SM-3-11
Revised April 1963

PERSONAL AND FAMILY SURVIVAL

Civil Defense Adult Education Course Student Manual

SUPERSEDES SM-3-11 "PERSONAL PREPAREDNESS IN THE NUCLEAR AGE" DATED AUGUST 1961

DEPARTMENT OF DEFENSE
OFFICE OF CIVIL DEFENSE

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INTRODUCTION

This manual is prepared to give participants in the courses held under the Civil Defense Adult Education Program a permanent record of the matters covered in the course and to serve as a basic home reference on Civil Defense. It does not pretend to be a study of all aspects of the problem.

No claim is made that this manual is any encyclopedia on Civil Defense or that it is a definitive study. Rather, the manual should be considered to be a collection of basic information needed by families to enhance the chances of their survival under nuclear attack.

Civil Defense, as part of the total program of national security, affects every unit of government and has heavy implications for most aspects of the individual citizen's daily life. Civil Defense is such a broad and dynamic field of public and personal endeavor that it must be said: that this manual represents the status of official policy and expert opinion as of the date of publication.

The Civil Defense Adult Education Program is managed for the Office of Civil Defense, Department of Defense, by the U.S. Office of Education, Department of Health, Education, and Welfare. The Office of Civil Defense sends the Office of Education the latest Civil Defense information. The Office of Education, in turn, sends the information to the States and, through them, to instructors of the courses. The instructors have special training to teach this special course and are furnished the latest information available pertaining to it.

Instructors are instructed to modify the course so that it has the greatest possible meaning and benefit for the people in a particular class. As part of the course, the local Civil Defense Director, or a representative of his office, is invited to make a presentation so participants can understand how Civil Defense operates in their community.

No given instructor can be expected to know everything about Civil Defense. However, instructors are furnished with standard works, such as Effects of Nuclear Weapons, prepared by the Department of Defense and published by the U.S. Atomic Energy Commission, and others of the type represented in the bibliography at the end of the manual.

The Civil Defense Adult Education Program is now presenting survival information in over 40 States, Puerto Rico, and the District of Columbia to over 1

million adults a year. The Government commends participants in the course for their prudent interest in personal and national survival.

NOTE-This publication supersedes SM 3-11 "Personal Preparedness in the Nuclear Age," issued August 1961

CHAPTER I

THE CIVIL DEFENSE PROGRAM

PURPOSE OF THE COURSE

The purpose of this course is to help save lives if a nuclear attack should ever come to America. In January 1962 the Department of Defense issued basic survival information under the title Fallout Protection: What To Know and Do About Nuclear Attack. This course elaborates upon and encourages discussion of the vital matters presented in the basic work. The outcome of the course will be more effective family planning to meet emergency situations and an understanding cooperation with community disaster plans.

Nuclear war is possible. This fact accounts for the appropriation each year of significant sums for antiaircraft and antiballistic missile programs to meet the contingency of a failure of the deterrent force which accounts for much of our military budgets. The recent series of Russian weapons tests, the continuing Berlin situation, and the recent Cuban crisis are continual dramatic reminders of this fact.

President Kennedy's words on May 25, 1961, continue to define the inescapable responsibility of the Federal Government to take reasonable and practical steps to strengthen the national civil defense posture:

"But this deterrent concept assumes rational calculations by rational

men. And the history of the 20th century is sufficient to remind us of the possibilities of an irrational attack, a miscalculation, an accidental war, or a war of escalation in which the stakes by each side gradually increase to the point of maximum danger which cannot be either

foreseen or deterred. It is on this basis that civil defense can be readily justifiable-as insurance for the civilian population in case of an enemy miscalculation. It is

insurance we trust will never be needed-but insurance which we could never forgive ourselves for foregoing in the event of catastrophe."

In his State of the Union message delivered in January 1963, President Kennedy reaffirmed his judgment in the importance of civil defense and identified it as a definite part of the total national defense posture. The President said, "... Until the world can develop a reliable system of international security, the free people have no choice but to keep their arms nearby.

"This country, therefore, continues to require the best defense in the world.... This means, unfortunately, a rising defense budget for there is no substitute for adequate defense, and no 'bargain basement' way to achieving it. It means the expenditure of more than $15 billion this year on nuclear weapons systems alone …

"But it also means improved air and missile defense, improved civil defense, a strengthened anti-guerrilla capacity and, of prime importance, more powerful and flexible non-nuclear forces.... "

Testifying before the House Armed Services Committee in January 1963, Secretary of Defense Robert S. McNamara said: ". . . In some wartime situations a reasonable Civil Defense program could do more to save lives than many active defense measures. To cite just one example, the effectiveness of an active ballistic missile defense system in saving lives depends in large part upon the availability of adequate fallout shelters for the population." Secretary McNamara also stated to the committee that "... The very austere Civil Defense program recommended by the President ... should be given priority over any major additions to the active defense."

THE NATIONAL CIVIL DEFENSE PROGRAM

The details of a Civil Defense program may change with changes in the kinds of weapons that might be used. But the essential elements of the program remain the same.

Since transfer of civil defense activities to the Department of Defense on August 1, 1961, a program has been developed based on two primary objectives:

1. A system of shelters, equipped and stocked with the minimum purpose of protecting our entire population from the fallout effects of a nuclear attack.
2. National, State, and local organization, planning and training to carry out warning, emergency communications, movement to shelter, health and feeding services, firefighting, decontamination, rescue and reconstruction of vital facilities and services.

An effective civil defense calls for advance planning at every level of government-local, State, and National. This planning must be flexible enough to adapt itself to changes in enemy weapons and tactics. It must be comprehensive enough to cover people living under widely different conditions, from ranch houses, to apartment buildings, to frame cottages. Planning of this nature requires understanding and support of the informed citizens of every community.

The Federal Civil Defense Act puts the responsibility for Civil Defense jointly on the Federal Government and the States. The Federal Government has assumed four responsibilities: (1) To keep track of the nature of the threat which the Civil Defense Program must be designed to meet; (2) to prepare information about the threat and how it can be met; (3) to bear a major part of the costs of certain kinds of Civil Defense activities, where such sharing will stimulate State and local and private activities ; and (4) to provide technical assistance through State and local channels for Civil Defense planning.

State and local governments have the operating responsibility for Civil Defense. An individual must be able to look to some agency of his State or local government for advice and assistance on civil defense planning, just as he looks to them for police and fire-protection services. By the same token, the responsibility for organizing community Civil Defense protection falls on the States and, through them, on local government units. Because the job is an extraordinarily difficult one, the Federal Government assists the States with technical help and matching funds for certain programs.

The key element in the national program is the provision of fallout shelter. Community shelters will protect a large part of the population; but many families, because of their location or individual preferences, will choose family fallout shelters. The Federal Government will join with States and communities, in a variety of ways, to help provide fallout shelter.

SHELTER EMPHASIS LOGIC

Since great emphasis is placed upon shelter from radioactive fallout the logic of the move should be explained. Many people close to the detonation of a nuclear weapon will not survive the blast and heat effects. However, survivors of blast and heat, as well as people at great distances from the explosion, can be threatened by radioactive fallout. Studies made by the Department of Defense that are used for both military and Civil Defense planning purposes show that most of the Nation could be subjected to fallout following a major attack. The potentiality is summarized on the map. (See Fig. 1.)

The map shows possible rather than actual fallout conditions. Depicted in the fallout resulting from a hypothetical attack on a spring day selected at random. The attack is heavier than would be possible today but is assumed to be possible some time in the future. The attack assumes that over 3,000 megatons would be

exploded on or near the ground, thereby generating fallout. (See Chapter 3.) The darkest areas on the map indicate where it would be necessary to stay in shelter for a week or two. The less dark areas indicate where it would be necessary to stay in shelter from two days to one week. People located in the light gray areas on the map would have to stay in shelter only the first day or two. Overall approximately 75% of the country is covered by fallout, assuming that average winds prevailed. Areas shown in white to be "free of fallout conditions could virtually be covered under different wind conditions, leaving other areas free.

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FALLOUT CONDITIONS FROM AN ASSUMED ATTACK AGAINST A WIDE RANGE OF TARGETS: MILITARY, INDUSTRIAL AND POPULATION

FIGURE 1.—Fallout conditions map.

Fallout conditions in an actual attack would depend on a number of variables. First, there will be the variability in the direction and velocity of the winds on any given day. Second, the targets at which the enemy might be shooting are matters of conjecture. Third, the number, size, reliability and accuracy of his weapons will

be matters of some variation. Despite the variables involved, fallout would threaten virtually all of the area of the United States.

The map shows clearly that fallout can create a hazard which must be coped with in all parts of this country. While radiation and fallout are discussed in detail in Chapter 3, it is important at this point to know only that people who have no protection from radioactive fallout will get sick and, if they get too much exposure, they will die. Fallout would be a nationwide problem and shelters from fallout are needed everywhere.

Planning assumptions for both military and Civil Defense purposes are based on the results of a continuing series of highly systematic studies conducted by the Department of Defense. These studies cover a wide range of potential attacks projected over the years ahead, based on varied assumptions as to enemy objectives, delivery capabilities, wind conditions, weights of attack, targeting systems and our own defensive capabilities. One consistent conclusion is that lives saved under heavy attacks by a total fallout shelter system, after allowing for imperfect use of the system and the vulnerability of shelters too close to explosions, would be somewhere between 40 million to 120 million. Even under low levels of attack, a minimum life saving potential of 20 million lives is anticipated. Fallout protection is an integral part of our defense posture, and is the lowest cost method of providing wide-scale protection for the total population.

FIGURE 2.—Fallout shelter sign.

The existing shelters have already been surveyed and, with the permission of building owners, are being marked and stocked with minimum survival supplies and equipment. (The National Shelter Survey is discussed in Chapter IV.)

The black and yellow shelter signs going up all over the country mean more than shielding from radiation. They represent not only a place to go which will significantly improve chances of survival but also a place where trained leadership can be found for those crowded into shelters; where there will be a communications link to authoritative sources of information and direction; where food and water is available; where medical supplies are provided with a nucleus of people trained in their use; and where radiation detection equipment is available with personnel trained in monitoring operations.

SUPPORTING ACTIONS

Civil Defense involves every unit of government and has implications for many facets of daily living for individual citizens. Within the Federal Government primary responsibility for Civil Defense has been placed with the Office of Civil Defense within the Department of Defense. Also involved, by virtue of its responsibility for resource mobilization planning, is the Office of Emergency Planning within the Executive Office of the President. In addition, Civil Defense assignments by Executive order have been made to 29 agencies, including the Department of Health, Education, and Welfare and the Department of Agriculture, which have considerable impact on State and local Civil Defense. The Office of Civil Defense has eight regional offices which assist States with their Civil Defense planning.

Each State government directs and coordinates the Civil Defense activities of the State, its counties, townships and other political subdivisions.

Governors, mayors, and other community officials oversee the Civil Defense programs in the areas under their normal authority. With the assistance of their Civil Defense staff, these officials provide planning and leadership for government functions in emergencies. The governor appoints a State Civil Defense Director who is in charge of Civil Defense and is often charged with the defense mobilization activities throughout the State. Mayors appoint city directors with similar local defense responsibilities. Final responsibility, however, remains with the regularly elected heads of government.

Cities, large and small, face many problems in protecting their people during emergencies. Many communities have already developed emergency plans and have assigned responsibilities to their employees. City workers are being trained for special emergency tasks, and volunteer helpers are receiving training to augment regular employees.

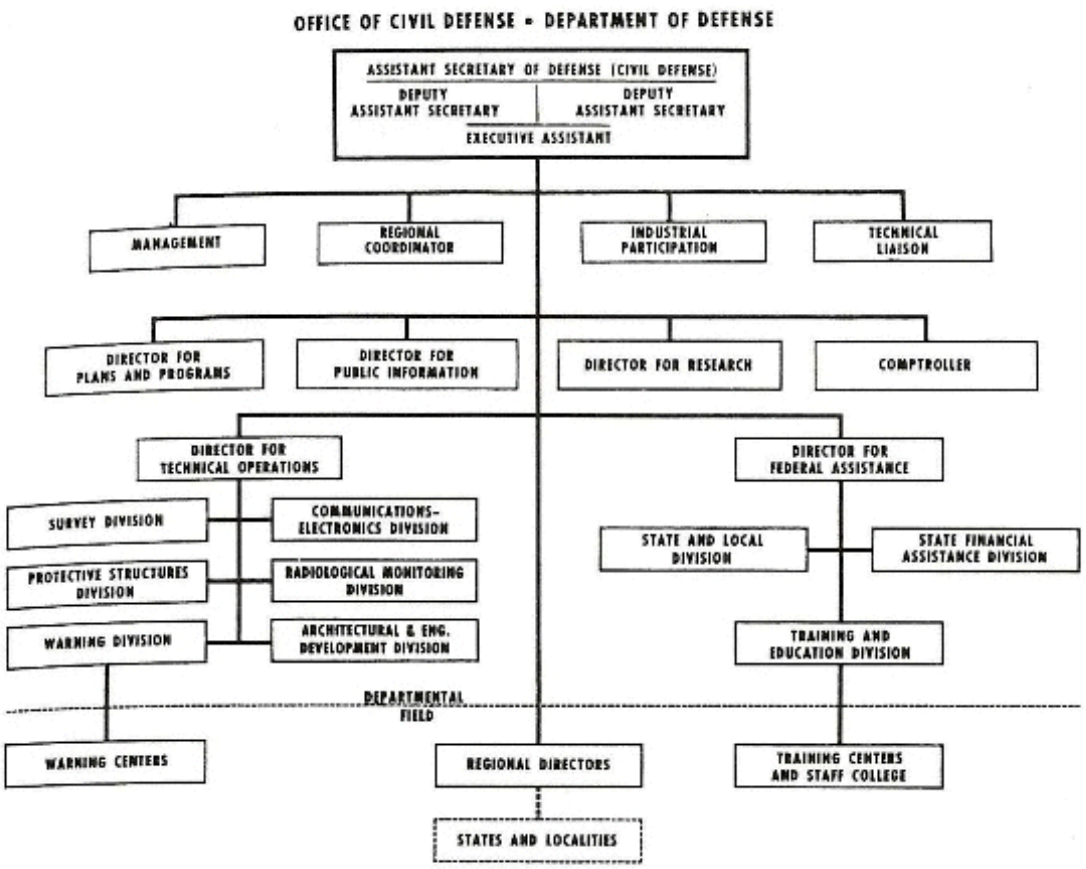


FIGURE 3.—Channel of coordination, President to local government.

Counties have also been actively developing emergency plans. County government officials know that farmers will have the vitally important responsibility of feeding the nation during the post-attack period. Rural survival plans are often developed by county government in close cooperation with the County Agricultural Agent, local farm associations, granges, farm cooperatives, and other local voluntary organizations.

The task of informing every citizen about nuclear attack, and what he can do about it, is carried on by National, State, and local government Civil Defense agencies. These organizations also provide specific training to the hundreds of thousands of volunteer workers who must be prepared to assist constituted government agencies in shelter management, decontamination efforts, rescue work, firefighting, first aid, and to restore necessary services.

Today many Americans who have informed themselves about the danger facing the Nation feel an obligation to take positive action. Each individual's

preparedness adds to the defensive strength of the Nation, When the citizen takes such action, he not only serves his country, but also has the satisfaction of having done all that can reasonably be expected of him to improve the chances of his own survival and the survival of his family and community. Under attack conditions initial lifesaving actions will have to be taken first by individuals, families, and communities. In the chapters that follow is information on what actions to take to improve the odds for survival.

FIGURE 4.—Class.

CHAPTER II

WARNING AND COMMUNICATIONS

A dependable warning system is a vital part of civil defense. In the nuclear age no one can know the number of seconds, minutes or hours of warning we might have before an attack. An ultimatum might set a deadline; enemy bombers can be tracked while hours away; but enemy missiles can arrive almost unannounced.

Fortunately, it appears likely that almost every missile would be directed against our military targets, such as SAC bomber bases and missile sites, and our air defense nerve centers. In an attack of this kind, many of our cities might have hours of warning before the arrival of the enemy bombers which might attack them. Other cities, however, near military targets or otherwise subject to missile attack, might have only minutes of warning.

However, even brief warning received by radio or public warning devices would give precious, lifesaving time to act. It should be kept in mind also that there would be a significant period of time, in many areas several hours, between the explosion of nuclear weapons and the arrival of radioactive fallout.

A WARNING SYSTEM

Current Warning Systems Network

Warning depends upon discovering approaching aircraft or missiles as far from the Nation's borders as possible. This warning must be rapidly transmitted to the general public. The National Warning System (NAWAS), together with State and local warning systems, make up our Civil Defense Warning System. Telephone, radio, teletype, and special systems are used to flash warnings throughout the States and their political subdivisions. Sirens, horns, whistles, voice-sound systems and similar sound-producing devices are used to warn the public.

NORAD

To provide the necessary early warning, the North American Air Defense Command (NORAD)-a joint United States-Canadian defense system-maintains a surveillance network that includes ground radar installations and radar-equipped aircraft across the northern reaches of North America. Far to the north, lines of detection stations face the North Pole, Europe, Russia and Asia. Other radar-equipped planes and radar picket ships are on duty off our shores, watching and listening for danger that might be approaching across the Atlantic or Pacific.

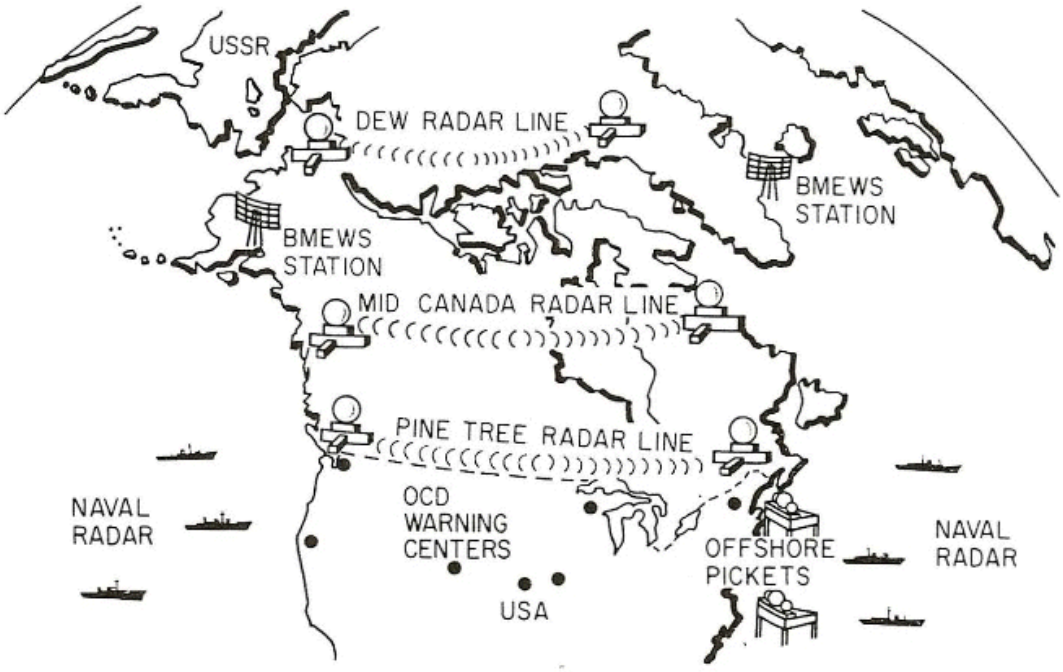


FIGURE 5.—North American detection radar lines.

Detection begins at the DEW Line (Distant Early Warning Line), a radar wall extending some 4,000miles across the Arctic, through the Bering Sea, and into the North Pacific. Navy picket ships and radar-crammed patrol planes extend the DEW Line far out to sea.

The mid-Canada Radar Line, shown in figure 5, is some 600 miles south of the DEW Line. The Pinetree Line of this huge radar network parallels the United States-Canadian border.

Offshore detection lines are formed by radar-equipped picket ships, aircraft and blimps.

BMEWS

The U.S. Air Force has recently set up a system of giant radar installations that will spot missiles thousands of miles across the Arctic. This system, called BMEWS (Ballistic Missile Early Warning System), is especially designed to give warning of approaching intercontinental missiles. BMEWS installations are located at Thule, Greenland, and Clear, Alaska. A third at Flyingdales Moor in England will be operational in 1963. BMEWS reports can establish (1) that hostile missiles have been fired, (2) the areas from which they were fired, and (3) the estimated missile target. In a matter of seconds electronic computers analyze

the signals, compute data, and transmit findings to the North American Air Defense Command.

NAWAS

The backbone of the Civil Defense Warning System is the National Warning System (NAWAS) which links the OCD National Warning Center at NORAD Headquarters and 6 OCD Warning Centers at NORAD Regions with 500'IVarning Points in the continental United States. Once it has been determined that attack is probable or imminent, OCD Warning Centers disseminate an Air Raid Warning and supplemental information concerning type and direction of attack, and Warning Time (time available before attack) to the 500 Warning Points. They, in turn, relay the warning and the Warning Time to approximately 3,500 secondary warning points, who pass the warning to local officials responsible for warning the public.

The attack warning system is always at wartime readiness. This system is tested regularly.

Warning Signals

There are two Civil Defense warning signals to alert the public to approaching enemy attack. Everyone should know what to do when each of these warning signals is sounded. These warning signals can be sounded on horns, whistles, or sirens. Regardless of the warning device used, each person should be able to recognize each signal instantly and know what action to take.

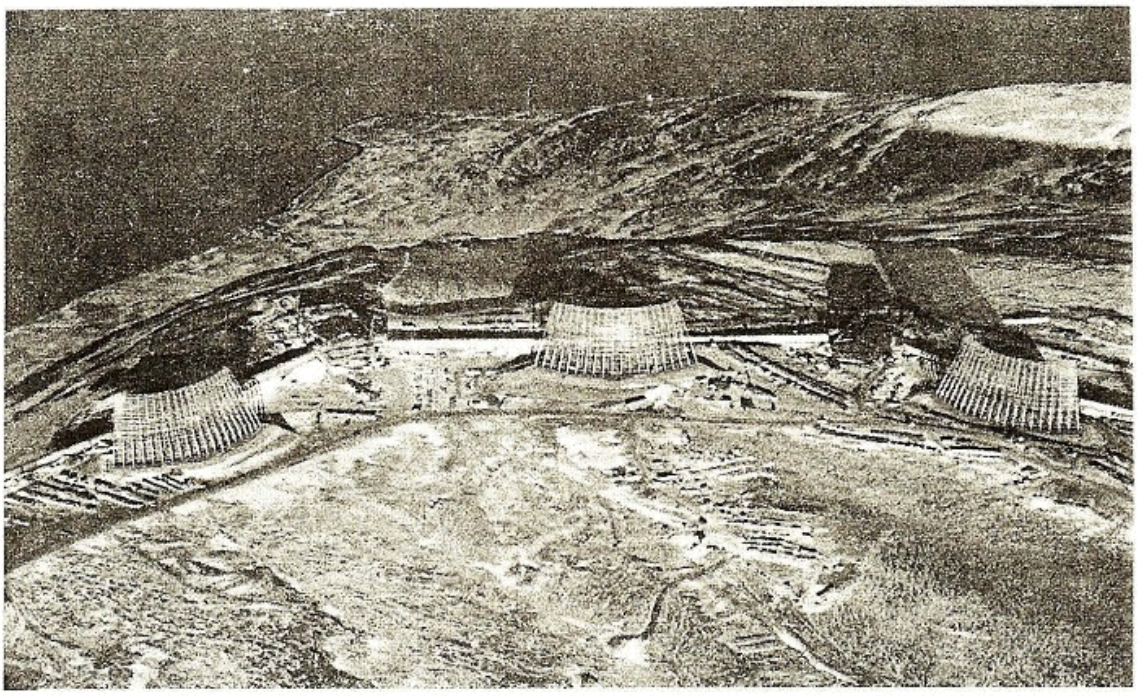


FIGURE 6.—BMEWS antenna.

Alert Signal

A STEADY 3-to-5-MINUTE SOUNDING of the siren or other warning device is the "Alert" signal. This signal is used if there is evidence of impending attack. When the Alert is heard, each person should turn on the radio for emergency instructions. The Alert signal will mean that there is some time to take predetermined or survival actions, such as movement to public or family shelters. The survival measures must be predetermined in case of this warning and incorporated into the local Civil Defense survival plan. Whatever an individual is to do should be done at once. Family practice and drill should also be held periodically.

