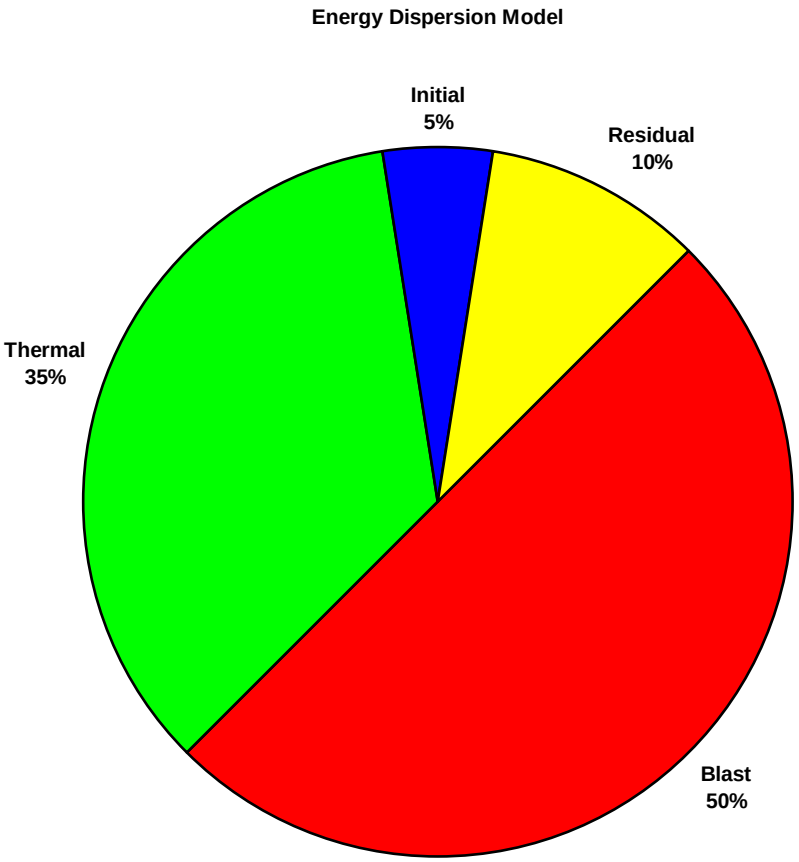


Effects of 500-KT Surface-Burst Weapon (Not to scale)

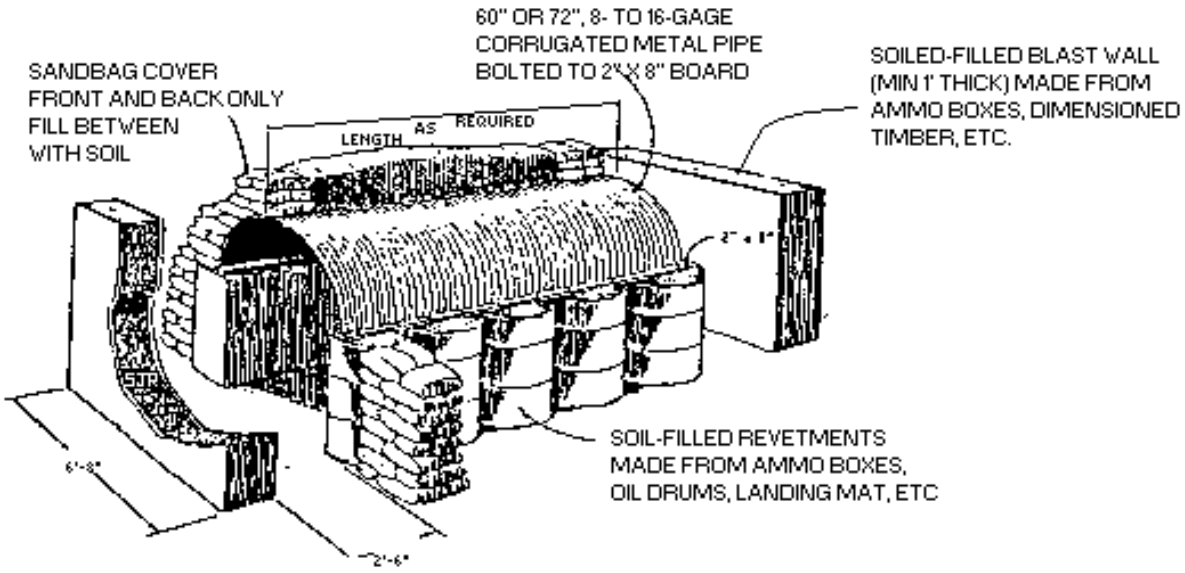
Tentative Criteria for Direct Blast Effects in Man From Fast-Rising, Long-Duration Pressure Pulses