THE WARNING NETWORK

Here's what would happen if an enemy air attack were launched against our continent:

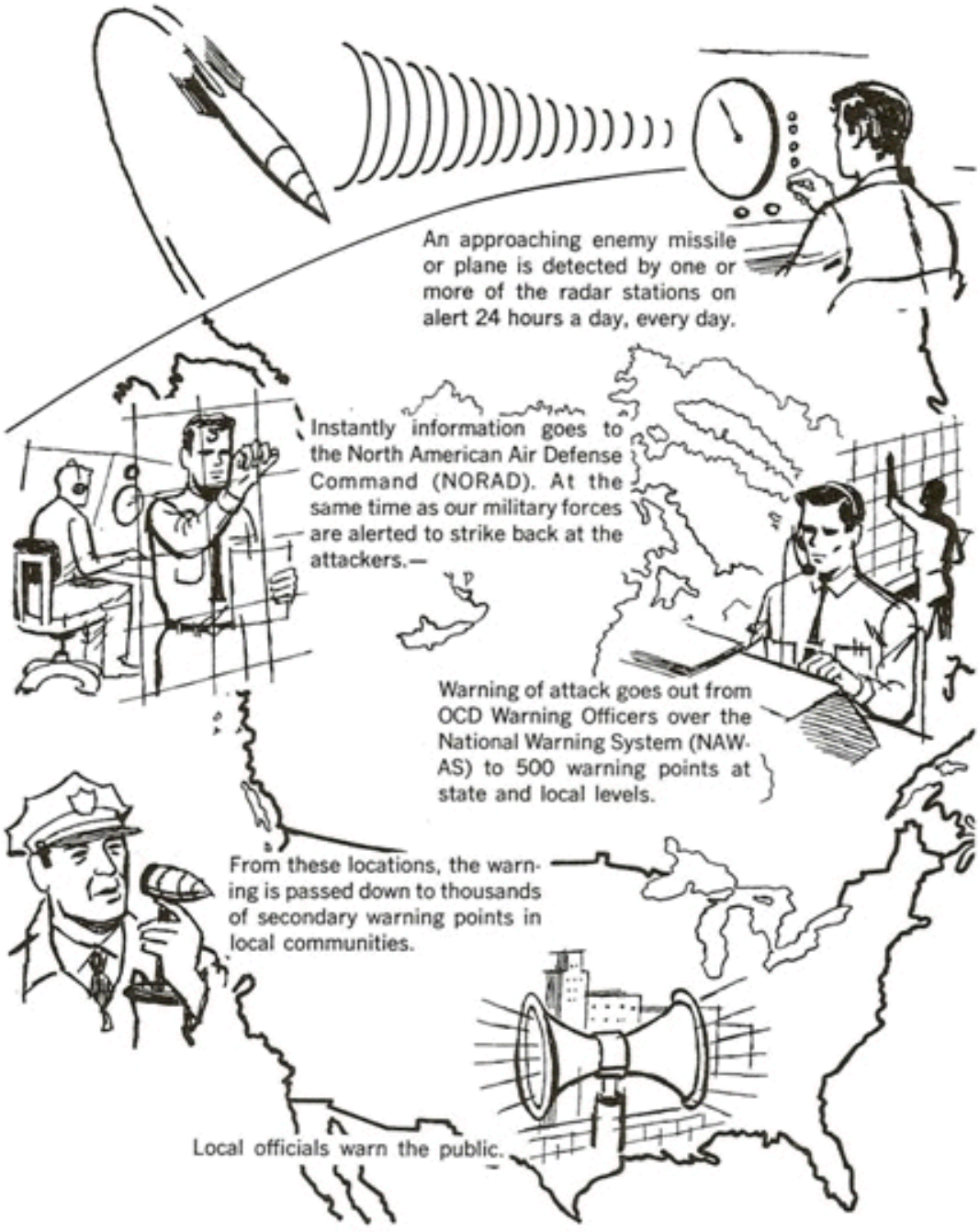


FIGURE 7.—Association of warning network elements.

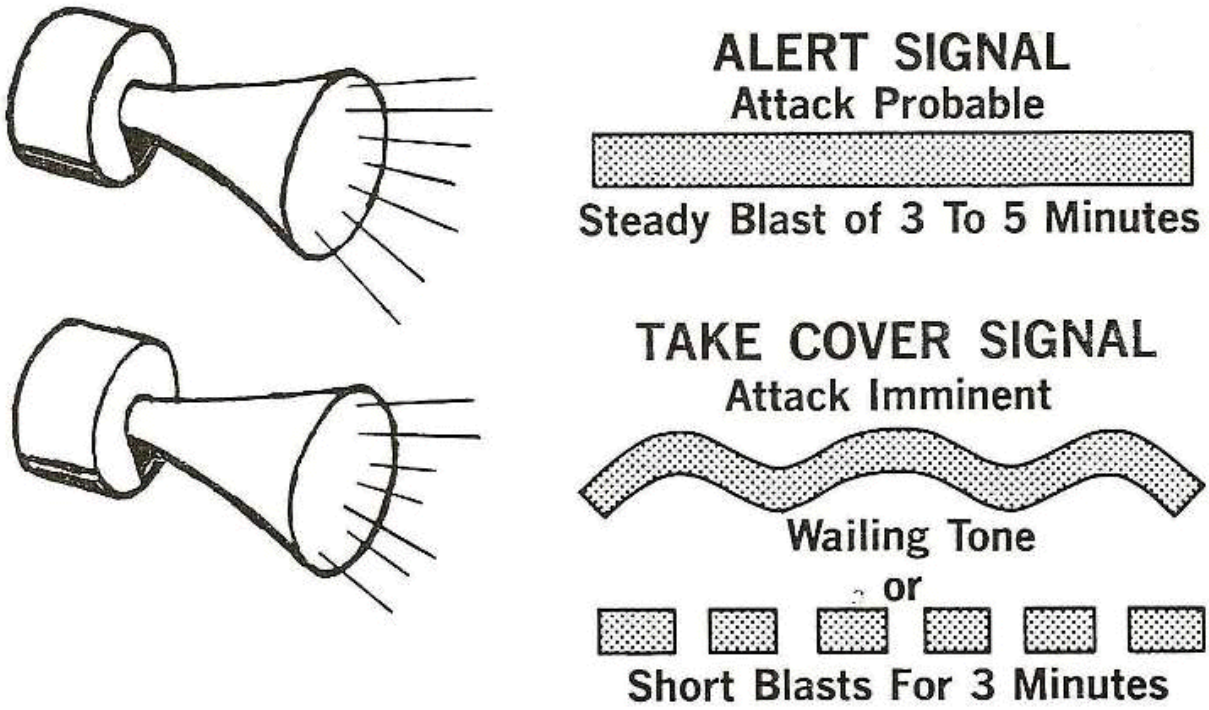


FIGURE 8.—Warnings; alert, take cover.

Take Cover

A WAILING TONE OR A SERIES OF SHORT BLASTS FOR 3 MINUTES on sirens or other signaling devices means take cover. This signal is used to indicate that hostile attack is imminent and that time permits only the most rapid movement to shelter. It is essential, then, to go as quickly as possible to the nearest shelter. People who are in a building should move at once to a marked shelter area if one is available in the building, otherwise to the best protected part of the building. People who are outside should run, not walk, to the nearest cover.

An "all clear" signal will not be sounded on public warning devices. Information on the further action required will be passed by voice communication media, probably radio.

LOCAL WARNING DEVICES

Local warning devices vary from community to community, as noted above. The most important considerations, however, are that the warning devices be in

sufficient number and of sufficient intensity to be heard by the entire community. Indoor warning devices such as Bell and Lights, Muzak, telephone calling, etc., can also be utilized. Periodic testing of local devices helps insure their adequacy and readiness for any emergency, and familiarize the public with the meaning of the signals.

NEAR

The National Emergency Alarm Repeater (NEAR) System, the name given to OCD's prototype indoor warning system, entered one of a number of engineering tests October 1962 at Phoenix, Ariz. At that time, a converter was installed and testing began on the Arizona Public Service Company system. This engineering test phase will continue through June 1964. In addition, several different prototype NEAR receivers will be tested and operational control methods for the system will be tested.

This system is designed to provide a capability for almost instantaneous warning of impending attack for the indoor public. It will make warning available to about 96 percent of the population in homes, offices, factories, schools, and in other places of public assembly. It will be particularly valuable in bringing warning to rural areas where outdoor warning systems would be too expensive to install. The NEAR system is activated by a special signal transmitted over electric utility lines.

The receiver for the NEAR signal is a small box approximately a 3½-inch cube (see fig. 9). It can be plugged into any standard 120-volt receptacle. When activated by the signal transmitted over the electric utility system lines, it produces a loud, annoying buzzing sound which may be heard over the usual indoor noises.

The NEAR system will supplement sirens and other outdoor warning devices and systems.

Receipt of the NEAR signal is the order to seek shelter immediately!

CONELRAD

CONELRAD (CONtrol of ELectromagnetic RADiations) was devised to provide radio communications in a national emergency while denying enemy bombers the use of radio beams as an aid in finding targets. This is accomplished by having television and FM stations cease their regular transmission and selected AM stations to go to either 640 or 1240 kilocycles.

The basic defense requirements for CONELRAD have decreased as the potential of attack with ballistic missiles has increased. Recently, the Department of

Defense determined that, it was no longer essential to minimize radiation by non-Government transmitters as possible navigation aids to an enemy. Accordingly, the CONELRAD system is now known as "The Emergency Broadcast System." This system, when completed, should ensure civil governments a more effective means of communication with the public. Also, OCD, in cooperation with the radio broadcast stations, is building shelters in selected radio stations, to allow them to continue broadcasting under fallout conditions.

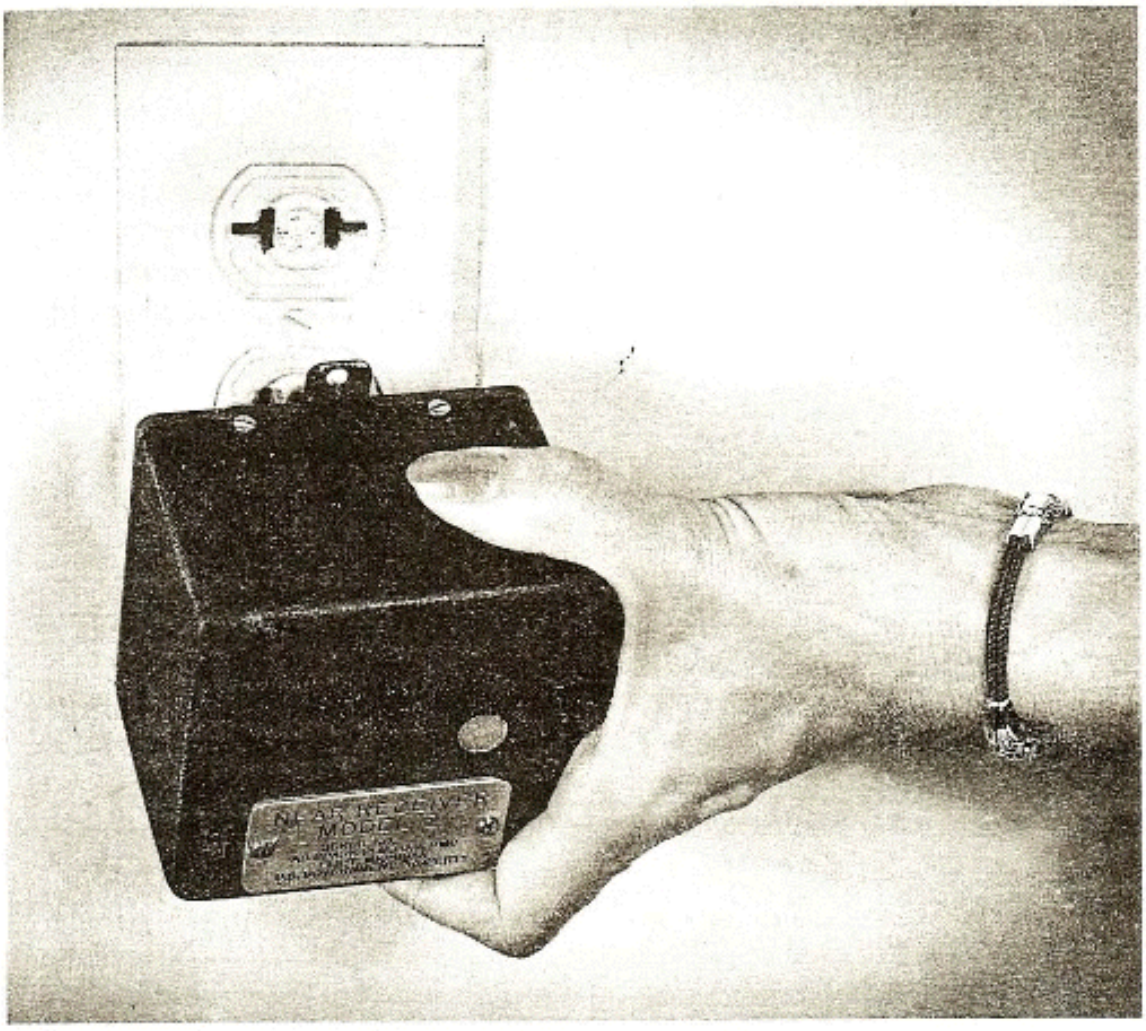


FIGURE 9—NEAR receiver.

SHELTER COMMUNICATIONS

Telephones are expected to be the principal means of communication between community shelters and between the shelters and the local government Emergency Operations Center (EOC). It is also expected that the telephone system will be backed up by radio. As this plan is carried into effect, information applying to all community shelters could be broadcast by radio. Information for or from a particular shelter would be conveyed by telephone. The necessary communication equipment should be installed by the local community.

Within large shelters, information and instructions to occupants may be provided by public address systems.

In large community shelters, communications equipment will be operated by specially trained staff members. Each local government Emergency Operations Center will transmit instructions and directions to shelters within its area.

If, when warning is sounded, shelter staff members discover that for some reason a community shelter cannot be occupied safely, they will immediately call the local operations center for instructions. The Center, on the basis of all available information, may order that the shelter be closed and its occupants moved to other nearby shelters or that the occupants remain where they are and make the best of the situation.

CHAPTER III

MODERN WEAPONS AND RADIOACTIVE FALLOUT

BOTH THE MILITARY FORCES and the civilian population of the United States may be endangered by the effects of modern weapons. Our country must prepare to defend itself against any weapon which might be used in an attack. There are four possibilities: Conventional, chemical, biological, and nuclear.

CONVENTIONAL WEAPONS

Weapons which depend on TNT or similar nonnuclear explosives for their effectiveness are classified as "conventional". These include many of the weapon types used during World War I, II and the Korean War-shells, torpedoes, rockets, mines, and bombs. Preparation for defense against nuclear attack is more than adequate to prepare for coping with conventional weapons; the converse is not true.

CHEMICAL AND BIOLOGICAL AGENTS

Many studies inside and outside Government have been made concerning the relative threat posed to the survival of this Nation by nuclear weapons and chemical and biological agents. These studies quite conclusively indicate that, at the present time, nuclear weapons pose the most serious threat to the survival of our Nation. The studies concede that chemical agents could be used overtly or covertly against the United States in the event of an attack. Chemical agents, however, are not considered a major strategic threat as they are effective mainly if used against tactical targets of limited area. These studies also indicate that biological agents are a potential threat for the future. Knowledge about practical application of biological agents is insufficient to indicate when, if ever, this threat might become a reality. Hence, research on methods of detecting, identifying, reporting, and analyzing and defending against biological agents will continue. This potential threat is being kept under constant review.

NUCLEAR WEAPONS

Destructive Capabilities

A nuclear weapon is usually described in terms of the total energy it can release in comparison to the number of tons of TNT required to release the same amount of energy when exploded. Thus, the detonation of a l-megaton (1-MT) nuclear bomb releases the same amount of energy as the explosion of approximately 1 million tons of TNT. The results of the World War II bombing attacks on Coventry, England, and Hiroshima, Japan, can be compared. In the Coventry raid, the largest mass air raid on England, 437 aircraft dropped 394 tons of high-explosive bombs, 56 tons of incendiary bombs, and 127 parachute bombs. The results were: 380 persons killed, 800 injured. At Hiroshima, one bomber dropped one nuclear bomb. The results were: 70,000 killed, 70,000 injured. The weapon used in the Hiroshima raid was of the 20-kiloton (20-KT.) "A-bomb" class (equal in explosive force to approximately 20,000 tons of TNT). Yet, the Hiroshima bomb is now considered a weapon of limited power when compared to current "H-bombs" which can produce explosions equivalent to the explosion of many millions of tons of TNT.

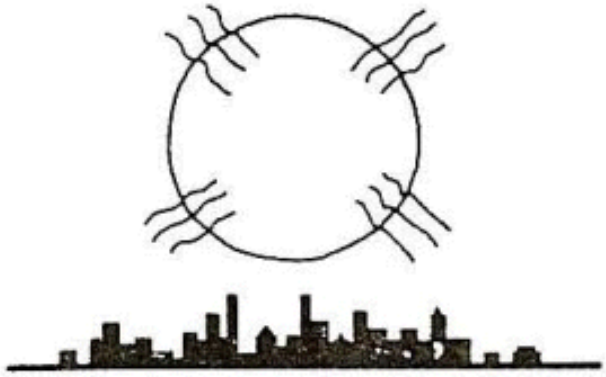
A nuclear explosion releases a large proportion of its energy in the form of a flash of light or heat, creating a giant fireball. Its intense light and heat can cause skin burns and fires at great distances from the point of detonation. Powerful blast and shock are likewise produced.

Nuclear explosions alone among the various types of weapons produce nuclear radiations. The initial (immediate) nuclear radiation that accompanies the blast and heat wave is usually defined as the radiation occurring within the first minute after the explosion. Its effects are limited to the immediate neighborhood of severe blast damage. About 90 percent of the total energy released by a nuclear weapon appears in the forms mentioned above. The remaining 10 percent of energy is released as the residual nuclear radiation associated with the radioactive

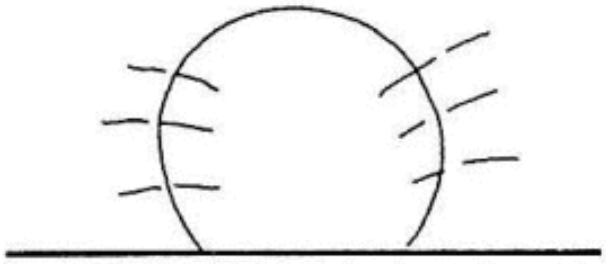
materials from the explosion. These, materials and other debris are drawn upward into the ascending cloud, returning to earth as FALLOUT.

An enemy might use nuclear weapons in various ways, depending on the results he seeks. He must consider the system for delivering the weapons, such as aircraft for dropping nuclear bombs or missiles armed with nuclear warheads. He must also consider the effects of various weapon yields and types of burst, because the power of an explosion and its point of detonation largely determine how much of an area would be destroyed, what types of partial or total damage would be inflicted, and how widespread the radioactive fallout and other secondary effects would be. For instance, a nuclear weapon may be detonated high in the air, or at the surface of land or water, or even after the weapon has penetrated below the surface.

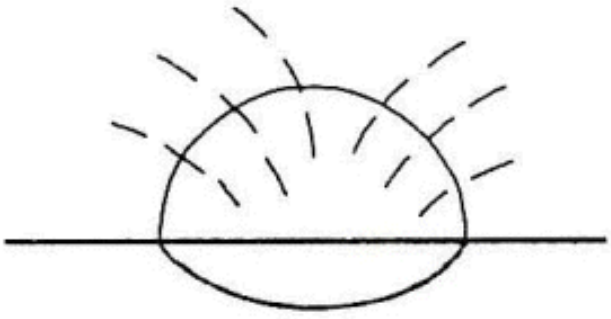
An air detonation results in the formation of very small fallout particles which travel with upper level winds for long periods of time. When the particles drift down to earth, they are widely distributed and pose a relatively small radiation danger. However, detonations at or near the surface of land, or below the surface, result in "local fallout," which means that much larger particles are formed and a large fraction of them settles to earth during the first 24 hours. This early contamination near the burst and for many miles downwind is a far greater hazard than fallout released high in the air by an air detonation, which may take years to settle out.



Air burst



Surface burst



Subsurface burst

Effects of the Explosion

The point directly beneath the center of a nuclear explosion is called ground zero. The surrounding land, objects, and persons would suffer varying amounts of damage, depending on their distance from that point and the size of the weapon. For weapons which burst at or near the surface, damage may be expected to vary generally with distance from ground zero. Closest to ground zero, destruction may be virtually complete with few survivors to be found. Moving away from ground zero, the probability of survival increases, while damage and destruction of structures tends to become less severe. The area of light but appreciable damage (shattered glass, kindling of dry fuels) extends as much as 10 miles for a 5-MT burst.

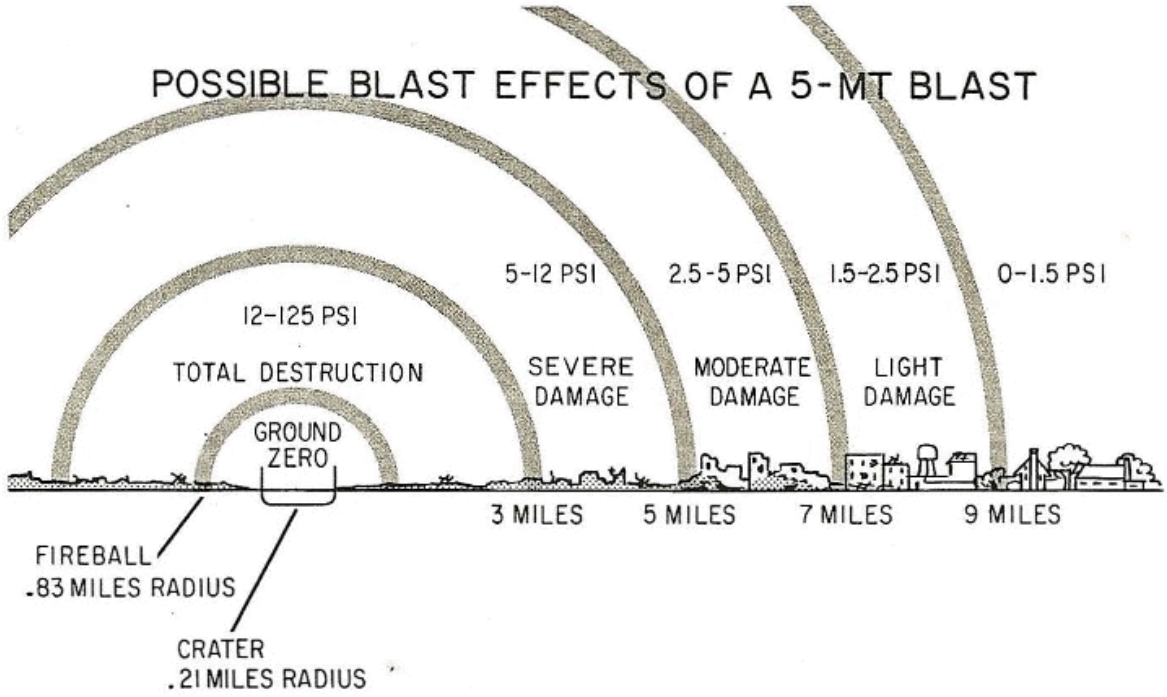


FIGURE 11.—Possible range of damage—surface burst.

The pattern of effects in an actual explosion would resemble a series of distorted, roughly concentric areas, never neat circles, because of hills, and valleys, large buildings or other obstacles near ground zero. As the altitude at which the bomb is detonated is increased, the areas of physical damage will decrease until at high altitude detonations the blast wave may not reach the ground and the predominant effect would be the thermal radiation.

Fire Hazards

A large portion of the energy in the detonation of a nuclear weapon is given off as heat. This heat is intense enough, beyond the range of any physical damage to structures, to ignite "kindling fuels" exposed to it either outside or inside buildings through windows. Papers, fabrics, and thin or dry rotten wood are "kindling fuels." Fires in these materials may spread to heavier fuels-furniture, rooms, fences, porches, etc.-and then grow to involve entire buildings or groups of buildings in the absence of any attempts to extinguish the fires when small. In the presence of a ground wind the fires would merge and form probably several large moving fires or "conflagrations." These conflagrations would be similar to those which have swept through Chicago in 1871, Baltimore in 1904, the Maine forests in 1947, and the Bel Air section of Los Angeles in 1961. In the absence of a ground wind and in combination with several other factors-large congested area with many fires-a "fire storm" might develop. The fires merge into a large fire with a vertically rising column of hot gases and smoke. Strong in-blowing winds are created which, in turn, fan the fire to a greater intensity. The conditions for this type of fire are believed to exist in only certain portions of a few American cities and are not regarded as serious a threat as the thousands of individual fires and numerous conflagrations which could more likely occur. The spread of fires from a nuclear attack would be limited by barriers such as open space, rivers, wide expressways, rainfall and distribution of burnable material. The number of fires that might initially occur from a nuclear attack could be significantly reduced by attention to proper maintenance of buildings and cleanup programs, and extinguishment of those individual fires that did occur while they were still small and easily controlled by simple measures.