EFFECT	EFFECTIVE PEAK PRESSURE (psi)
Lung Damage Threshold Severe	 12 (8-15) 25 (20-30)
Lethality: Threshold 50 % 100%	 40 (30-50) 62 (50-75) 92 (75-115)
Eardrum Rupture: Threshold 50%	 5 15-20 (more than 20 years old) 30-35 (less than 20 years old)

Attachment 1 - Illustration of Effects of a Nuclear Weapon



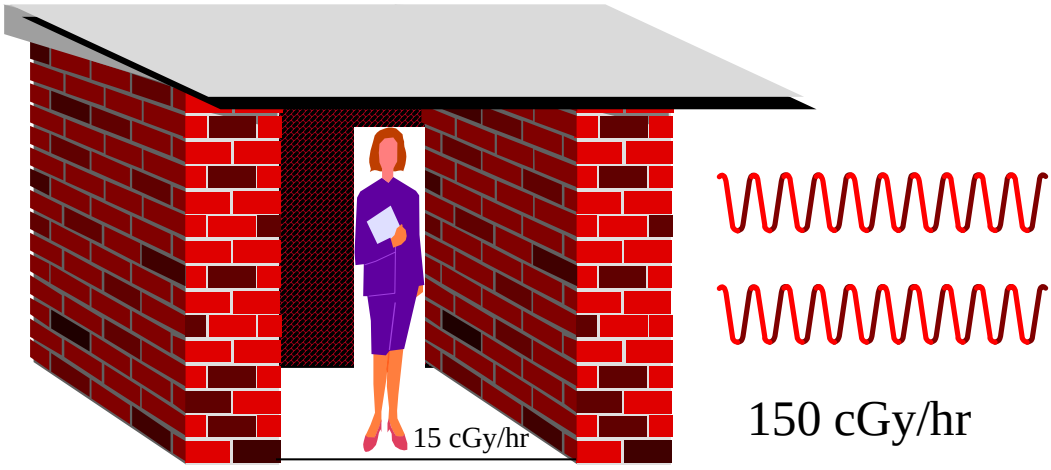
Attachment 2 - Illustration of Energy Dispersed From a Nuclear Detonation



Attachment 3 - Illustration of an Expedient Shelter

Note:
This shelter would be suitable for immediate blast protection. The open configuration would not be useful as a fallout shelter. Modifications could be made by enclosing the shelter.

Outdoors



Indoors with PF of 10

Attachment 4 - Illustration of How Protection Factors Work

	Accumulated radiation exposures cGy (centigray)in any period of			
Medical care will be needed by:				
	one week	one month	four months	
A NONE	150	200	300	A
B SOME (5% may die)	250	350	500	B
C MOST (50% may die)	450	600	---	C

Attachment 5 - Estimated Effects on the Average Adult From Exposure to Gamma Radiation

TRAINING PACKAGE COMMENT REPORT

RTP #	RTP DATE

To get an *immediate response* to your questions concerning subject matter in this Readiness Training Package (RTP), call the author (listed on the front cover) or the Contingency Training Section at DSN 523-6160 between 0700-1600 (CT), Monday through Friday. Otherwise, write, fax, or E-mail the author to make comments, suggestions, or point out technical errors in the area of: references, body information, performance standards, test questions, and attachments.

NOTE: Do not use the Suggestion Program to submit corrections for printing or typographical errors.

Comments:_____

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