An example of the possible effects are illustrated by the following example of a 5-MT surface burst. Other weapons of larger sizes are possible and detonations may be at various altitudes-all of which would change the effects from those in the following example.

Effects of a 5-Megaton Burst

A 5-megaton nuclear weapon explodes with a brilliant flash that lasts about a minute. A quick burst of nuclear and heat radiation emerges from the fireball. The spurt of initial nuclear radiation can be lethal within a radius of 2 miles. The heat rays and immediate radiation are followed by a blast (shock) wave which loses much of its damaging force over a distance of about 10miles. With the blast wave comes a violent wind which picks up loose objects and carries them outward.

A 5-MT burst at ground level would leave a crater about one-half mile wide in the area of the explosion; it would destroy nearly everything within the radius of a mile from ground zero. It would also destroy most buildings two miles from the point of explosion, push steel-frame buildings sideways, and start fires.

The destruction 5 miles away would be less severe, but fire and early fallout could be significant hazards.

Ten miles away, most buildings would remain intact but fires would be started indirectly by the blast wave which follows a burst, not by the heat from the fireball. The blast wave could rupture gas lines and short-circuit wires within houses and buildings, which would add to fire hazards. Flying glass and early fallout would also be major dangers.

Somewhat farther away, all buildings would remain standing. The fading blast wave would take longer to arrive, but would still shatter many windows. The most acute danger at these greater distances downwind from the explosion would be from early fallout, which might begin to arrive in some areas within one-half hour to a few hours, depending upon the distance and wind conditions at the time.

The blast, heat, and fire caused by a nuclear explosion could cause widespread destruction, but radioactive fallout would be a much greater hazard. It could spread over thousands of square miles, covering a much greater area than the area endangered by fire and blast, and sicken or kill unprotected people many miles from the point of detonation. Although only a small fraction of the total energy expended by a nuclear explosion is released as nuclear radiations, it is a highly important fraction. What, then, is radioactive fallout?

THE NATURE OF FALLOUT

In a surface burst, large quantities of earth or water enter the fireball at an early stage and are fused or vaporized. When sufficient cooling has occurred) the fission products and other radioactive residues become incorporated with the earth particles as a result of the condensation of vaporized fission products into fused particles of earth, etc. A small proportion of the solid particles formed upon further cooling are contaminated fairly uniformly throughout with radioactive fission products and other weapon residues, but in the majority the contamination is found mainly in a thin shell near the surface. In water droplets, the small fission product particles occur at discrete points within the drops. As the violent disturbance due to the explosion subsides, the contaminated particles and droplets gradually fall back to earth. This effect is referred to as the "fallout." It is the fallout, with its associated radioactivity which decays over a long period of time, that is the main source of the residual nuclear radiations.

Time of Fallout Arrival

It takes time for fallout to drop from the nuclear cloud, even close to the burst, and the size of the particles is an important factor in determining the rate of its return to earth.

Significant amounts of fallout begin to arrive in the immediate vicinity outside a blast area about 30 minutes after an explosion. People some 20miles away may have an hour to seek protection from the fallout. At a distance of 100 miles, the fallout may not arrive for 4 hours or more. The fallout will continue to cover an increasingly larger area, and may eventually cover several thousand square miles. Some areas that will receive fallout might not get it until 24 hours after the explosion, and lighter deposits of fallout may continue for many hours afterwards. Outside of areas affected by blast and heat, then, the earliest and most immediate serious danger following a nuclear attack could be from local fallout.

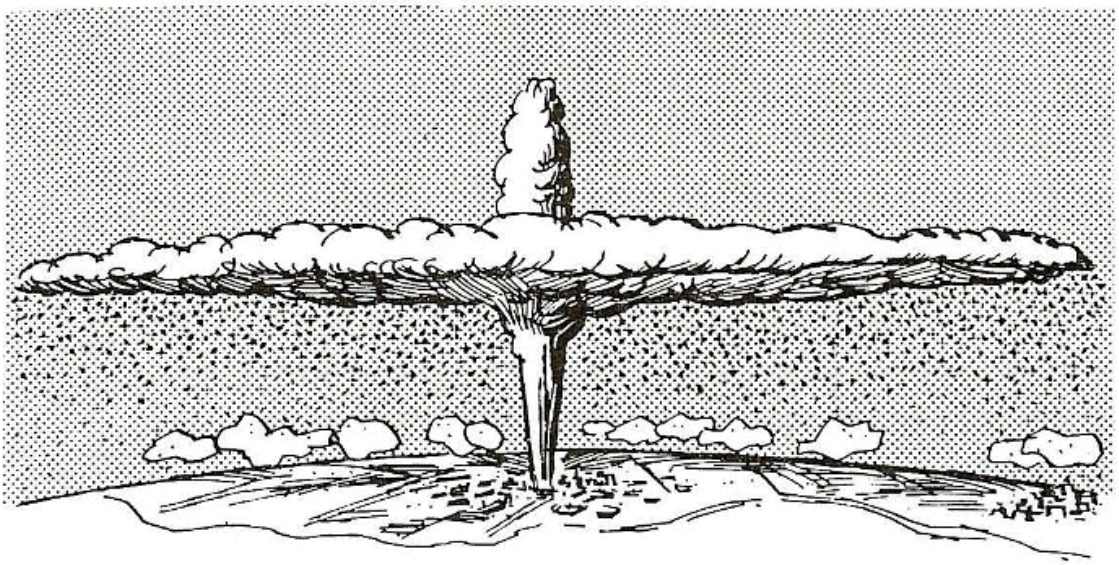


FIGURE 12.—General shape of a nuclear cloud and the fallout from it.

The time of fallout arrival at various distances and directions from the points of explosion (ground zero) depends on the winds and upon the height of the explosion. Layers of air move in various directions at different heights. Fallout distribution is determined primarily by high altitude winds that often blow in a quite different direction from the ground level winds. In a 1954 test of an H-bomb, the fallout reached a point 160 miles downwind about 8 hours after the explosion and continued to fall for several hours.

As much as 80 percent of the radioactive material from a land-surface burst of a nuclear weapon may return to the earth as early fallout within the first day, and will assume an irregular pattern stretching from the downwind neighborhood of the blast-damaged area. Early fallout descends so quickly and in such heavy

concentration that the hazard from it is much greater than that of the widely distributed, slow-falling types of worldwide fallout. The remaining radioactive material rises high into the sky, is blown around the world by high winds and. falls back to earth over a period of months or years.

Some peacetime tests of nuclear weapons have caused worldwide fallout. Quantities of radioactive isotopes have risen into the stratosphere and have come down slowly afterwards as very light fallout, creating fears of health hazards. It should be understood that slow-falling worldwide fallout resulting from a war waged with nuclear weapons would be much greater in quantity than the fallout from peacetime tests. However, the main concern should be protection against wartime close-in or local fallout.

Area of Severe Fallout

The region of severe local fallout lies downwind from the point of burst. It is impossible to predict with accuracy how large this area will be or what shape it will take because so many conditions can affect it. The area of severe local fallout might stretch 5 miles or more upwind of ground zero and 150 to 200 or more miles downwind depending on the strength of the wind and the bomb yield. The pattern could be irregular in outline, and fallout within the area might not be evenly distributed. There might be local or regional hot spots as well as other areas with very little fallout. These variations could result from differences caused by local hills, valleys, lakes and streams, or from wind, rain, and other local weather conditions. Also, heavier deposit in central areas than at the periphery is the rule.

The extent and location of a fallout area arid the levels of radiation in that area are determined by:

1. Altitude of the bomb burst,
2. Power and design of the bomb,
3. Size, shape and density of the fallout particles,
4. Atmospheric conditions such as air currents and the direction and speed of the winds, particularly those up to perhaps 80,000 feet,
5. Snow and rain,
6. Nature of the ground surface.

The Nature of the Atom

All matter is made up of one or more simple materials known as elements. The total number of naturally occurring elements is 92. Among the common elements are the gases--hydrogen, oxygen and nitrogen; the solid nonmetals--carbon, sulfur, and phosphorus; and various metals such as iron, copper, and zinc. A less familiar element, which is used as a source of atomic (or nuclear) energy, is uranium, normally a solid metal.

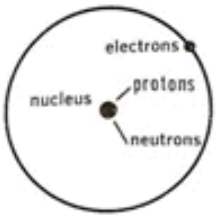
The smallest part of any element that can exist, while still retaining the characteristics of the element, is an atom of that element. Thus, there are atoms of hydrogen, or iron, or uranium, and so on. The hydrogen atom is the lightest of all atoms, but the atoms of uranium are among the heaviest found in nature. The atom of one element is the smallest unit that can combine with the atom of another element to produce 'a chemical reaction. For example, common salt known as sodium chloride (NaOl) is a combination of one atom of sodium (Na) and one atom of chlorine (Cl). When atoms unite chemically, they form molecules; for example, one atom of oxygen is represented by the symbol O, but the normal oxygen molecule exists as a combination of two atoms, or O_2

Atomic Structure

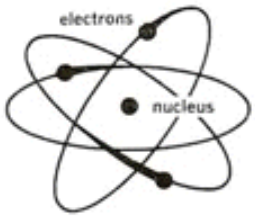
The atom contains three primary types of particles--protons, neutrons, and electrons. The inner core of the atom, called the nucleus, is composed of both protons and neutrons. The protons are electrically charged and are referred to as having a positive (plus) charge, whereas the neutrons are not electrically charged. The only atom which is an exception to the above is that of ordinary hydrogen, which does not contain a neutron.

NUCLEAR ENERGY

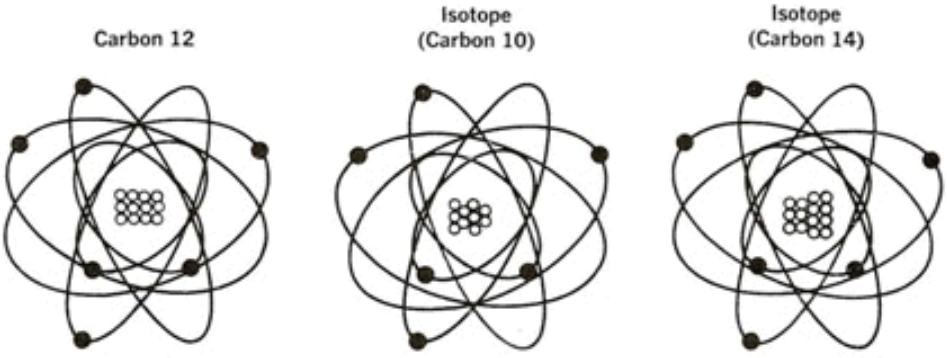
All matter is made up of atoms



Energy is locked inside the heart, or nucleus, of an atom. The nucleus of every element except Hydrogen contains neutrons.



FISSION. In the process of "fission" (splitting), the atoms of some heavy element, usually Uranium, are broken into and divided. As each nucleus is split, neutrons break free and energy is released.

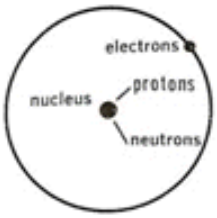


During the process of fission, **isotopes** are created. Isotopes are forms chemically like normal elements but atomically different, in that they have a different number of neutrons.

FIGURE 13.—Nuclear energy.

NUCLEAR ENERGY

All matter is made up of atoms



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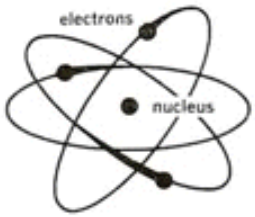

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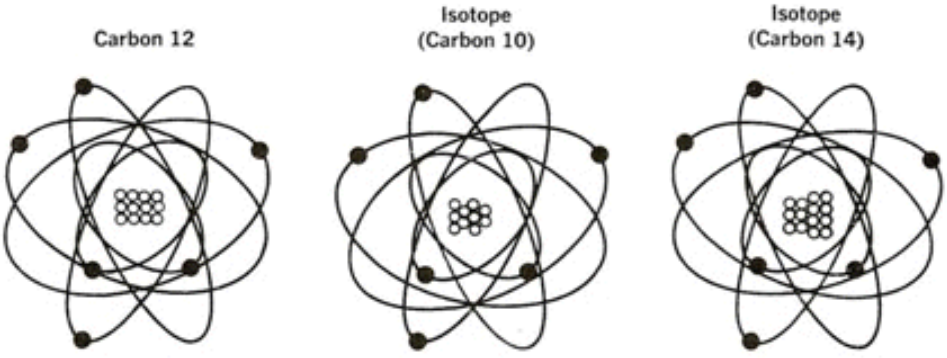


During the process of fission, **isotopes** are created. Isotopes are forms chemically like normal elements but atomically different, in that they have a different number of neutrons.

FIGURE 13.—Nuclear energy.

The free neutrons released by each atom-splitting can, under certain conditions, cause the splitting of others, leading to what is called a **chain reaction.** It is like one match lighting two others, that in turn light others, and so on.

"A-bombs" (atomic bombs) are fission weapons. When conditions are just exactly right for a chain reaction, within an extremely small fraction of a second the reaction builds up within a very small space to release enormous amounts of energy. From a relatively small amount of material, there comes a tremendous explosion, many times more violent than is obtained from chemical explosives like dynamite.

FUSION. In nuclear fusion, a pair of light nuclei unite (or fuse) together, to form a nucleus of a heavier atom. An example is the fusion of the hydrogen isotope known as deuterium or "heavy hydrogen." Under suitable conditions, two deuterium nuclei may combine to form the nucleus of a heavier element, helium, with the release of energy. The fusion of all the nuclei present in one pound of deuterium would release roughly the same amount of energy as the explosion of 26,000 tons of TNT

FIGURE 14.—Nuclear energy.—Continued.

Electrons are very tiny particles that carry a charge of NEGATIVE electricity. They surround the nucleus and can be thought of as revolving around it in about the same fashion that the Earth and other planets revolve around the sun. Every atom can be pictured as a tiny "solar system." The "sun" of the atom is its nucleus and the "planets" of this sun, revolving in orbits around it, are the electrons.

Radioactivity

The essential difference between atoms of different elements lies in the number of protons in the nucleus. A hydrogen atom, for example, contains only 1 proton; a helium atom has 2 protons; and a uranium atom has 92 protons. Although all the nuclei of a given element contain the same number of protons, they may have different numbers of neutrons. The resulting atomic species, which have identical atomic numbers but which differ in their masses, are called "isotopes" of the particular element.

Radioactivity is the process whereby isotopes of certain elements spontaneously emit particles and/or rays from the nuclei of their atoms. Some elements are naturally radioactive, whereas others can be made artificially radioactive by bombarding the nuclei. Significant initial radiation from a nuclear explosion includes gamma radiation and neutrons. Significant later radiation (fallout) includes gamma rays and beta particles. Beta particles are high-speed electrons, and gamma rays are similar to X-rays although usually more penetrating than X-rays.

Natural radioactivity is characterized by the ability of certain types of atomic nuclei to decay spontaneously, giving off alpha, beta, or gamma radiations, or combinations of these. Radium, for example, is one of about 50 naturally radioactive atomic species.

In a nuclear explosion, various isotopes of many normally stable elements can be created. Although most are radioactive, they produce beta and gamma radiation; none produce alpha.

Fission

Nuclear fission is the splitting of heavy atomic nuclei. The nucleus of an atom of a heavy element such as uranium may be split into two or more parts. This atom splitting is accompanied by the release of energy.

Self-sustaining fission reactions occur only with the heavy elements, uranium, plutonium, or thorium. When a fissionable nucleus is split by a neutron, it releases energy and one or more neutrons. These released neutrons may split other

fissionable nuclei, releasing more energy and more neutrons. In an atomic explosion this reaction becomes self-sustaining.

Fusion

Nuclear fusion, on the other hand, is the joining together of light atomic nuclei to forma heavier nucleus. Such fusion can only be accomplished under conditions of very high temperature (millions of degrees). If two nuclei of light atoms fuse, the fusion is accompanied by the release of a great deal of energy. The energy of the sun, for example, results from the fusion of certain light atoms to form heavier ones. Much of the power from the so-called hydrogen bomb (H-bomb) results from the fusion process. Atoms formed by the fusion process are not radioactive; atoms formed by fission process are radioactive.

Detecting the 'Presence of Fallout

Radioactive debris-fallout-may be of many sizes. Of course, the larger, heavier particles come down closer to the explosion. Particles the size of sand or table salt may be carried some miles downwind from the explosion. Smaller particles stay in the air much longer and travel much farther before reaching the ground. Whether or not the particles are visible, the nuclear radiation given off by them cannot be detected by the senses directly. The radiation from fallout cannot be seen, heard, smelled, tasted, or felt; instruments must be relied upon to detect and measure the radiation.

FIGURE 15.—Man being bombarded by "invisible" rays.

There are various types of radiation-measuring instruments, including dosimeters which are used to measure the total radiation exposure of personnel and survey meters which are used to measure the rate of radiation. Civil Defense personnel, called radiological monitors, have been given special training in the use of these instruments.

Radiation Not Transferred From Fallout

Nuclear radiation from fallout can damage living things, but it does not cause the damaged matter to become radioactive. Thus, if fallout particles are on the body of a person or animal, instruments may detect nuclear radiation coming from that contamination but, if the fallout particles are removed, no radiation will be detected. If radioactive fallout drops on a body of water, the water itself does not become radioactive. After the radioactive fallout has been removed the water itself is not radioactive. The same principle applies _to water in storage tanks, or to food in cans or other containers. Mere exposure to radioactive fallout does not make the water or food dangerous.

Kinds of Radiation

Fallout from a nuclear explosion emits beta particles and gamma rays.

Beta particles have a maximum range of only 10 to 12 feet in open air (average range 3 to 4 feet) but they do not penetrate materials easily. Several layers of clothing can protect the body. But if enough new fallout remains on exposed skin for some time (hours), the beta particles can cause severe burns. Some beta particle emitters have long half lives and if substantial amounts enter the body, some damage may result.

Gamma rays pose the greatest threat, since they are long-range and extremely penetrating. They may be likened to a kind of invisible light to which all things are partly transparent. In contrast to the thin amount of material needed to stop beta particles, only 50 percent of the gamma rays are stopped or absorbed by about 17 inches of wood. In a fallout area the amount of gamma rays reaching the body can be reduced to acceptable levels by putting enough shielding (mass) between a person and the source of radiation. In general, the denser the material, the less thickness is required for shielding. If the shielding is thick enough and dense enough, it would cut gamma radiation to such a low level that it can do little harm.

Fallout Distribution

The size and design of a nuclear weapon, type of burst, and wind condition chiefly determine the amount and distribution of radioactivity in a fallout area. Since these things can't be predicted, actual field measurements of nuclear radiation would be necessary following an attack.

Measurements of radiation levels are made at sheltered monitoring stations, where monitors can take quick readings outside of shelters and by mobile monitors when levels are low enough to allow extensive field activity. An area of high radioactivity may be monitored from an airplane.

Radiation dose is measured in units called the "roentgens" (pronounced "rent-kins"). It is named after W. K. Roentgen, the discoverer of X-rays, and is the measurement of X-ray or gamma radiation. A smaller unit often used is a milliroentgen, which is one thousandth of a roentgen. Remember that the roentgen is a unit of radiation exposure.

HEALTH HAZARDS FROM RADIATION

Internal and External Radiation

During the early postattack period, external radiation is the primary problem and is the major concern in this section. However, radiation damage can result from either internal or external nuclear radiation. Consumption of heavily contaminated food and water could cause some internal radiation damage. This damage would be minor in relation to the external radiation danger.

Foodstuffs contaminated with fallout contain many different radio-isotopes. Once inside the body, some of these isotopes are concentrated in specific organs, tissues, and bones. For example, iodine concentrates in the thyroid gland. Strontium 90 behaves much like calcium and is deposited primarily in the bones.

Radiation From Natural Sources

Living things are exposed to radiation from natural sources every day. Natural nuclear radiation comes from radioactive rocks and soil; other radiation comes from far out in space. The individual sees nothing and feels nothing, but the radiation damages or destroys some of the body cells. The effects on an individual's health are not serious because very few cells of the body are involved.

Inside the body there are very small amounts of naturally radioactive materials (potassium 40 and carbon 14). Additional amounts are taken in through food, water, and air. Soil and rocks contain potassium 40 and uranium, thorium, and radium. Tiny amounts of these materials are taken into the body with food and water.

Small amounts of radiation can be received for medical purposes without significant harm. The average tuberculosis chest X-ray exposes the chest to an amount of between one-tenth to one-half roentgen. Even large amounts of radiation can be applied to limited areas of the body without being fatal. Cancer specialists often bombard cancerous area with massive doses of radiation, destroying more cancer cells than normal cells.

During the average lifetime, every human being receives about 10 roentgens of radiation from natural sources.

Exposure to Radiation

When large amounts of radiation are absorbed by the body in short periods of time, sickness and death may result. In general, the effects of radiation exposure stay with people and accumulate over a period of time. Few people get sick who have been exposed to 100 roentgens or less. Exposure to more than 300 roentgens over a period of a few days will cause sickness and may cause death. And death is expected to ensue for almost everyone who receives an exposure of 600 roentgens over a period of a few days. The effects of similar exposures over a period of months or years are still under study, though in general, even a fairly large dose of radiation absorbed over months or years is not as dangerous as when absorbed

over a few days. In the former case, the body is able to repair much of the cell damage as it occurs.

The table below shows the effects of various amounts of short term radiation exposure.

RADIATION DOSE (ROENTGENS)	EFFECT
50	Smallest dose detectable in an individual by laboratory methods.
75-100	May cause transient nausea on day of exposure in 10% of the people exposed.
200	Largest dose that does not cause illness severe enough to require medical care in the majority of people (90-95%)
450	Will cause death to about 50% of the people exposed, 3 to 4 weeks after exposure.
600	Will cause death to almost everyone so exposed, 2 to 3 weeks after exposure.

Radiation Sickness Not Contagious

YOU CANNOT "CATCH" RADIATION SICKNESS FROM VICTIMS

FIGURE 16.—Giving aid to a victim of radiation sickness.

Persons and animals exposed to large amounts of radiation will develop radiation sickness. Radiation sickness is neither contagious nor infectious; a person cannot "catch it" from others. People or animals suffering from radiation sickness can be helped without fear of "catching" radiation injury from them. However, a person or animal with "radiation sickness" could be suffering from a massive infection, and should be treated accordingly. Again, fallout radiation cannot make anything radioactive. Food and water that have been exposed to fallout radiation are contaminated only to the extent that they contain fallout particles or dissolved radioactive material. Exposed food that may have particles on it should be washed, brushed, or peeled. Fallout particles can be removed from water supplies by sedimentation or filtering. People who have fallout particles on their bodies or clothing probably would not carry enough to endanger other people, but they should clean themselves for their own protection.

Radiation Sickness

People may show symptoms of radiation sickness if they have received a dose of from 100 to 550 or more roentgens. Such symptoms as nausea, vomiting, or diarrhea, may appear in the first day or so, then about a week may pass before other symptoms appear. These later symptoms may include loss of weight, loss of appetite, bleeding, discolored spots on the skin, paleness, redness, swollen mouth and throat, and general discomfort.

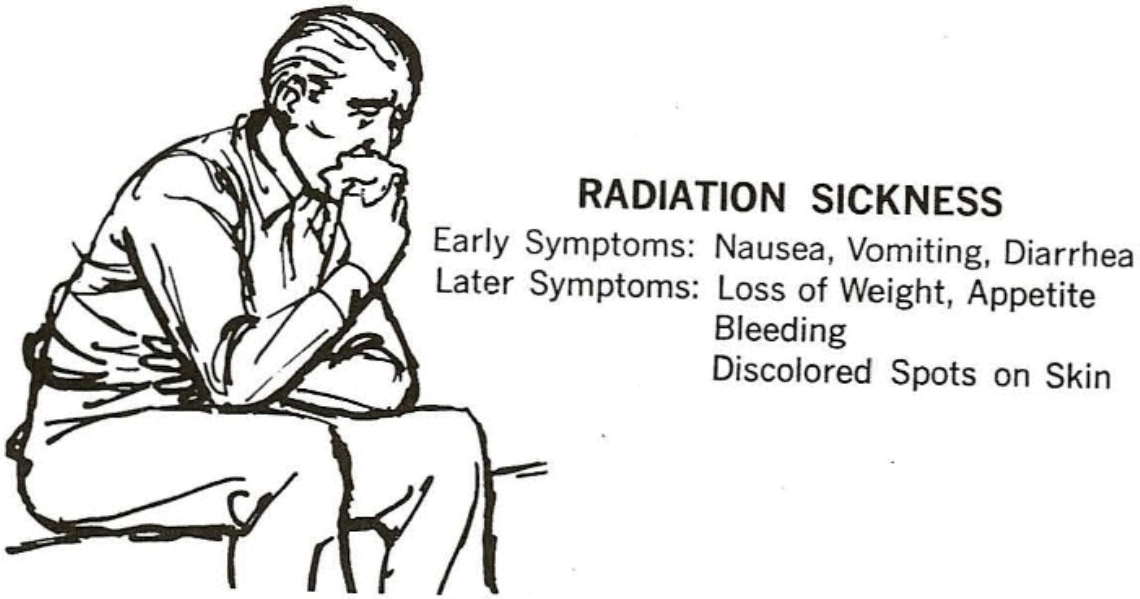


FIGURE 17.—Radiation sickness symptoms.

Symptoms of three degrees of radiation sickness are: Mild-the especially sensitive person will show some nausea, lack of appetite, and fatigue within a few hours after exposure. He should rest but can continue normal activities. Recovery will be rapid. Moderate-the same symptoms appear, but well within two hours of exposure, and more markedly. Vomiting and even prostration may occur. By the third day, recovery may seem complete, but symptoms may recur in the next few days or weeks. Severe-again, all the early symptoms show up and may vanish after a few days. But after a week or more, fever, mouth soreness and diarrhea may appear; gums and mouth ulcerate and bleed; and, in about the third week, the patient's hair may start to fall out. Recovery may take 7 to 8 weeks. When exposure has been overwhelming, death comes in hours.

Symptoms should be treated in this way: General rest. Aspirin for headache. Motion sickness tablets for nausea. Liquids for diarrhea and vomiting, but not

until vomiting has stopped (ideally, 1 tablespoon of table sale to 1 quart of cool water, to be sipped slowly). This solution can be used as a mouthwash for sore mouth.

It is important to remember that many of the symptoms may also appear in people who do not have radiation sickness at all. Symptoms such as nausea, lack of appetite, and fatigue may be seen in persons subject to extreme anxiety and emotional stress.

Individual Exposure Dose

Exposure to radiation of individuals should be kept as low as possible. This would be done in the immediate postattack period by using the best available shelter for the period of time necessary to ensure survival. If it becomes necessary to leave shelter for essential items, the dose rate and the time of exposure will determine the amount of radiation that an individual receives. A simplified method of calculating dose would be to multiply the dose rate by the time of exposure (e.g., 3 roentgens per hour times 4 hours equals 12 roentgens). Generally, individuals should obtain guidance on permissible dose from their local Civil Defense officials.

Median Lethal Dose

A measuring point for the effects of extreme whole-body exposure that is often used is called the median lethal dose. Usually abbreviated as MLD, or LD/50, it is the radiation dose delivered over a short period of time that is expected to kill 50 percent of exposed persons (or animals) within about a month. An acute dose is that received when the whole body is exposed for a short period of time-up to about a week. About 450 roentgens (acute dose) is the estimated median lethal dose for man, as compared to about 325 roentgens for dogs or 800to 900 for rats.

RADIOACTIVE DECAY

Radiation rate or intensity from fallout decreases with time-that is the radiation level, as measured in roentgens per hour, drops lower and lower. This falling off is known as radioactive decay.

The "half-life" of a radioactive element is the time that it takes for a given amount of the isotope to decrease in radioactivity to half its original value. For instance, a form of cobalt (cobalt 60) has a half-life of about 5 years. This means that a measurement of 200 r/hr., if repeated 5 years later, would have fallen to about 100 r/hr.; 5 years after that it would have fallen to about 50 r/hr., and so on.

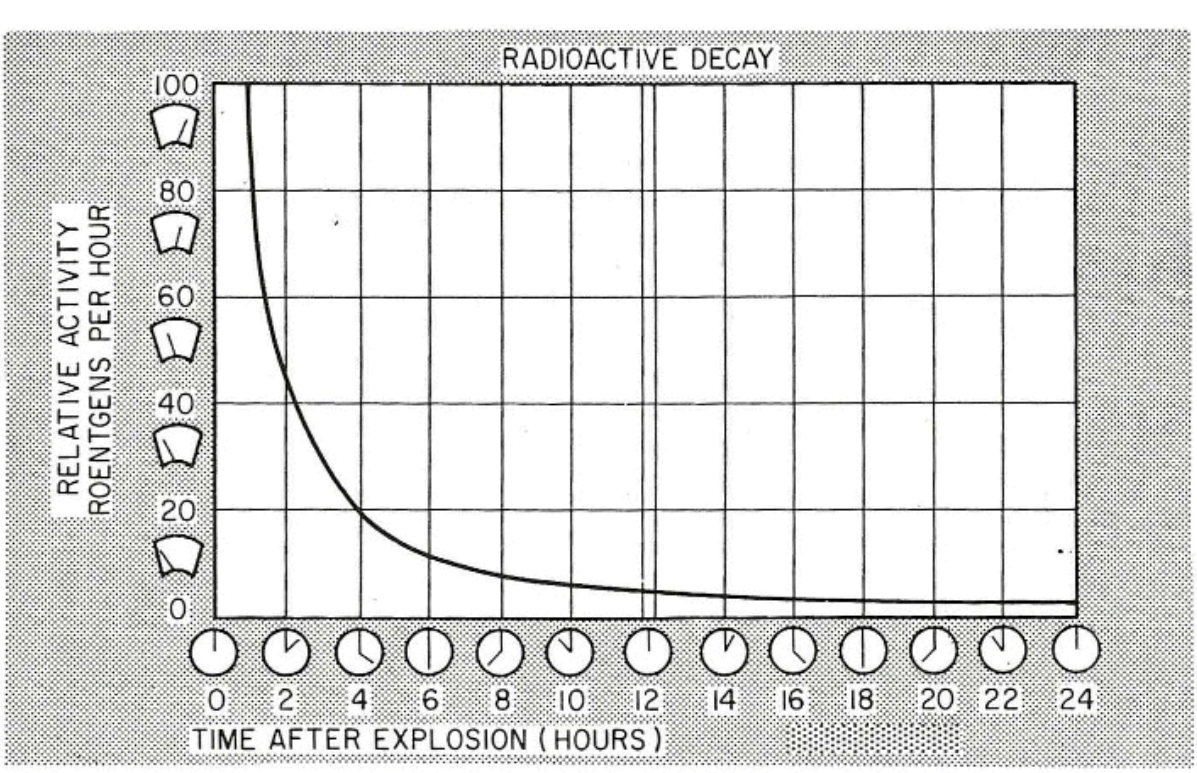


FIGURE 18.—Radioactive decay chart.

Each radioactive isotope has a different half-life, and this ranges from a small fraction of a second to billions of years. The passage of seven half-lives of a radioactive isotope decreases its radiation level to about 1 percent of its initial radiation level. The passage of 10 half-lives decreases the radiation to about one-tenth of 1 percent of the initial radiation.

The mixture of isotopes formed after a nuclear burst-the mixture that makes up fallout-is so complex that it is not possible to calculate the exact decay rate. However, from experimental measurements, a rough approximation indicates that for each sevenfold increase in time, the radioactivity of the mixture found in fallout drops to about one-tenth of its former value. In general, the radioactivity at 4:9 hours after the explosion will have dropped to about 10 percent of its amount at 7 hours. Within about 2 weeks, the radioactivity can be expected to decay by another factor of 10. But even this level of radiation can be dangerous if there is a heavy concentration of fallout, and the decay rate may differ in some cases.

Decay Cannot Be Speeded Up

It must be emphasized that the nuclear radiation in fallout cannot be destroyed. Neither boiling nor burning, treatment with chemicals, nor any other action will destroy or neutralize radioactivity. Because of radioactive decay, fallout will become less harmful with the passage of time, but there is no known way to speed up the decay process. Fallout cannot be made harmless quickly. However, fallout can be removed from many contaminated surfaces.

PROTECTIVE MEASURES AGAINST RADIATION

Protection from external radiation exposure is a combination of three things: Time, distance, and shielding. That is, a person may protect himself by:

1. Shielding (shelter),
2. Distance (decontamination, movement),
3. Exposure control (combination of 1 or 2 above with time-scheduled exposures)

In a fallout area, shielding is the only dependable means of protection. Methods of providing shielding are discussed in Chapters IV and VI, in which shelters are considered in detail. People within a well-stocked shelter have placed mass between themselves and the source of radiation, and they should remain behind this mass until the radiation has decayed to levels permitting activity outside of the shelter.

Defense Against Fallout

Persons seeking shelter after a nuclear attack should remember that the introduction of radioactive material into shelter areas can be minimized by such ordinary precautions as closing doors and windows. Unnecessary movement in and out of shelters should be avoided whenever there is a possibility that fallout is near. Prolonged contact with fallout material is hazardous.

Following a nuclear attack the air would be contaminated by radioactive fallout to the extent that it Contained Fallout Particles. The most hazardous fallout particles-early fallout-would reach the earth in the first day after the detonation, but their mere passage through the air would not contaminate the air. Some radiation will probably penetrate all shelters, but fallout particles in harmful amounts should be and can be kept out of shelters. People in underground shelters could keep fallout particles out of their shelters by having a simple hood over the air-intake pipe. Special filters are not needed for small basement family shelters. However, group shelters that have high velocity air-intake fans might need filters on the air-intake system to keep fallout particles out.

Special Clothing Offers Little Protection

Fallout gamma radiation would pass through any type of protective clothing that would be practical to wear. Heavy and dense materials such as earth and concrete are needed to stop the highly penetrating gamma rays. Tightly woven outer clothing could be useful-particularly for emergency workers-in keeping fallout Particles off the body, but the wearer would not be protected from the Gamma radiation given off by the particles. The worker would wear the outer clothing when in a fallout contaminated area and then leave it outside or brush or wash it thoroughly before entering a noncontaminated area.

No Special Antiradiation Medicines

Many experiments have been conducted to develop a special medicine to protect against the effects of radiation. Thus far, there seems little likelihood that a pill, or any other type of medicine, will soon be developed that can protect people from the effects of fallout radiation.

Decontamination

Contamination is the deposit of radioactive material on the surfaces of structures, area, objects, or people following a nuclear explosion.

Decontamination is the reduction or removal of contaminating radioactive fallout from a structure, area, object, or person.

Self-decontamination

Contamination could be caused by fallout material settling on persons outdoors while fallout was descending or by entering a very dusty area after fallout had ceased.

Self-decontamination should be accomplished only after a person has assured himself that he is protected from the far greater hazard of the fallout field of radiation in his area. Therefore, if one is caught in the open when fallout begins he should immediately seek shelter and then remove any contamination from his person by brushing, shaking or washing as appropriate under the circumstances. Some community shelters may contain a decontamination area in which showers would be available and a change of clothing might be appropriate. In most cases simple wiping or washing of hands, face, and clothing, would reduce the contamination to insignificant levels.

Contaminated fruits and vegetables may be eaten safely if the contaminated skins or outer layers are carefully removed and discarded.

If contaminating fallout has settled on the outsides of cans or other containers, the food within may be eaten safely if it is carefully removed. If possible, the removed food should be checked for radioactivity.

Place discarded outer skins and containers in a can marked "CONTAMINATED" and place this can where it will not expose people to radiation from the discarded materials.

FIGURE 19.—Decontaminating food.

Decontaminating Food and Water

It is unlikely that food and water inside a building would be sufficiently contaminated to be dangerous to eat or drink. If food supplies do become contaminated many types of food can be treated to remove the radioactive material. Fresh fruits and vegetables can be washed or peeled to remove the outer skin or leaves. Food in cans, covered jars or closed containers such as plastic bags can be decontaminated by washing or wiping the material off the container. The contents would not be contaminated. Similar cleaning methods appropriate to the type of food involved would in most cases be sufficient.

Water supplies in the home (water heater or toilet tank) or shelters would not require decontamination. However, there is a possibility of contamination of public water supplies. Serious contamination of public water supplies is unlikely. Should this occur, however, a water softener in the home is an effective method of decontamination, as is distillation, when practical. It should be noted that mere boiling of water contaminated with fallout is of absolutely no value in removal of the radioactivity. It is of interest also, that the regular water treatment

(coagulation, sedimentation, filtration) by public authorities will remove most of the contaminated material.

Area Decontamination

The decontamination of buildings, streets, and equipment, might be necessary before an area could be used for its intended purpose. Civil Defense authorities would undertake this type of decontamination operation. Since radioactive contamination is similar to dirt, its removal by water or sweeping could be done by fire department or public works personnel using their day-to-day operation equipment. Many communities have organized decontamination teams for this purpose.

For the individual who might have occasion to decontaminate in his home, common methods of cleaning could be used. Thus, brooms, or vacuum cleaners might be useful. But this should be undertaken only on instructions from local authorities.

MEASUREMENT OF RADIATION

As mentioned previously, the unit of measurement for gamma radiation doses is roentgens or milliroentgens.

In evaluating the effect of nuclear radiation on living things, we are concerned not only with total amounts of radiation received, that is, the dose, but also with the dose received within a given amount of time-the dose rate. We want to know not only how much the total exposure dose is, but also how fast the exposure dose is building up.

Total accumulated radiation exposure, or total dose, is expressed as so many roentgens. The rate of radiation exposure at a place of interest is expressed as roentgens per unit of time (usually roentgens per hour). This is sometimes called radiation intensity, or radiation level, but more often "dose rate." Because the human senses cannot detect nuclear radiation, special instruments have been developed to measure it. These devices are either ratemeters or dosimeters (dose meters).

A ratemeter will indicate the intensity of the radiation. It is analogous to a speedometer in a car except that it measures roentgens per hour rather than miles per hour. Thus, an indication of whether to leave the shelter for a brief period can be obtained from a ratemeter reading made just outside the shelter. The dosimeter can be used to show the total amount of radiation to which a person has been exposed during an emergency period. It is analogous to a mileage indicator in a car, but it measures total roentgens rather than miles.

The Citizen's Instrument Kit

A citizen's instrument kit is now commercially available. In the event of a nuclear attack, the set of instruments in the kit can be useful, especially to the occupant of a home shelter.

The kit consists of a ratemeter, dosimeter, and charging unit. The ratemeter can be used to measure the intensity (dose rate) of radiation at a specific time; while the dosimeter is used to measure the total amount of radiation accumulated over a period of time.

NUCLEAR ENERGY

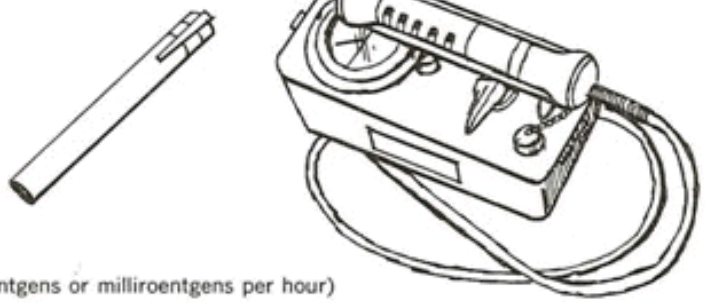
DETECTING NUCLEAR RADIATION

DETECTING NUCLEAR RADIATION

YOU CAN'T SEE IT — HEAR IT — SMELL IT —
FEEL IT — TASTE IT

instruments are needed to detect its presence.

DOSIMETERS measure total radiation dose (roentgens or "milliroentgens" — a milliroentgen is 1/1000 of a roentgen)



SURVEY METERS
measure dose rate (roentgens or milliroentgens per hour)

Civil defense Radiological Monitors are specially trained to read radiation levels from these instruments.

FIGURE 20.—Detecting radiation.

FIGURE 21.—Radiation instruments.

FIGURE 22.—Citizen's instrument kit (ratemeter, dosimeter, charging uni

Relation of Federal, State and local Monitoring

Wind currents determine where fallout would be deposited as the result of a nuclear attack. Therefore, in the event of an emergency the U.S; Weather Bureau would prepare and issue forecasts and estimates of areas likely to be covered by fallout to States and territories. These forecasts can be used to predict where fallout is likely to be deposited and approximately when it will arrive there. The intensity of fallout radiation, however, would not be predicted. Intensity can be determined only after the attack when measurements will be made with instruments.

A Federal network of fixed monitor stations is being developed that uses the facilities of many Federal agencies. Many facilities of the Weather Bureau, the Federal Aviation Agency, and the Department of Agriculture are already in use. This network, combined with State and local monitoring, is designed to provide radiation information that can be used to assist in making decisions for protective, remedial, and recovery action.

The Federal Government is providing equipment for radiological monitoring stations and operators are being trained to use this equipment. A total of 150,000 monitoring points are being established in protected locations, with communications capability to the local Emergency Operating Center.

The Office of Civil Defense trains radiological monitor instructors and radiological defense officers at its Staff College in Battle Creek, Mich., and at its Civil Defense Training Centers at Brooklyn, N.Y., and at Alameda, Calif.

Radiological Monitoring in Community Shelters

A radiological Defense (RADEF) Officer, serving in the local government's Emergency Operating Center, directs the technical operations of monitors in his area.

Some community shelters will be selected to serve as special monitoring and reporting stations. Such stations will evaluate and report the radiological situation in the shelter and also measure and report unsheltered radiation dose rates and dosages.

A radiological monitoring kit is provided that contains dosimeters, ratemeters, charging units, accessories, batteries, and instruction manuals. With these instruments the monitor will be able to provide information to the shelter manager and the local emergency operating center. For example, if dose rates in shelters vary in different locations it might be advisable to move persons to minimize the dose they would receive.

CHAPTER IV

COMMUNITY SHELTERS

FALLOUT SHELTERS are necessary because they offer the most reasonable protection against the widespread danger of fallout. As shown in Chapter I, they can save 40 to 120 million American men, women and children, depending on the nature and weight of an attack.

FIGURE 23.—Various types of shelters.

While individual shelters will protect some of the people in a community, the major part of the local population will need protection in community shelters. For this reason, American communities need to devote much of their Civil Defense effort to the preparation of community shelters. Such shelters will provide fallout protection for large groups of people if and when the need arises.

In addition to protecting the population against radioactive fallout, community shelters will effectively contribute to postattack recovery. Trained shelter staffs assigned to each community shelter before the attack can organize their respective

shelter groups during the period of shelter occupancy. As organized groups in devastated areas, these survivors may form the nuclei of community recovery efforts. Survivors from home shelters can join these groups during the postshelter period. Skills identified or utilized during the period of living in community shelters could be very valuable in postshelter operations.

FIGURE 24.—Shelter manager speaking to occupants of a community shelter.

The Department of Defense will issue federally procured shelter provisions to local governments for placement in public fallout shelters having a protection factor of 40 or greater (radiation outside the shelter would be 40 times greater than radiation inside) and a capacity of at least 50 persons. Previously, such provisions were supplied only for those shelters having a protection factor of 100 or greater. Marking of these additional shelters with official Civil Defense fallout shelter signs was begun during the Cuban crisis. This action is designed to utilize, to the maximum, protection for the people in existing structures.

The National Shelter Survey Program has identified over 70 million shelter spaces in existing buildings and in mines, caves, tunnels, and subways, with a protection factor of 100 or greater, and an additional 35 million shelter spaces with protection factors ranging from 49-99. The shelters with protection factors of 100 or greater tend to be concentrated in cities, and more in the northern than southern regions of our Nation. The use of shelter spaces in the 40-99 protection factor

range provides a broader base of protection in the areas most deficient in shelter with the higher protection factors.

Defense Department studies, approved by the Joint Chiefs of Staff for both military and civil defense planning purposes, indicate that over 90 percent of the people who might otherwise die from the effects of nuclear radiation could survive in shelters with a 40 protection factor during nuclear attacks which could occur over the next few years. Continuous review of enemy capabilities in relation to shelters with protection factors of 40 to 99 will be made to assure their future adequacy in effectively reducing potential fatalities under predictable radiation conditions.

THE NATIONAL SHELTER SURVEY

The National Shelter Survey was undertaken to find and identify those spaces in public and private buildings and in caves, tunnels and subways which could be used for community shelters. Every shelter with sufficient spaces and with a protection factor of 20 or more was considered. Approximately 600 architect and engineering firms were under contract with the Federal Government to carry out the survey. They gathered pertinent data on local structures, assisted in locating the owners of buildings, identified each acceptable space and made cost estimates for improvements.

After the capacities of existing fallout shelters were determined estimates were made on the cost of improving those structures having a protection factor of 40 to 99 and substandard habitability and capacity. For example, the habitable shelter capacity of many existing buildings can be substantially increased by improving the ventilation. It is estimated that the improvement1 of ventilation alone will provide additional shelter space in existing facilities for millions of people.

Building owners are being asked to make their facilities available for use as community shelters, if space on their premises qualify as community shelter sites, by signing a permit of "license." (The building owner can terminate the license on 90-day notice if he so elects.) The owner who has signed such a license has demonstrated patriotism and concern for the safety of his fellow citizens in a very practical and meaningful way. He is entitled to the admiration and thanks of the residents of his area.

The National Shelter Survey was undertaken to locate every qualified shelter. The local Civil Defense Director has the responsibility to decide which qualified shelters that have been licensed by their owners, will be marked and provisioned with food, water, medical kits, radiation detection instruments, and sanitation kits.

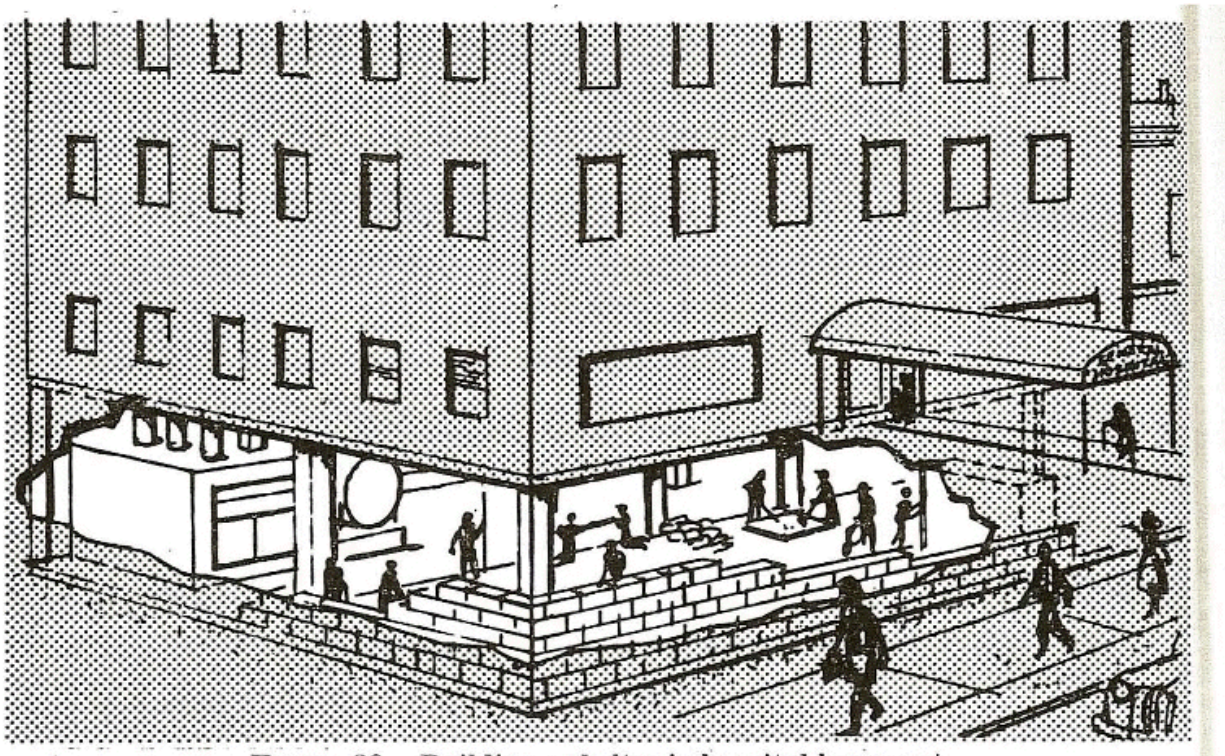


FIGURE 26.—Building a shelter in hospital basement.

When an institution such as a school or hospital decides to construct a community shelter or to modify an existing space, the directors of the institutions and Civil Defense Director will be able to participate in the project. They can help solve such problems as providing efficient shelter construction, fitting the use of the shelter into the overall community plan, preparing the shelter for occupancy, providing adequate warning and communication systems, planning for the earliest possible emergence from the shelter, and training people in the use of radiation detection equipment and other skills needed by the shelter staff. Through their efforts, they can focus the attention of the entire community on the need for additional community shelter spaces, beyond those located by the survey in existing buildings.

A shelter in a school or hospital basement is often only a partial solution to a community's need for emergency shelter spaces. A recognition of the fact may stimulate the energy and resources of the community to develop other shelters and accomplish a more complete solution to the problem of providing community shelter spaces for the entire population. Recognition of this fact will also result in additional home shelters.

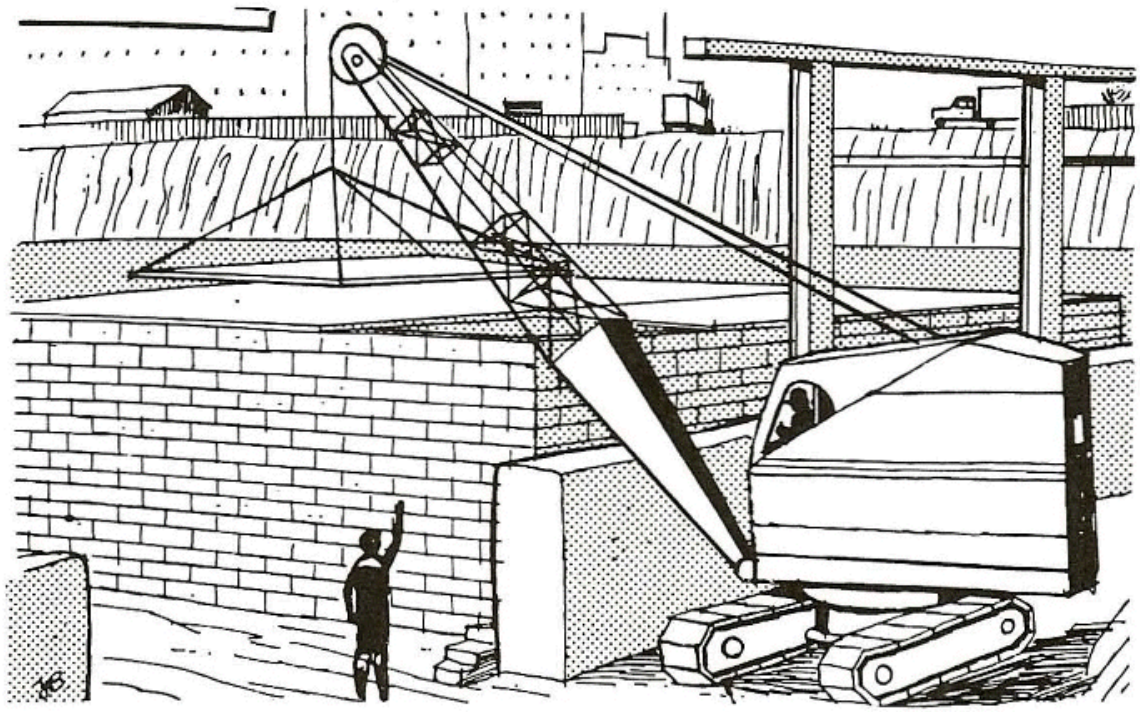


FIGURE 27.—Construction scene.

BLAST AND FALLOUT SHELTERS

Most structures provide some protection against blast, heat and radiation. Many parts of existing buildings provide good protection against fallout radiation and some measure of protection against blast and heat. Good protection against blast usually requires special shelters built of reinforced concrete or steel. After a nuclear explosion, the greatest danger to people who live outside the areas where nuclear weapons are detonated will be radioactive fallout. A fallout shelter will provide the necessary protection from the hazards of fallout radiation.

Personal and other special considerations may make home shelters more practical or desirable for certain individuals or families than community shelters. For example, in small rural and suburban communities, families may live a considerable distance from the nearest community shelter. For these families, a home shelter will provide more accessible fallout protection. Other families may prefer to have a home shelter for personal reasons.

For most of the population, community shelters provide the best answer to fallout protection. People away from home at the time of an attack should have immediate shelter available. As a member of a group, a person may better face the problems of shelter living. People could expect to find more special skills, for example, medical skills, represented within a group of 50 or more persons than with a small family unit. A large number of people could also share any necessary radiation exposure, for example, in leaving a shelter area for a short time to search for additional supplies. This would minimize the exposure to each person.

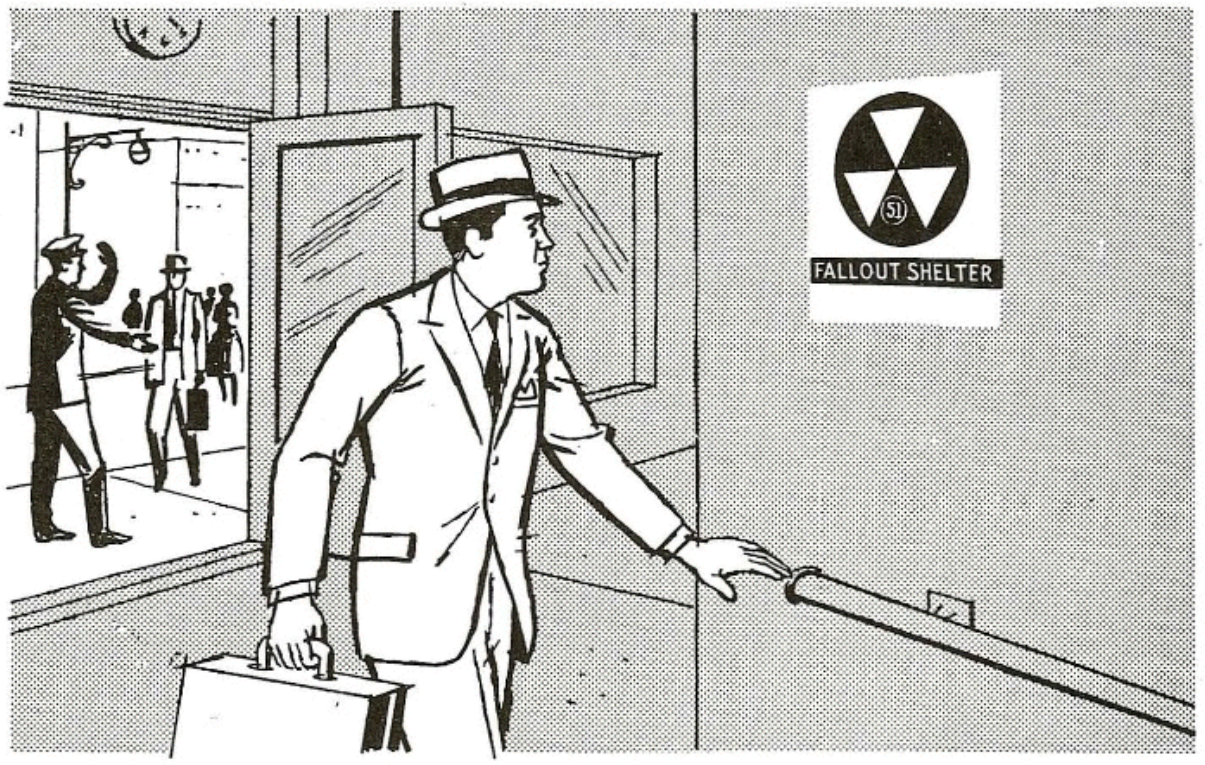


FIGURE 28.—Shelter marker.

A community shelter can also have peacetime uses. It might be used advantageously by the community as a cafeteria, community meeting hall, or as a local Civil Defense Training Center.

TYPES AND DESIGNS OF COMMUNITY SHELTERS

Community shelters may consist of shielded space in a basement, in underground chambers, in the inner cores of buildings, in subways or in other suitable space. The exact nature of the space or design may vary greatly.

A community shelter must provide the minimum essentials required to support life. There must be sufficient living area and adequate air for the expected number of occupants. Ten square feet of floor space per person is considered minimum provided there is adequate ceiling height and at least 3 cubic feet of fresh air per person per minute. Without forced ventilation or adequate natural draft, approximately 500 cubic feet of space for each inhabitant should be allowed.

Planning Factors in Utilizing Shelter in Existing Buildings or in Providing Additional Community Shelter.

In addition to certain construction details, several other considerations must be included in planning community shelters. One of the most important factors concerns the location of the shelter.

Community shelters should be situated close to population centers. They should be located near the people who will occupy them. An excellent shelter which people cannot reach within a short time is of limited value.

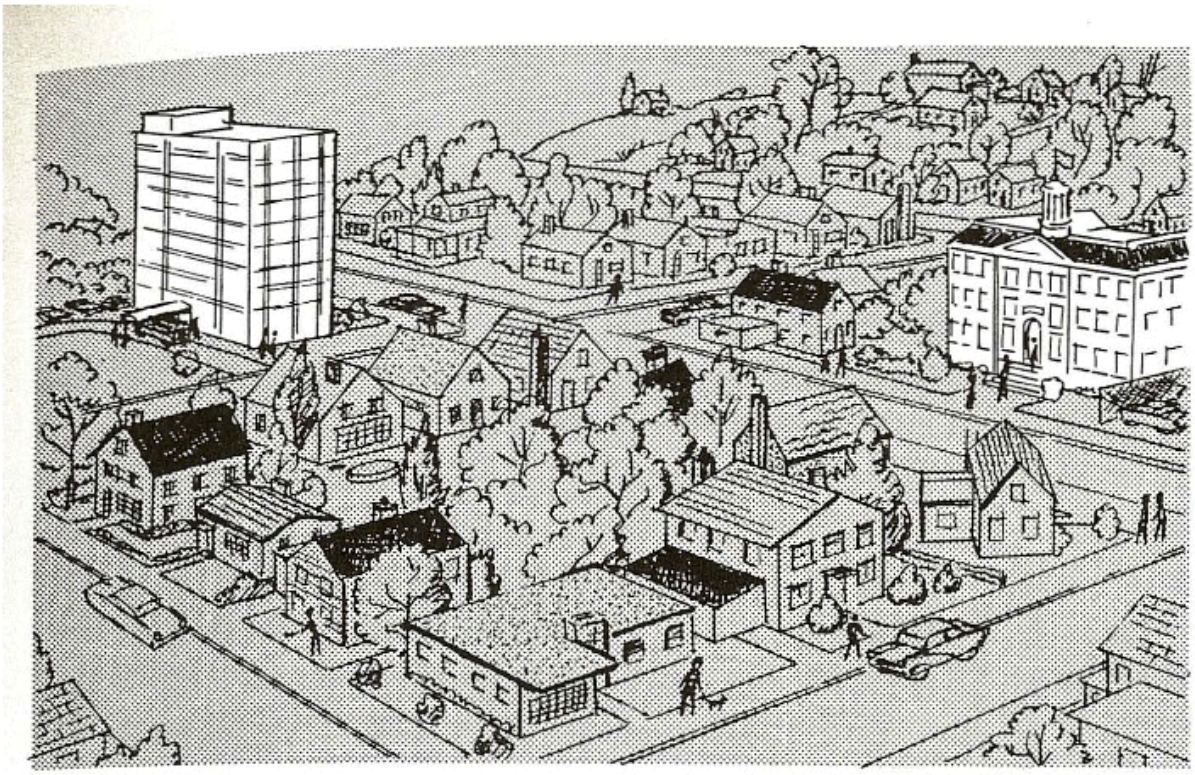


FIGURE 29.—School and/or hospital as shelter.

Attention should be given to day and night variations in population patterns. For example, on a weekday, large numbers of people are normally concentrated in downtown areas. Late at night or on weekends many are at home or outside the downtown areas. The locations and number of community shelters should include planning for such variations.

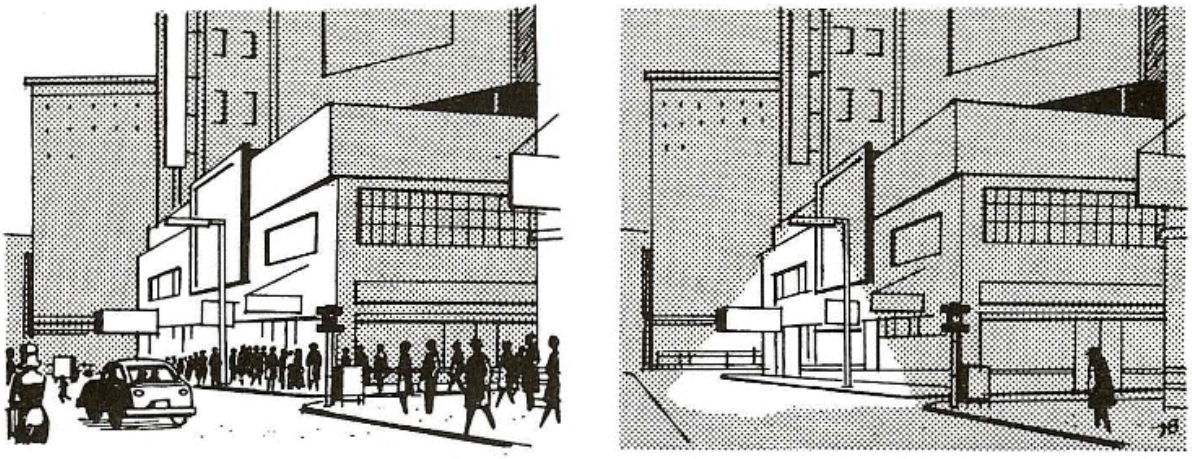


FIGURE 30.—(1) Crowded downtown street during day. (2) Same street at night but now deserted.

A shelter should be accessible. If a shelter is located several floors above the ground, consideration must be given to access by stairway. Because of power failure, elevators or escalators may not be operable.

Electric power availability must also be considered in shelter planning. Performance of vital functions will require lighted spaces. There may be injured persons who will need medical aid. Other important functions, such as the operation of communication and ventilation equipment, will also require power. Therefore, it is desirable in planning to include provision for an alternate power supply where it can be determined that there is a high probability that public power will fail under attack conditions.

Fresh air is the most important requirement in a shelter. If the shelter capacity is based on minimum space requirements, then at least 3 cubic feet of fresh air per minute per person are required. When ventilation is by natural draft, the capacity of a shelter is determined on a volume basis. When the shelter is above ground and can be adequately ventilated, 10 square feet per person is the basis for determining the capacity. Good grade commercial filters are desirable on

mechanical ventilation systems. If filters are used they should be properly shielded.

Heating devices which utilize a flame should not be used in a shelter because they consume valuable oxygen and may endanger the shelter occupants.

When new buildings are being constructed, fallout protection should be included in the designs. For example, the "safety core" design concept used in the school shown in figure 31 will provide adequate fallout protection for a nominal sum. The thick-walled central core with a concrete roof contains activity rooms which are divided and reinforced by the walls of the library and rest rooms. Baffle walls projecting from the building shield the surrounding classroom windows.

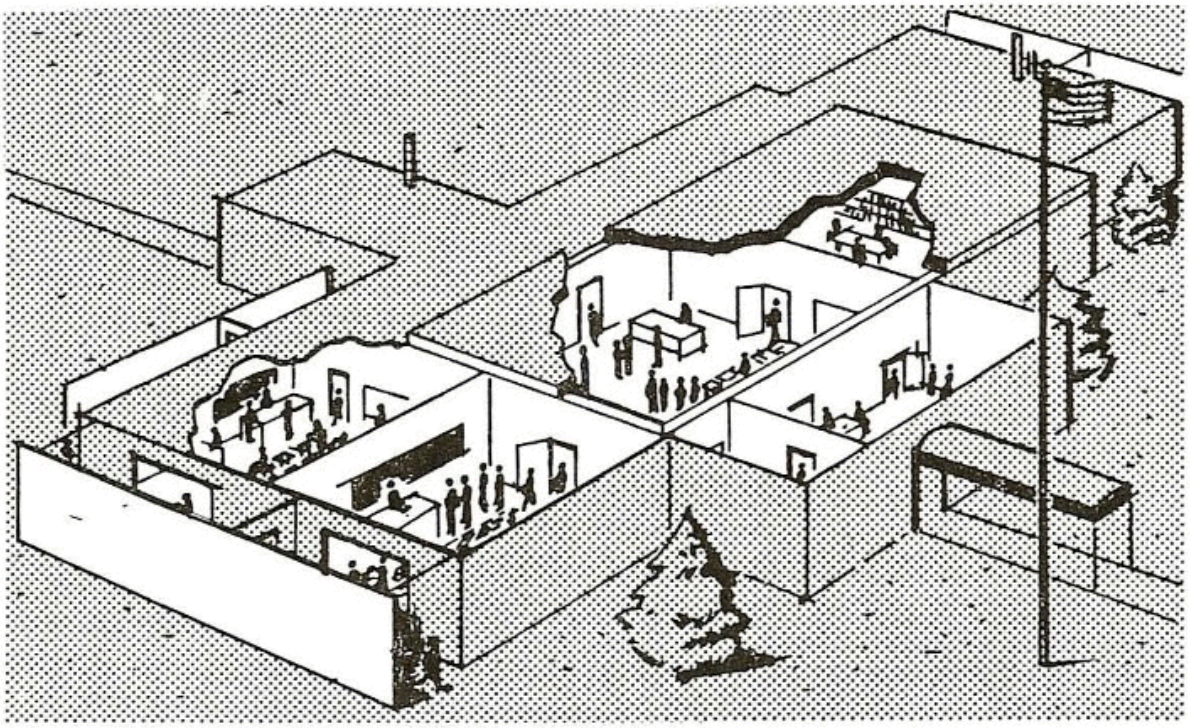


FIGURE 31.—Safety core design in school buildings.

Many communities or neighborhoods need meeting places for various civic groups and local organizations. Others may require space for a community recreation hall or cafeteria or for public automobile parking. Teenagers often need a place for their after-school activities. A community shelter can serve these and similar purposes. In figure32 a PTA meeting is adjourning for coffee in one section of the shelter while people are using the branch library in another section.

An underground shelter such as this can be built under a playground or other public property without interfering with the present uses of the aboveground area.

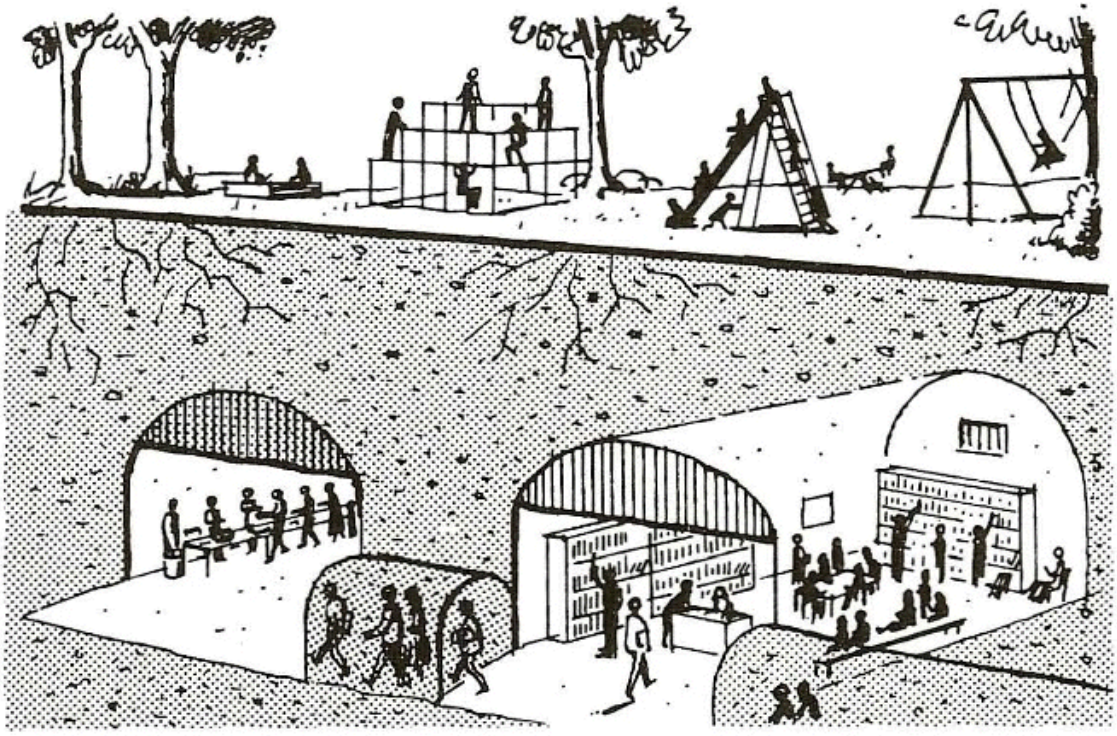


FIGURE 32.—Dual purpose use of community shelter.

PREPARING, ORGANIZING AND MANAGING COMMUNITY SHELTERS

In a civil defense emergency, proper staffing, management, and operation of a community fallout shelter can be vital to the survival of shelter occupants. Those in the shelter must function under an organized plan which takes into account the peculiar problems of shelter life, the special dangers of radioactive fallout, and the need for cooperation.

Shelter supplies provided by the Federal Government are the minimum needed to sustain life. Food is limited to specially prepared crackers. No blankets or cots will be provided under the Federal Shelter-Provisioning Program. However, communities may augment the federally supplied material at their own option and expense. Another solution is for families to bring essential supplies with them to community shelters.

The plans that must be made for living and surviving in a community shelter must take into account the many physical and psychological problems that could arise. Childbirth, injury and death will occur in the shelters. Occupants may be crowded with little opportunity to move about. They will encounter an unaccustomed lack of privacy, unfamiliar noises, unpleasant odors, and other discomforts or inconveniences. Federally stocked food will sustain life, but will be monotonous. Certain foods and supplies may be in short supply or nonexistent. Some occupants may be worried about their own chances for survival, about missing members of their families, and about the circumstances of postattack living. In such situations it would not be surprising if some occupants suffered mental anguish and annoyed others in the group.

Prior planning and organization must contemplate handling such situations. In each locality, planning activities are carried out under the guidance of a local Civil Defense Director. He and his staff of trained personnel deal with the overall problems related to community survival and select and train other persons to take leadership responsibilities in local community shelters. Each local area should have a protected emergency operating center, which will provide a "seat of government" during emergencies, housing for local governmental officials and the Civil Defense staff. After an attack, situations may occur which prevent some staff personnel from reaching an emergency operating center before fallout arrives. In spite of the absence of several staff members, it is expected that most emergency operating centers will be able to carry out previously planned operations. Every emergency operating center will be responsible for the community shelters in its area. If an intershelter communications system is functioning, personnel at the center will provide technical guidance and advice to leaders in community shelters during and 'after the period of shelter confinement. They will also maintain communication, insofar as possible, with emergency operating centers at state and federal levels.

Actual management arrangements may differ for each community shelter. The arrangements will depend upon the shelter's size, capacity, layout, supplies, equipment, and stock of food and water. Every community shelter, however, will require leadership. This leadership is best supplied by persons trained before an emergency. State and local governments are following Federal Civil Defense recommendations in selecting and training a shelter manager and a staff for each community shelter.

The shelter manager should be a man who has already demonstrated leadership in his community. He should be the type of person who faces emergencies with calm resourcefulness. His training includes information leading to a thorough understanding of the radiation danger and associated dangers of modern war, an appreciation of methods of group management, and an actual experience of living for a time in a community shelter. He represents the authority of his local government.

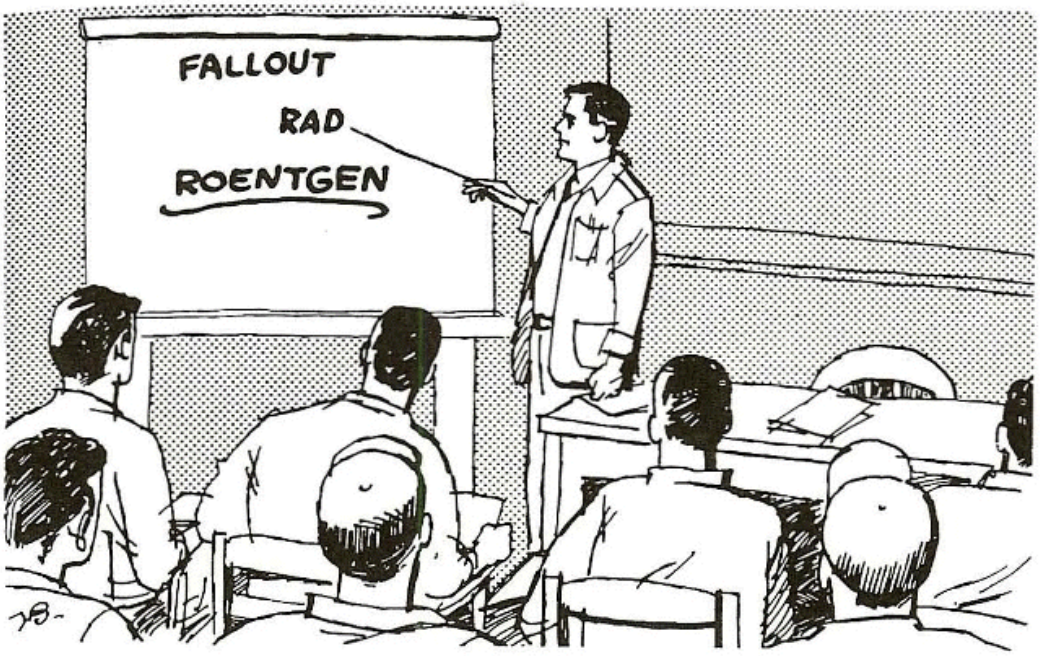


FIGURE 33.—Classroom session. Instructor is explaining radiation to adult students.

In a typical plan for community shelter organization, the shelter manager will have to have help with various aspects of shelter direction. In many shelters there will be need for a deputy for operations to oversee on-going shelter functions; a deputy for education and information to oversee the activities of community shelter occupants; and a deputy for supply and maintenance to oversee all shelter material needs. In some shelters, the shelter manager will also need an administrative assistant who will transcribe staff messages and reports, keep the shelter log, and relieve the manager of as much operational detail as possible.

In those communities where preattack assignments of people to specific shelters can be made, other shelter duties can be distributed among the expected occupants. In most community shelters, however, the staff will have to be selected from among the shelter occupants, based on the skills and knowledge found among them. Each shelter should have a small advisory committee to act as a clearing house for matters involving relationships between the shelter management staff and other occupants. The committee would be responsible for presenting problems to the manager and his deputies and for communicating to the group any problems the management may be experiencing.

The deputy for operations and members of his staff (radiological monitors, the chief of safety-police and fire control-sanitation and feeding personnel) must organize the physical layout of the shelter for most efficient use. They must plan the registration and feeding arrangements. During the period of shelter confinement, they must oversee all shelter safety, health and sanitary facilities and generally maintain order.

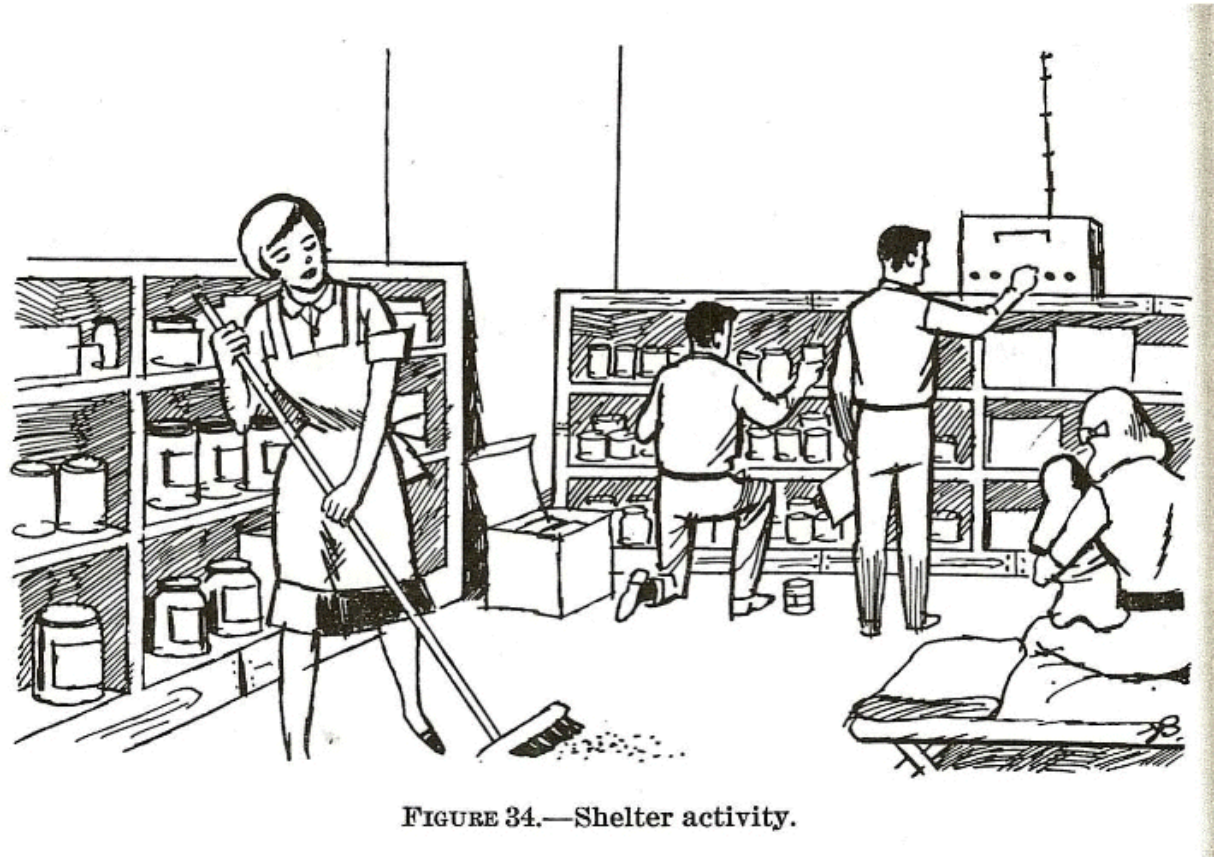


FIGURE 34.—Shelter activity.

The deputy for operations and the radiological monitors direct the operation of all monitoring and communications equipment.

Throughout the period of shelter confinement, a 24-hour monitoring and communications watch should be maintained.

The deputy for information and education will take charge of informational programs during the period of shelter confinement. He and his staff will prepare announcements, conduct discussions, and otherwise keep occupants informed. They will also promote recreational and social activities designed to maintain morale and meet spiritual needs. Discussions conducted during the period of

shelter occupancy will stress the needs of the expected postattack environment. Limited physical exercise and social activities can be important in reducing the tensions of shelter confinement and some participation by all, regardless of age, sex, or ability, should be encouraged.

In order to carry out his responsibilities during the current period of shelter preparation, the deputy for information and education may be stocking as many books, games, writing materials and similar supplies in the shelter as he can obtain through donations from the community. He should try to provide items for all age and interest groups expected to occupy the shelter. Since shelter space is at a premium, this type of material should be compact and not reduce the capacity of the shelter.

During the current period of shelter preparation, the deputy of maintenance and supply and his staff should acquire supplies, both from governmental sources and community contributions, and look after their proper storage and maintenance. During the period of actual shelter occupancy, the supply staff will be in charge of and will issue all shelter supplies, including food, water, drugs and other heath and sanitation items. Supplies should be stored so they are protected and can be issued in an orderly manner. When the radiation levels outside the shelter are low enough to allow for brief journeys outside, additional supplies may be brought from nearby sources.

Men of the community should be selected and trained as auxiliary policemen to serve in shelters. When an actual warning is received, these men will direct others to the shelter and will assist in maintaining law and order within the shelter throughout the period of occupancy. They must be men who can exercise good judgment under stress, for they must be needed to calm excited and emotionally disturbed people.

Other duties for which men and women may be selected and trained during the current period of shelter preparation include those of distributing food and water, rescue and fire prevention. Persons trained in medical self-help, in radiological monitoring, and in the operation of communications equipment will be vital to the successful operation of any community shelter.

Keeping Order

The shelter manager and his staff should try to confine their activities to meeting serious emergencies. Problems directly involving health and safety should remain staff responsibilities. In other matters, however, shelter occupants should be encouraged to solve their own problems, including certain behavior difficulties. Occupants must be encouraged to develop self-reliance, to help one another, to adjust willingly to the needs of others, and to help keep formal operating rules a matter of general agreement. The more occupants do for themselves, the more they will lighten the load on the shelter staff and less tension will result. Effective

and orderly shelter living will depend to a great extent on the occupants and their willingness to cooperate.

SHELTER SUPPLIES, MATERIALS AND EQUIPMENT

In conjunction with the National Shelter Survey, the Federal Government is marking and stocking acceptable community shelters with certain essential supplies and equipment. These supplies are secured from Federal warehouses. The anticipated shelf life of these supplies is approximately five years.

Each shelter will be stocked with a minimum quantity of food and water. A 10,000-calories supply of food will be provided for each person in the form of special crackers resembling graham crackers. Water containers, also supplied by the Federal Government, will be filled with water. Once empty, the water containers can be used as chemical toilets. In addition to food and water, shelter stocks will include sanitation kits. These kits include everyday items for sanitation needs and materials for converting the water storage container for use as a toilet. Additional fluids will be available from water trapped in the buildings and in containers brought to the shelter by its occupants.

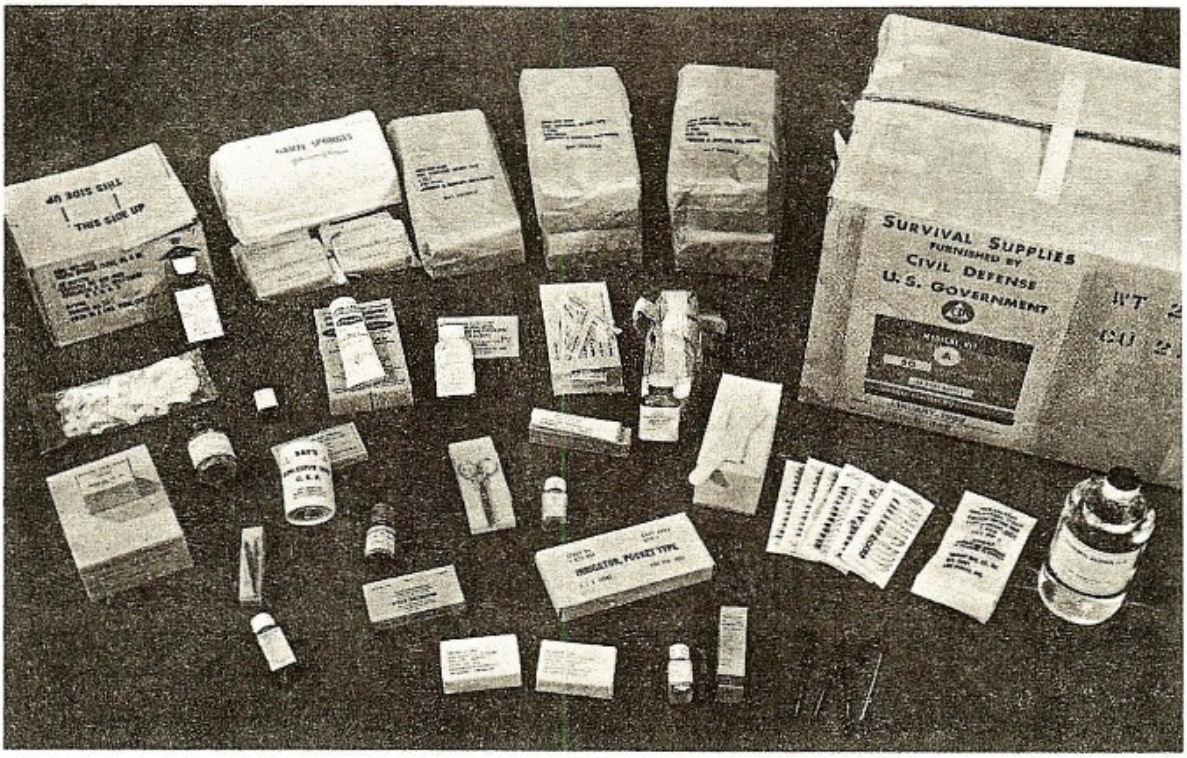


FIGURE 35.—Survival items include medical kits.

Since professional medical assistance may be limited in any particular shelter, a medical kit with instructions is included in the shelter provisions.

One of the most important items to be included in any shelter is the radiological monitoring kit. These -kits contain radiation detection equipment to permit trained monitors to determine the radiological situation within the shelter and to survey the area near the shelter.

Special Supplies

Some community shelters will be located near public or private homes for the aged or infirm, or hospitals. This imposes special requirements which may be met by the community. In any shelter where occupants may be expected to include diabetics or chronic invalids, supplies should include insulin, hypodermic needles, and special drugs and foods. Infants or very small children will need powdered formula mixtures, canned or powdered milk, water, canned baby foods, nursing bottles and nipples, a nursing bottle funnel, and an adequate supply of disposable diapers. Such special supplies Should be brought in by the persons needing them.

Care must be taken to ensure proper storage of the items in the shelter. Storage should be carefully planned so that no more space is taken up than is absolutely necessary. However, certain safeguards are required. The package is intended to protect the product from physical damage and chemical deterioration. Temperature is the most important variable condition in storage of shelter supplies, with relative humidity next in importance. High storage temperature, dampness, and insect or rodent infestation are the major causes of deterioration of packaged products. Rigid supervision and cooperation will be required for best utilization and distribution of the limited supplies. Since much of any damage which may occur will be "hidden," thorough periodic inspections are necessary.

CHAPTER V

INDIVIDUAL AND FAMILY PREPAREDNESS FOR SHELTER LIVING

(Emergency Shelter Action)

WHETHER MEMBERS OF A FAMILY expect to occupy a community shelter or a home shelter in the event of an attack, they must be prepared to begin a

completely different way of life from that which they Have known. It will be a time for courage, faith, resourcefulness, and mutual help. In a war emergency, the change in personal manner and Level of living may be dramatic—from plenty to privation.

INDIVIDUAL RESPONSIBILITIES IN A COMMUNITY SHELTER

During the time people must remain inside a community shelter, they must be prepared to face and solve problems without outside assistance. As long as radiation levels in the area around the shelter are high, no outside help can be expected. Moreover, no one will be able to leave the shelter to obtain assistance from outside.

The shelter manager and his staff will provide trained leadership for the community shelter but they will need the cooperation of all occupants. The health, safety and comfort of everyone will depend on everyone's working together. Decisions will have to be made, several key jobs will have to be filled, and vital programs and activities will have to be commenced. These things cannot be done without each person doing his part. A spirit of cooperation will make the situation easier and will increase the effectiveness of individual and group efforts.

One of the most effective ways to minimize anxiety is to keep busy. Every person must be willing and able to help others who may need assistance. Every person must be prepared to perform any task given him calmly and effectively.

ASSIGNMENT TO COMMUNITY SHELTERS

In some communities, shelter assignments may be made in advance of emergency. If so, each person may be assigned a place in a particular community shelter and must learn the location of the shelter in which he is to seek protection if an attack warning is sounded. Such assignments, however, can only be tentative because it is quite possible that some people will not be near their assigned shelters at warning. If an individual was far from his assigned shelter when the "TAKE COVER" was heard, he should seek protection in the nearest available shelter.

Wherever a person may be during the day or night, he should know the location of the nearest community shelter. Local civil defense authorities can advise regarding those in a person's own community. Members of every family should learn the location of shelters in areas they frequent. When a person visits a new or unfamiliar area, he would do well to make a point of noting nearby shelter markers.

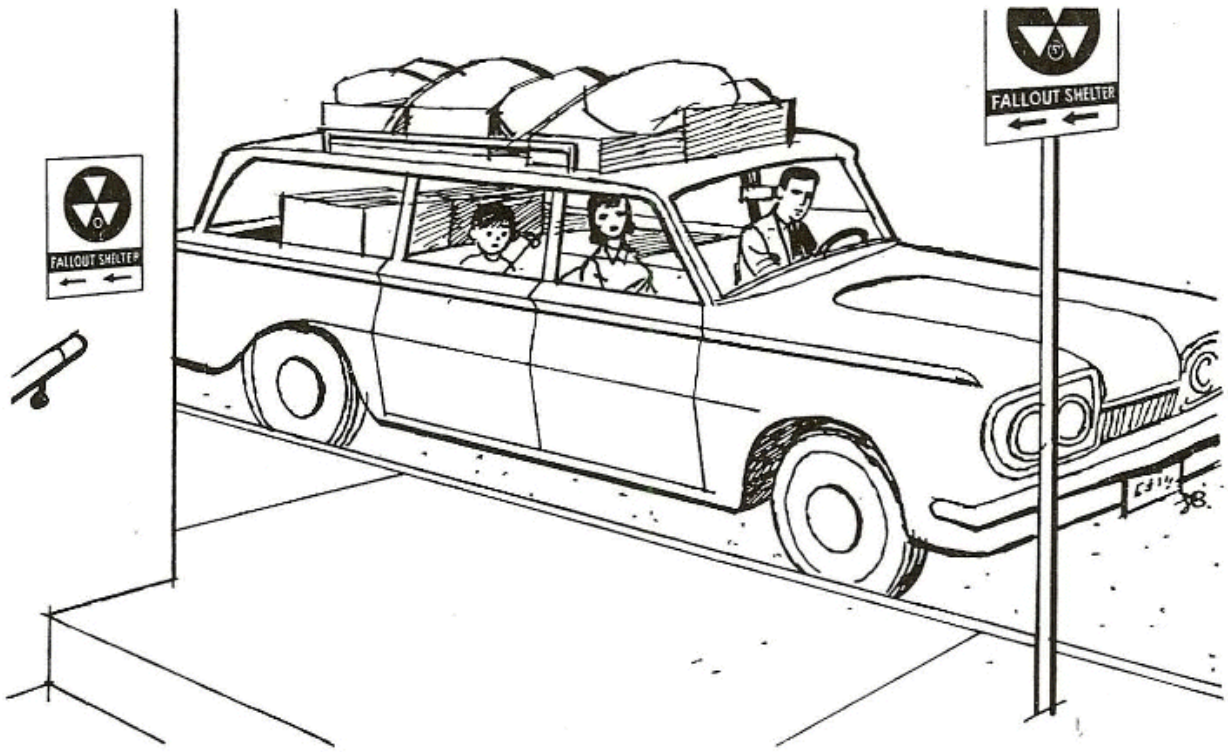


FIGURE 36.—Newcomers learn the community shelter locations.

LIVING IN COMMUNITY SHELTERS

If the "take cover" signal is given, no person should pause to collect scattered belongings or unnecessary items. Hesitation will consume valuable time which may be needed in order to reach a shelter safely. In addition, it is probable that most space in a shelter will be required for the occupants and essential shelter stocks. There will be little room for personal possessions other than special medicines, drugs or specific items requested by local Civil Defense authorities. When an individual reaches shelter, some staff members may already be present. They will probably assign people a place to sleep and to receive rations. Although shelter occupants may at first be worried and shocked over the attack, everyone must be prepared to keep himself emotionally in check. It will help to keep occupied, and several tasks important to the health and safety of the shelter group will probably need immediate action. For example, the shelter staff may need assistance with new arrivals or the immediate needs of a person's own family may require attention. A thoughtful and cooperative attitude will be a vital asset.

Early in the shelter stay, each person will be asked to fill out a registration form giving his name, address, relationship to other members of his family, special skills, disabilities or illnesses, and locations, if known, of family members elsewhere. All occupants will provide such records. Children and invalids will have these forms filled out by relatives or staff members.

The form will provide for an individual's statement of preference for an in-shelter responsibility or duty. Efforts will be made to assign duties according to abilities and preferences.

It is quite possible that the community's Civil Defense program will encourage people to bring certain items, such as blankets, into the shelter. If so, these items may have to be shared with others who did not have the time or opportunity to obtain them.

SHELTER REGISTRATION FORM (front)*

FAMILY NAME	HOME ADDRESS _____ PHONE _____			
FIRST NAME	AGE	SEX	SKILLS OR OCCUPATION	ILLNESS OR DISABILITY
1 (head of family or single person) _____				
2 others - indicate relation to head of family (i.e. - son) _____	REL			
3 _____				
4 _____				
5 _____				
6 _____				
OTHERS IN FAMILY - NOT HERE			PRESUMED WHEREABOUTS - OR UNKNOWN	
7 _____				
8 _____				

SHELTER REGISTRATION FORM (back)*

NAME - for each person, use the same number as other side	TALENTS OR HOBBIES	ASSIGNED TO:	
		Group	Work Team
1 _____			
2 _____			
3 _____			
4 _____			
5 _____			
6 _____			
7 _____			

ITEMS BROUGHT INTO SHELTER

_____

_____

_____

_____

_____

PRESENT LOCATION (if not with family)

_____

_____

_____

_____

* This form is for guidance only. Each community should develop a shelter registration form which conforms to its particular operations plans and procedures.

FIGURE 37.—Sample registration form.

PSYCHOLOGICAL ASPECTS OF COMMUNITY SHELTER LIVING

During the period of shelter occupancy it is anticipated, based on extensive tests, that most people will be unhappy but normal. There may, however, be people who will be uncertain and disturbed. This condition may be brought on by the unfamiliarity of shelter living or by fear for the safety of missing relatives and friends. Abnormal or disturbed behavior will vary from individual to individual in this group. Some may appear unusually excited. A few may exhibit only a slight nervous mannerism or tic. All in this group need help. Everyone must try to be tolerant of the situation because some of these disturbed people will recover in a short time. A calm, optimistic, sympathetic, but unemotional acceptance of the situation will help considerably. All these problems were met and surmounted during the war by the occupants of shelters in London, Berlin, Tokyo, and elsewhere.

People under tension often need a chance to talk. They need simple tasks to take their minds off their experience and to give them a chance

to get back their self-possession. If they receive no care, however, they may become a serious burden to the shelter community. Therefore, fellow shelter occupants should try to talk calmly and quietly to them, to establish sympathetic contact and, once contact has been made, to help them take part in some simple, helpful activity. Serious cases should, as soon as possible, be referred to trained staff workers. Generally, a layman should never try to administer sedatives or use physical force on emotionally disturbed people. Such people may even be harmed by shouts or slaps intended to "snap them out of it." These four general principles should be borne in mind: (1) It is everyone's right to have his own feeling. (He must not be blamed for his upset.) (2) A person's limitations are real; they should be recognized and accepted. (3) The possibilities for an individual's recovery and usefulness should be estimated. (4) Every person should accept his own limitations as a helper.

FIGURE 38.—A community shelter.

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Wherever possible, special attention and encouragement should be given to elderly people and children. They ought to be given something useful to do and shown that their help is appreciated,

Everyone must be prepared to make the best of life under conditions which are remote from the normal living pattern. There will probably be an annoying lack of privacy or a feeling of confinement. Everyone will be together day and night in the same limited area. Since each person must live, eat and sleep here until it is safe to leave the shelter, he should be prepared to accept and cooperate with those around him, whoever they may be. Again, however, *these conditions will be no worse than living conditions which thousands have undergone* in surviving peacetime catastrophes.

SUPPLIES IN COMMUNITY SHELTERS

Food Supplies Most shelter occupants will be able to eat the food in shelter stocks, including items supplied by the Federal Government and by the community itself. People who require a special diet, such as those who must eat

salt-free or sugar-free foods, may bring their own supplies. Local Civil Defense officials can give advice regarding local policies on bringing supplementary rations, bedding, or other supplies to shelter areas.

Not all shelter areas marked are now provisioned with food and water or other standard supply items. Accordingly, plans and procedures for bringing home supplies into an unstocked community shelter should be developed in cooperation with local Civil Defense officials. The items that should be considered for inclusion in a portable food and water kit are listed on page 85.

Cleaning and Special Personal Supplies

Soap and disinfectants will be included in community shelter stocks. However, some people may wish to prepare a small emergency kit for personal hygiene, to be carried into the community shelter. Such items as special drugs or medicines, sanitary napkins, towels, and powder may be included. If there are infants or invalids in the family, certain items for their health or comfort could also be included. Local Civil Defense officials can give advice and information concerning useful emergency items.

Clothing and Bedding

Blankets and extra clothing are valuable additional items which 'the community may want to include in shelter stocks. They should be clean and safely stored to prevent mildew. In addition to those required by the expected number of occupants, a few extra blankets might be included for use by the sick and injured.

Rescue Tools

Tools that can be used for rescue are shovels, crowbars, hammers, screwdrivers, pliers, ropes and buckets. These tools might be required to clear exits from basements of buildings.

Miscellaneous Supplies

Shelter occupants will need to record the passage of hours and days. Therefore, a reliable clock and a calendar are important items for the shelter. Matches will be needed, and should be kept in a waterproof container.

Old newspapers can also be of great value to shelter occupants. They can be rolled into tight, stiff tubes to be used as emergency splints; they can be spread under bedding or inside clothing as insulation.

FOOD IN COMMUNITY SHELTERS

Food and water supplies will have to be carefully regulated to ensure that they will last as long as possible. For the first few days after taking shelter, a system of food rationing may be required. This strict control over food and water may be relaxed when more information is available regarding probable length of shelter stay.

The shelter staff will supervise the food supply. Inventory control and equitable distribution will require the help and cooperation of everyone. If the federally supplied food is augmented, some people may help serve the food. If the shelter is large enough, cafeteria-type serving may facilitate feeding.

Food can help morale. Therefore, wherever possible, menus should be varied. People who are familiar with the preparation of food may be able to devise a surprisingly large variety of meals with only the stocks on hand.

If a community augments Federal food stocks, care should be given to selecting items which will require little or no cooking. Container sizes should be selected which will keep spoilage or leftover to a minimum.

CARE OF THE SICK AND INJURED

Since doctors, medical supplies, and other aids may not be available for days or even weeks, it is important that the person in the shelter best qualified medically supervise the care of the sick and injured. A nurse or person with first aid training may be among the occupants. If so, that person should assume medical supervision of the shelter. People who have had any similar training should be prepared to help whenever necessary.

It is quite possible that medical emergencies will be experienced during shelter occupancy. Some people may suffer from illnesses at the time they take shelter. Others may injure themselves. Childbirth may occur, as it has in lifeboats, airplanes and taxis. If sickness or injuries occur, the shelter staff should be notified immediately. Effective quarantine will probably be impossible in most shelters because of space and facility limitations. However, it is desirable to keep the sick and injured in a separate area of the shelter, screened off, if possible, from other occupants. This procedure will facilitate their care and will minimize interference in other essential shelter activities.

In addition to medical supplies, shelters will be equipped with first aid, medical and sanitation handbooks. They will provide detailed reference material for treating sickness and injury. They can also be used to train shelter occupants who have had no previous instruction in these subjects.

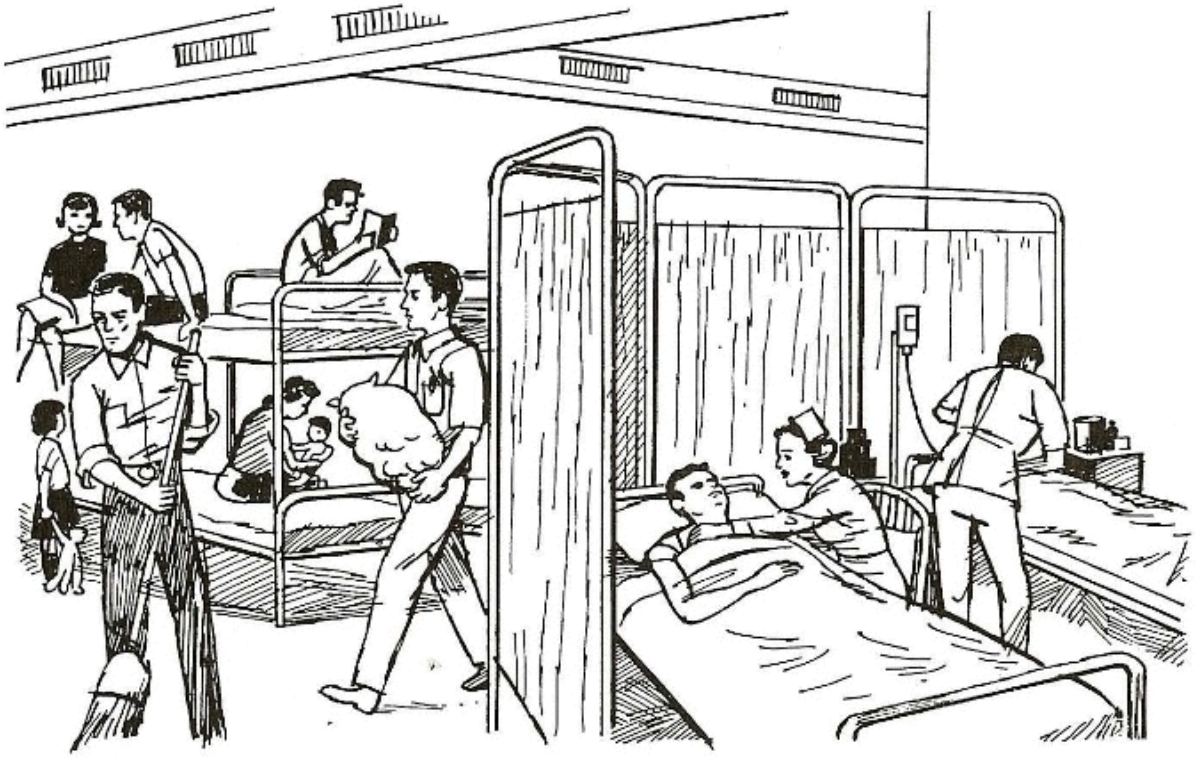


FIGURE 39.—Section of a community shelter screened off for sick.

SLEEPING IN COMMUNITY SHELTERS

Shelter stocks supplied by the Federal Government will not include sleeping equipment. Therefore, the community may wish to provide bunks and bedding.

Sleeping takes up the greatest amount of floor space of any single shelter activity. For this reason, it is the most significant factor in determining shelter capacity. Also, one-third or more of every day will probably be needed for sleeping. Therefore, arrangements should include measures to make shelter occupants as comfortable as conditions will allow. If beds are not available or if the number is limited, some shelter occupants will have to sleep on the floor. A blanket, jacket or coat may serve as a pad or for covering.

Depending on the configuration of each shelter, variations can be made in sleeping patterns. If, for example, there is a separate room connected to the main shelter area, people may sleep in shifts. This will reduce the space required for

sleeping. While one group is sleeping, the remaining shelter occupants will be able to continue with shelter activities.

SANITATION

The number of people occupying a community shelter requires careful attention to sanitation. Cleanliness and the proper disposal of wastes are vital to the prevention of disease, and here, even more than elsewhere, "an ounce of prevention is worth a pound of cure." During the period of shelter confinement, it will be important that occupants remain in as healthy a condition as possible. Medical supplies will be limited. If contagious illnesses break out in the confined space of the shelter, there may be no way to control them.

It is the responsibility of every community shelter occupant to keep himself as clean as possible and to encourage those around him to be scrupulously clean during the entire period of shelter confinement. Severely limited supplies of soap and water may prevent washing as often as desired, but full use should be made of cleaning opportunities. Any disinfectants available should be used. Special efforts should be made to keep hands clean.

If the food supply is limited to the basic shelter crackers, the cleaning problem after meals will be minimized. If more elaborate rations are available, there will be a greater problem in disposing of meal scraps. In any case, everyone should do everything possible to keep areas where food is prepared and eaten free of crumbs and dirt. Latrine areas should also be regularly swept, mopped, and treated with a germicidal solution, if available. The entire shelter should receive a sanitary inspection at least once every day, and the latrine area should be inspected at least twice daily.

A home shelter should be stocked with necessary cleansing materials (see Chapter VI) and the occupants should use them frequently. In the confined isolated environment of the home shelter there may be a strong temptation to let standards of cleanliness slide, but remember that such neglect can easily endanger the family's health.

USE OF TIME

Whether a family is preparing to go into a community shelter or into a home shelter, there should be plans for activities which will help pass the time more quickly, take people's minds off their worries, and help to prepare people for life in the post attack environment. Most of these activities require supplies which should be placed in the shelter ahead of time.

In the community shelters, there will be staff persons assigned to direct informational and recreational activities. Individuals may want to donate supplies

that would be helpful in a shelter activity program, in the event that the shelter ever has to be occupied.

Religious Activities

In any community shelter where no priest, minister, or rabbi is present, the best-qualified laymen will be asked to take charge of religious activities. Keeping up religious observances during the period of shelter confinement. can be a rich source of encouragement. Clergymen and laymen will find Bibles, other books of spiritual guidance, and religious articles appropriate to various faiths helpful in bringing spiritual comfort to shelter occupants.

Religious observances in a home shelter will also be enhanced by the presence of Bibles and other spiritual books. Clergymen can be of great service in advising family members of appropriate and available spiritual helps. A book of prayers or a devotional guide will prove its worth in time of emergency.

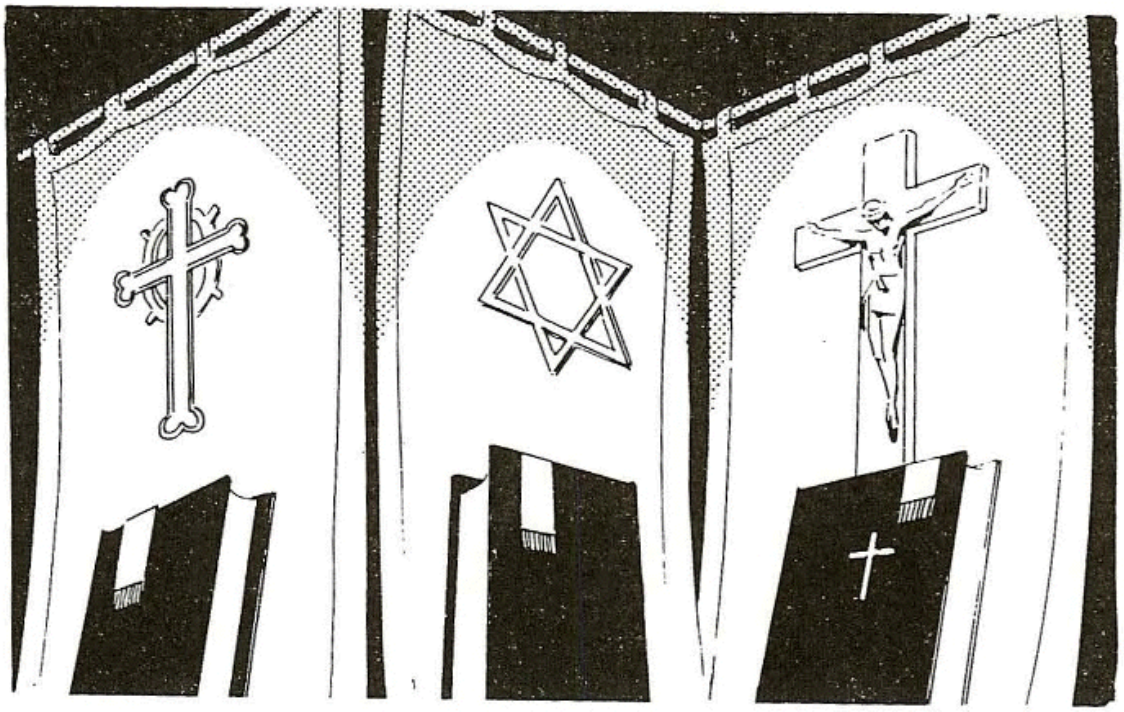


FIGURE 40.—Spiritual aids.

Schoolbooks and Schoolwork

If the community contains many children of school age, community leaders should try to have them continue some of their schoolwork while confined to the

shelter. Aside from the future value of this learning, it helps give children a feeling of normalcy and confidence. A bookshelf in either a community or a home shelter might include a sample of books on school subjects to allow teachers or parents to organize activities similar to regular schoolwork during shelter confinement. Note paper, pencils, and other schoolwork equipment should be stocked if space permits. Keeping daily journals may be helpful for adults as well as children.

Other Reading Matter

Some members of the community may want to donate a supply of books to be placed in the community shelter nearest them. Whether or not individuals in the community *ordinarily* find time to read, the community shelter should be stocked with plenty of reading matter. Everyone will probably be doing much more reading than usual. Both books and magazines will help to pass the time. In addition to novels, fiction and factual books, the shelter library might include books of riddles, brain teasers, and crossword puzzles.

Home shelters, too, should contain a good stock of all kinds of reading matter, suitable to the ages and interests of family members.

Music, Games, and Handicrafts

It is strongly recommended that shelters be stocked with song books or song sheets. Singing has helped people keep up their spirits in many painful or frightening situations.

Some people may even want to store small musical instruments in the shelter. A mouth organ, or even a toy instrument or two, can be helpful and physical activities, such as marching in place, can be made more interesting by accompanying them with music. Space permitting, shelter equipment should also include a number of table games and amusements suitable for children and adults, as well as simple toys for very young children. The games should be as different from one another as possible and might include card games, board games, pencil-and-paper games, or any other types that. need only a limited space. The best kind of game is one that is so absorbing that it turns the player's attention completely away from his current difficulties.

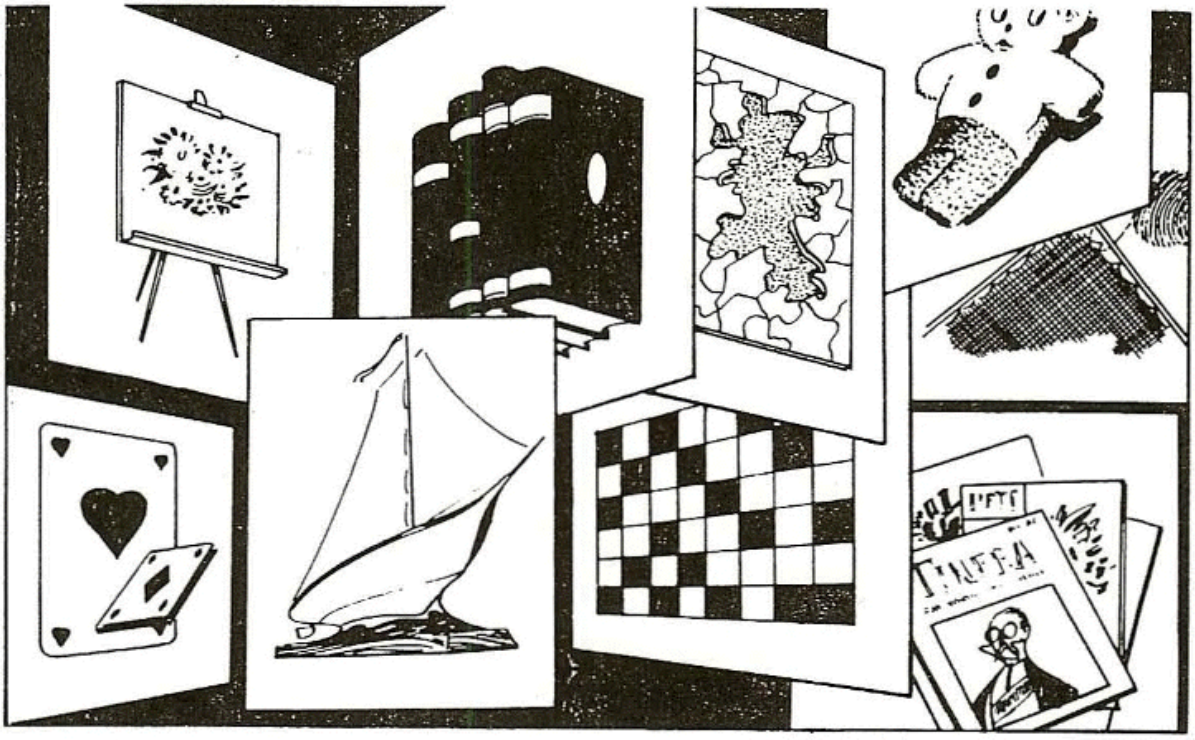


FIGURE 41.—Games and hobbies.

The person arranging shelter amusements should choose games that will not create too much noise when they are played, since shelter occupants may be ill or asleep at the time others want to play. Games likely to arouse arguments should be avoided. Those that can be played by one person or several, such as jigsaw puzzles, will be especially useful.

A community shelter or home shelter might well contain inexpensive equipment for such activities as drawing, painting, clay-modeling, or paper-cutting. Supplies for knitting or sewing might also be included. Handicraft equipment should not be limited to types requiring bright light. The shelter light supply may be dim, and, in any case, it will be important to save the brightest lights as much as possible. If there

are young children, blocks and similar construction toys will be welcomed. Building kits for model planes, ships, and cars can be useful, but are limited in that the model can be put together only once, while clay, for example, can be used over and over.

Physical Exercise

In the postattack world, the ability to carry heavy burdens or to travel long distances on foot may be required of young and old. Life in a shelter, however, with its limited room, can easily become an inactive existence resulting in stiff, sore muscles and physical weakness.

That is why all members of the group must engage in regular physical exercise while they are confined to the shelter. Everyone should do some simple exercises every day. However, rigorous and strenuous activities should be avoided, to prevent raising the shelter temperatures to uncomfortable levels and to prevent stimulating appetites for food and water.

FIGURE 42.—Family exercising.

PLANNING FOR LIFE OUTSIDE

During the period of community shelter occupancy, staff leaders should conduct group sessions to discuss problems of shelter living including the shelter organization, individual and group responsibilities, the need for conserving supplies, and safety precautions. They should also devote attention to the situation that occupants might find outside the shelter. Groups may meet at "classes" to receive this information or, in some of the smaller community shelters, information may be presented to the entire population at one time.

The subjects discussed will vary with the situation but may include what is known about attack effects across the Nation, or locally, expected community fallout persistence, ways in which individuals can assist in Government efforts when they emerge from shelter, and restorative actions that will be taken by the local, State and Federal Governments. Or they may include such subjects as home maintenance—wiring, plumbing, and structural repairs, etc.—preparation of food with limited facilities, or similarly useful material on personal living.

At a later time during the period of shelter confinement, small teams may leave the shelter for brief trips to get additional supplies, make contact with other shelters, or accomplish other tasks. Such trips should be planned carefully. Each trip should be evaluated in terms of goals, routes, numbers of people going, fallout contamination dangers and times of expected return.

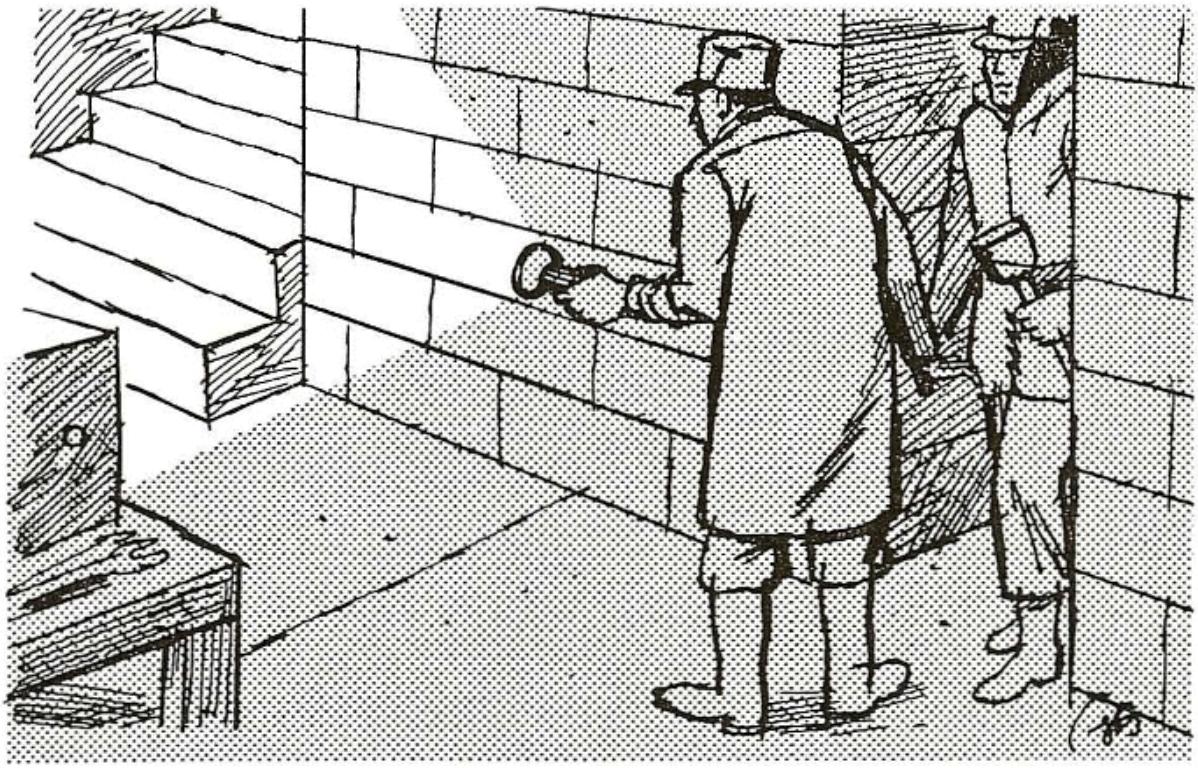


FIGURE 43.—Men leaving shelter.

Similarly, family members in a home shelter should discuss the probable situation outside, dangers of the postattack environments, and family needs, before allowing anyone to emerge, however briefly. Of course, only when the radio has announced that local radiation has reached relatively low levels should anyone plan to go out except for the most vital of reasons.

ADDITIONAL PREPARATORY TRAINING

In the event of an attack, everyone may have to occupy a community or family shelter for a period from several days to as much as 2 weeks depending on fallout conditions. In addition to the work in this course, what can an individual do to prepare himself for a period of shelter living? Acquiring skills useful in daily peacetime living, as well as during a period of shelter confinement, is significant.

One such skill is the ability to offer nonprofessional medical help to the sick and injured when no doctors or nurses are available. Other skills that might be acquired are those in fire prevention and firefighting, rescue work, and the operation of communications equipment. Special Civil Defense training courses have been designed to enable volunteers to acquire these and other emergency skills. A course, known as the Medical Self-Help Training course, has been developed by the Office of Civil Defense, and the Department of Health, Education, and Welfare, U.S. Public Health Service, in cooperation with the American Medical Association Council on National Security and Committee on Disaster Medical Care. This course includes information on caring for the sick, the injured, and emergency childbirth. Information about the availability of this course may be obtained from local civil defense and public health organizations. Red Cross Chapters also offer a number of courses of direct significance to civil defense work.

The local civil defense director can also furnish information about the training offered to shelter staff members described in Chapter VIII. For example, this training enables shelter staff members, in time of emergency, to act as shelter managers, auxiliary police or firemen, augmenting professionals.

CHAPTER VI

HOME SHELTERS

ALTHOUGH A FULL-SCALE PROGRAM of identifying, marking, and stocking community shelters is now going on, the home shelter continues to play an important part in planning for family protection. This chapter discusses the requirements for home shelter, the kinds of shelters that can be provided and minimum shelter supplies and equipment. It also presents some of the emergency measures for family protection.

GENERAL CONSIDERATIONS

Who Should Build Home Shelters?

Community shelters are being provided in dense population areas, in commercial, industrial, school, and other public buildings. They also serve as centers for training, preattack preparations, communications, and postattack control. They may not, however, serve an individual's need because of his residential location, job location, or other factors. For example, families living in rural or sparsely settled areas may find that the nearest community shelter is too far from their home. Others may have obligations that will prevent departure from the home areas.

Home shelters are often more immediately accessible to housewives and nighttime population than community shelters, and they offer certain advantages to individuals. Those who have backyards and Basements may prefer a home shelter, even though a community shelter may be located nearby. The choice is essentially one for individual families to make for themselves, after weighing the advantages and disadvantages of home shelters as they apply to their own situation.

What Kind of Shelters Can Be Built?

A permanent shelter is always more satisfactory than a temporary or improvised shelter. People with prepared home shelters require briefer warning of an impending attack than do those who must improvise, and their chances of survival are generally greater than for those without shelters or who have to improvise. As in the case of community shelters, home shelters may be designed to offer blast or fallout protection. A permanent shelter can also be designed to serve a normal daily use purpose adding to the livability of the homes. Improvised shelters, however, can be constructed that will provide necessary protection. These, along with emergency measures for family protection, are discussed below.

Lights and Power

Plans for a family fallout shelter should include provisions for continuous low-level lighting, since, in total darkness, many people might find shelter life unbearable. Also, brighter light will be needed occasionally for reading or for emergencies. Candles, kerosene, or gasoline-burning lamps should not be used in a home shelter. Such nonelectrical sources of light use oxygen from the air, give off carbon monoxide as they burn, and constitute a fire hazard.

After a nuclear attack, many community electric power stations may continue to function. Light. and power outlets from the house electrical circuits should be installed in every home shelter. If electric power from the house circuits can be used, light can be furnished in the shelter without storage batteries. Nevertheless, batteries should be kept in the shelter to provide light when central electrical power fails. Fresh batteries should be kept in the shelter area at all times.

The effectiveness of shelter-light sources can be increased by painting the shelter ceiling white. In addition, metal or metallic foil reflectors should be installed behind each light bulb for greater lighting efficiency.

Ventilation

The air in most basement shelters is circulated by convection currents through an open shelter entrance and low vents in the inside walls or through cracks and crevices in entrances piled with sandbags. No ventilation system power is required for such natural circulation. Fallout dust is unlikely to penetrate these shelter areas in any considerable amount because most of it is kept from the area by the structure above the shelter.

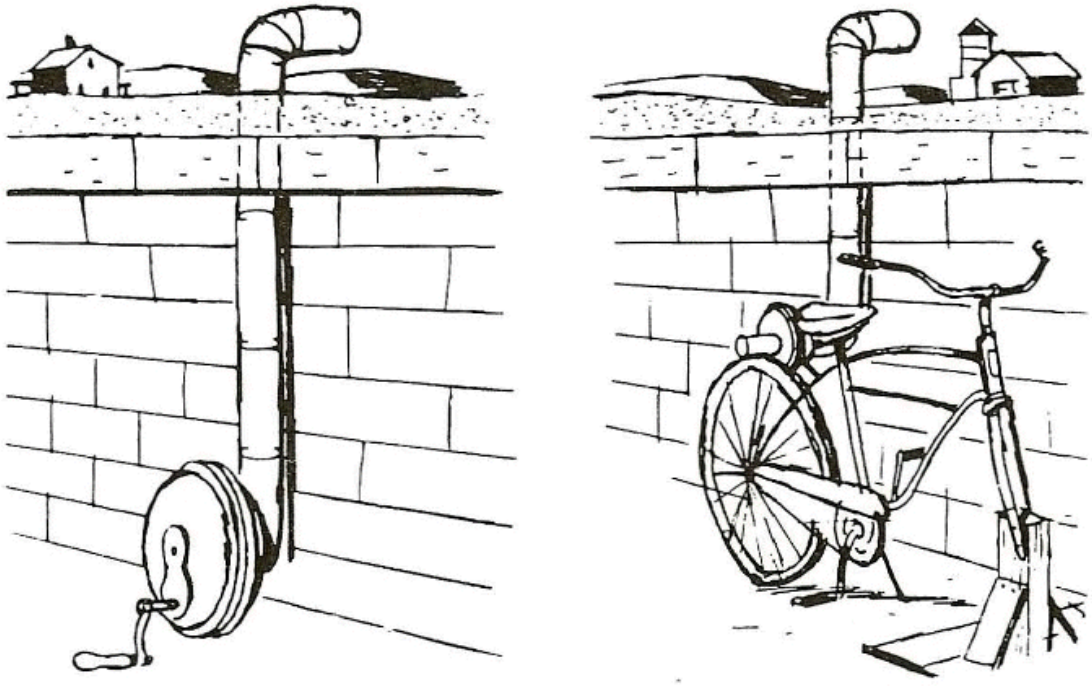


FIGURE 44.—Two types of air pumps—hand and pedal operated.

A blower or forced-air system requiring an air-circulating pump is needed in home underground shelters and would be desirable in a basement shelter for increased comfort.

In home underground shelters a 3-inch intake pipe is installed to lead in fresh air by means of a hand-operated blower that is cranked periodically; an exhaust pipe is set up to vent stale air. The air-intake pipe should extend about 2 feet above the ground and have a mushroom type cap and a screen of proper design. This gives the protection required to keep out fallout particles.

Heating

In most areas of the United States, a space-heating unit for the shelter is not needed. The body heat of the inhabitants will usually keep the shelter warm. Fuel-burning space heaters release dangerous carbon monoxide; therefore, such heaters should not be used. Electric space heaters require no special vents but are useless if outside electric power is not available.

FAMILY SHELTER CONSTRUCTION

Effects of blast, heat, and nuclear radiation were carefully studied before Office of Civil Defense recommendations were drawn up for home shelters. Basic shelter construction materials can be purchased from local building supply dealers and contractors throughout the Nation. For full information on home shelter construction, the booklet, "Family Shelter Designs" (H-7), can be obtained from local Civil Defense officials. New designs are made available from time to time as research and testing progress.

Due to the danger of fires which might be caused directly by the heat (thermal) effects of nuclear bursts, or indirectly, by the blast effects, which could cause short circuits or cause stoves or furnaces to start fires, consideration may be given to building shelters in the backyard. Whether fires would actually be started, especially by the heat effects, would depend on many factors, including the amount of mist or haze in the air at the time of burst, and the presence or absence of combustible materials in or around houses. Therefore, houses within 10 miles of a nuclear explosion might well escape burning, but it would clearly be safer to have a backyard shelter than one in a basement, in the vicinity of a possible target.

Backyard shelters should be placed as far from buildings as possible. If they are connected to basements, a fire-resistant door should be provided. Also, air-intake pipes should be placed as far from the house as possible, to avoid drawing in heated air or carbon monoxide. Basement shelters are far better than none, however, in or around possible target cities. The cities might not be attacked, and even if they were, shelter occupants might escape the hazard of fire. But it is a physical fact that backyard shelters provide better protection than those in basements. (Office of Civil Defense publications, some of them noted below, have diagrammed various types of backyard shelters in addition to those in basements.)

Do-It-Yourself?

It is less expensive to make family projects of the construction of a permanent home fallout shelter than it is to employ a contractor for the task. Many people who have basic skills in working with common construction tools and building materials have made substantial savings by building much or all of their own shelters. These do-it-yourself builders have depended upon advice obtained from

local Civil Defense officials, building supply dealers, contractors, and building trades craftsmen. Everyone should bear in mind, however, that the construction of an adequate shelter is no task for the rank amateur. Most families must depend upon the skill and knowledge of a competent building contractor for the task of constructing a suitable shelter. A number of reliable contractors throughout the country have had first-hand experience in building fallout shelters. Samples of their work can be found in almost every community.

Beware of Unscrupulous Shelter Firms

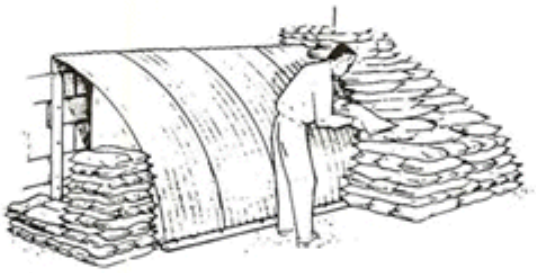
A number of firms have entered the home-shelter field. As in any

new commercial activity, there are abuses. Advertising claims may be misleading; designs and products may be inadequate or prices may be exorbitant for a shelter which is otherwise acceptable. State and Federal Governments will do what they can to minimize these abuses, but the most effective discouragement to those taking advantage of the interest in home shelters is the individual's caution and shrewdness. Every shelter planner will have the cooperation of the Better Business Bureau, the local Civil Defense Director, and the local State and Federal Government officials concerned with such matters. Trade associations that are interested in the shelter construction business have offered their cooperation in making home-shelter plans available to the public and in working with others to maintain a high level of business practice and ethics.

Many home shelters that meet Office of Civil Defense minimum technical requirements have been reviewed under provision of TM *62-20, Information on the Submission for Standardized Shelter Designs for Review by the Office of Civil Defense,* and assigned an OCD Serial Number. When purchasing a standardized shelter, look for this serial number.

INEXPENSIVE SHELTERS

All of the Shelters Shown Below Can Be Built With About $150.00 Worth of Materials or Less.



A Four-person Basement Shelter Made of Curved Asbestos-Cement Sheets Covered With Sandbags.

A Backyard Corrugated Steel Pipe Shelter.

A Sand-Filled Lean-To Basement Shelter Accommodating Three Persons.

This Backyard Plywood Shelter Can be Partially Above Ground, Mounded Over With Earth or Entirely Below Ground.

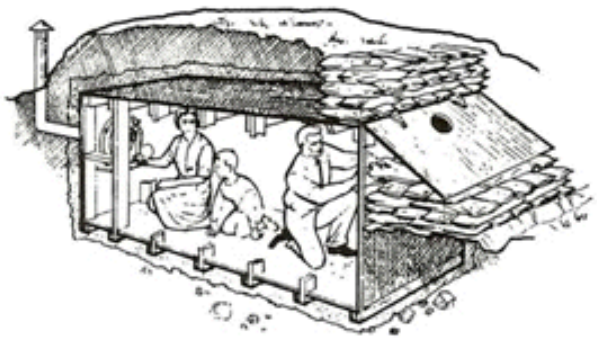


FIGURE 45.—Inexpensive shelters.

A number of quite inexpensive home shelters are described in the Office of Civil Defense booklet, *Family Shelter Designs* (H-7). The shelters are illustrated in figure 45, and other figures, and the booklet includes instructions for preparing them. These shelters are constructed of plywood, lumber, corrugated metal pipe, asbestos, cement and other materials. In several designs, the entrance is left open until the persons who are to use the shelter are ready to occupy it. The entrance is then closed with sandbags or concrete blocks.

SPECIFIC FAMILY FALLOUT SHELTER DESIGNS

Among the permanent home fallout shelters offering perhaps the most economical space of "living" room is a low-ceiling shelter, shielded by earth or solid concrete blocks. One version of this shelter is constructed of blocks in an existing basement. Another is in an excavation protruding outward from an existing basement wall. The latter type is formed by using blocks for walls in the excavation. Such a basement extension shelter should have a floor level roughly corresponding to the existing basement floor level or steps will be required. The floor should be made of poured concrete. The ceiling of the shelter should be covered by at least two feet of earth.

Unless the entrance is to be closed with sandbags or cement blocks at the time of occupancy, there should be a baffle wall opposite the entrance. Since nuclear radiation travels in straight lines, the right angle turn of the baffle wall cuts off most of the radiation that would otherwise come through the shelter entrance.

Basement Concrete Block Shelters

Basement shelters are, generally, the least expensive type that will give substantial protection as well as room in which to move about freely. If there is sufficient basement height, the ceiling will be high enough to provide standing room. Such a shelter can be built with solid concrete blocks as a do-it-yourself project. Basement shelters can also be incorporated in plans for your new home construction. Other types of effective shelters can be built in new homes with relatively minor changes in home design.

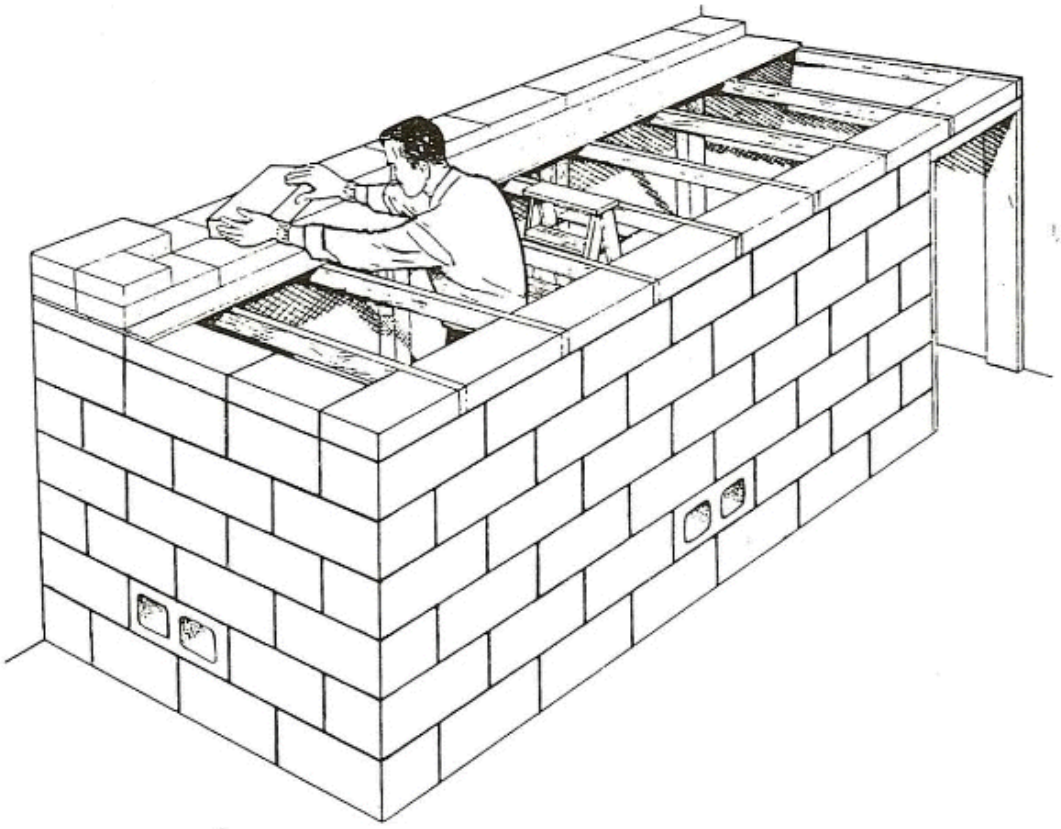


FIGURE 46.—Basement bunk shelter.

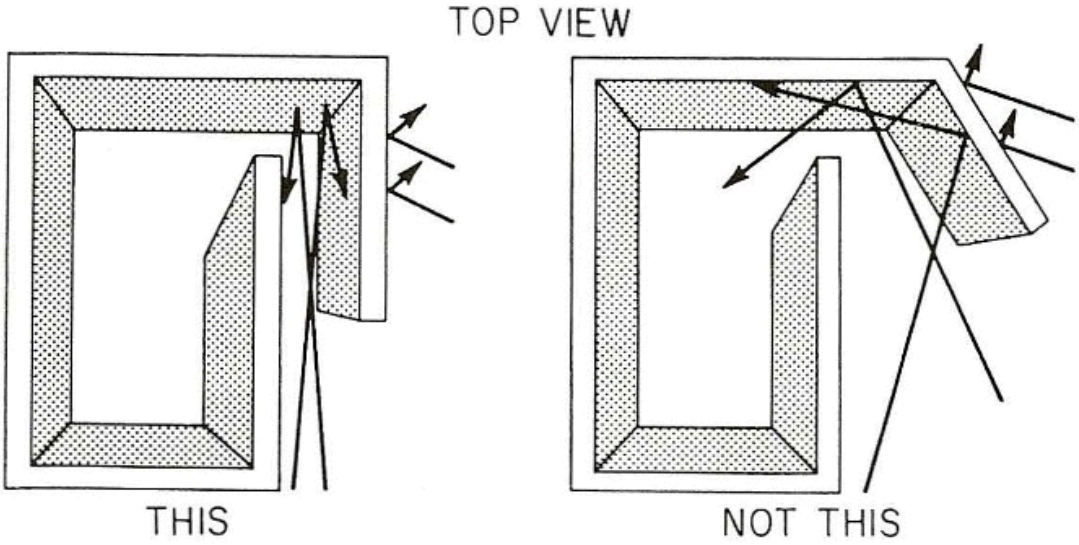


FIGURE 47.—Entrance with right angle turn.

Above-ground Double Wall Shelter

An above-ground shelter may be built in regions where rock or water is close to the surface, thus making it impractical to build an underground shelter. In this type of shelter, dual walls of concrete blocks are constructed and filled with gravel, sand, or earth to increase the shielding.

Precast Shelters

Preshaped corrugated metal sections or precast concrete can be used either above or below ground. They form effective fallout shelters when mounded over with earth.

Underground Concrete Shelters

An underground reinforced concrete shelter can be built by a contractor to provide excellent protection from radioactive fallout.

Clay Masonry Shelters

An underground shelter, similar in design to a concrete shelter, can be made of brick or clay masonry, to provide excellent fallout protection. At least 2 feet of earth should be mounded over the shelter. An outdoor above-ground shelter can also be built of clay masonry materials.

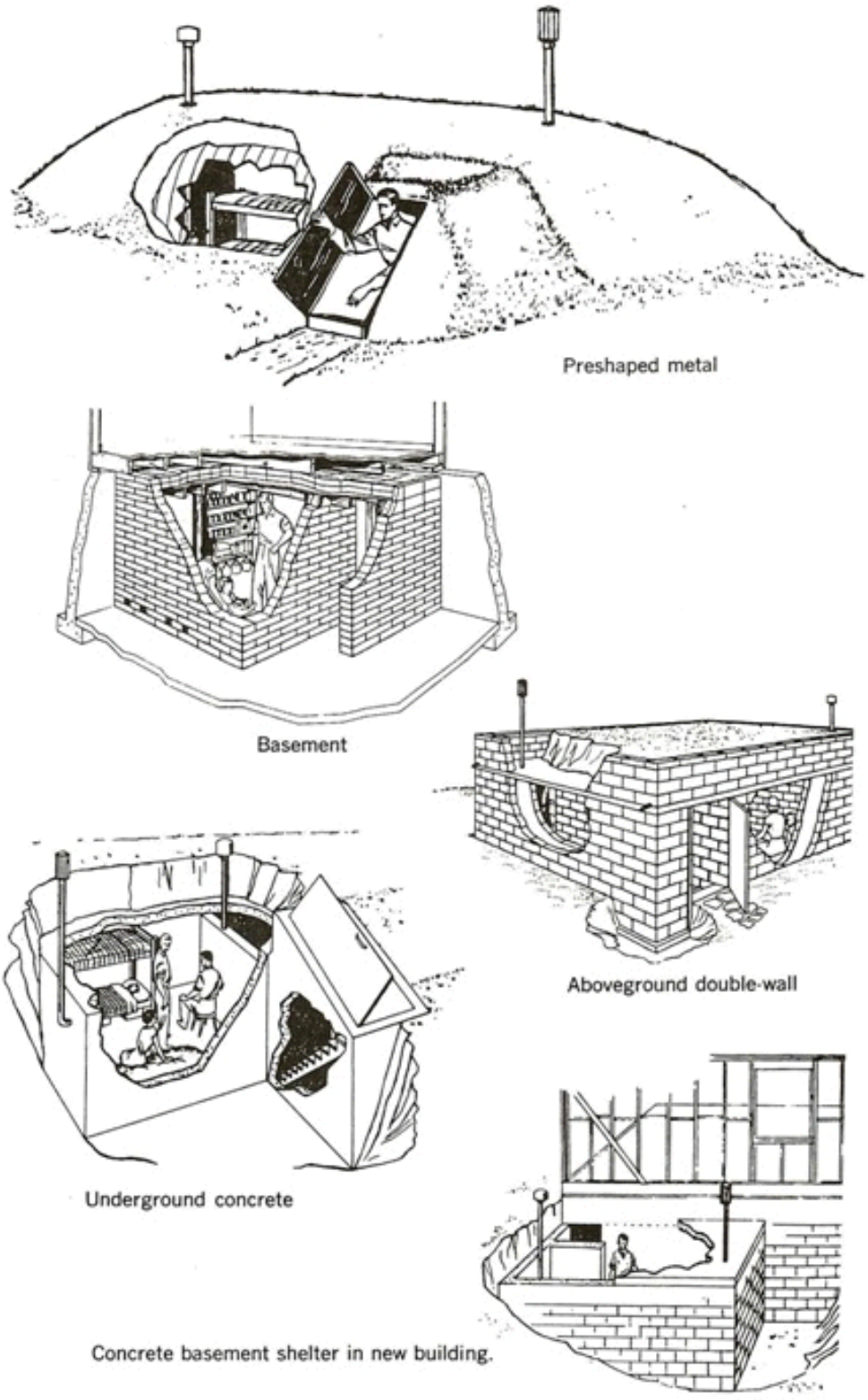


FIGURE 48.—Other types of shelter.

Family Fallout Shelter of Lumber

These shelters provide protection from radiation by the mass of earth which covers them. A protective barrier of at least 3 feet of compacted earth over exposed surfaces is necessary to secure a protection factor of 100. The structural framework is made of wood. The lumber should be treated with a wood preservative to provide protection against termites and decay. Use of toxic preservatives must be avoided.

Financing

Federal Housing Authority (FHA) home improvement loans may be obtained to finance the construction of permanent home shelters in most areas. These loans can be extended to any homeowner whose credit and shelter plan are acceptable. Many local banks and building and loan associations also offer their own property-improvement loans to qualified borrowers. Many of these loan plans can be used to obtain funds for shelter construction.

Some homeowners have made arrangements to buy their homes under the terms of special home mortgages known as "open-end mortgages." Shelter construction can often be financed by an addition to an open-end mortgage. If a shelter is built when a new home is constructed, the cost of the shelter is usually added to the other construction costs.

It is desirable to have plans and construction of home shelters reviewed by local civil defense officials. If you are building a home shelter it should have a protection factor 100 and should meet all Local requirements for health and safety.

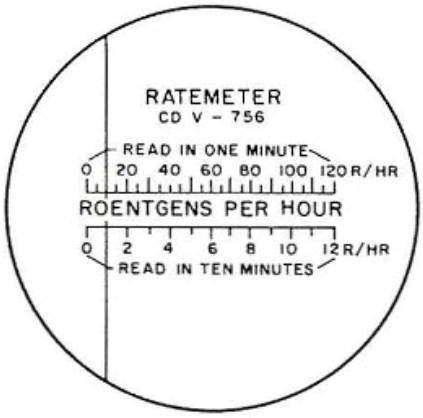
BASIC SUPPLIES AND EQUIPMENT

During the design and construction of a shelter, provisions should be made for installing storage shelves, compartments for special equipment such as garbage pails, and storage cabinets for bedding and clothing. Consideration must also be given the space needed for such necessary equipment as ventilation pumps, water storage containers, fire-protection equipment and radios.

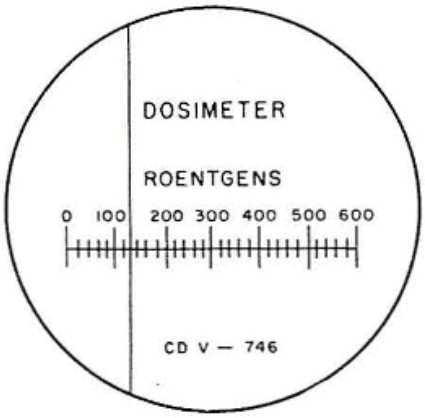
Radiation Meters and Radio

Because gamma rays cannot be detected by any of the five senses, each home shelter should have simple instruments to detect and measure them. Instruments developed specifically for home use can be ordered through department stores and other retail outlets. Possession of these instruments does not automatically

provide simple solutions to problems of radiation exposure, since the relations between close rate, total dose, time, and radioactive decay must be learned. Instructions are normally included with the instrument on how to interpret the instrument readings. Familiarity with the instruments and their use obviously would be of the greatest value in planning intelligent courses of action to be taken in a fallout situation.



— UPPER SCALE RATEMETER READING SHOWING SLIGHTLY LESS THAN 10 R/HR. (METER EXPOSED ONE MINUTE TO RADIATION)



— A DOSIMETER READING OF 125 ROENTGENS.

FIGURE 49.—Meter scales.

A portable radio is an important piece of shelter equipment. The information received by radio in an emergency may spell the difference between life and death. A transistorized portable radio is preferred because its low power drain on the radio batteries results in longer battery life. Vacuum-tube portable radios exhaust the power from radio batteries much more quickly than do the transistorized types.

The strength of radio signals is sometimes reduced by the shielding necessary to keep out radiation. As soon as the shelter is complete, a radio reception check must be made. It probably will be necessary to install an outside antenna to receive emergency broadcasts. It would be helpful to keep an extra indoor antenna in the shelter in case an antenna must be improvised.

Water

As stated in Chapter V, a dependable water supply is essential to a community. It is equally vital to a family shelter. A supply of about a gallon a day per occupant should be sufficient for drinking and washing needs. Some water is also needed for general sanitary purposes.

The water supply can be provided from several sources, including some from outside the shelter itself; but the basic supply of water should be inside the shelter.

Although large bottles do not take up as much floor or shelf space as smaller ones, they are usually difficult to lift, and the risk of spilling precious water or breaking the bottle is high. If the shelter water supply is to be kept in bottles, wrapping them in shock absorbent material will protect them from breakage.

Covered 1-gallon plastic containers are recommended as containers for the home shelter water supply. Plastic containers may affect the taste of the water in time, but the change is harmless, and such containers have a great advantage in that they seldom break when they are dropped. As each container is emptied it can be used to store wastewater and fluids.

Additional water for shelter use could be obtained from the household water tanks. The domestic hot water tank may be near the shelter. If a gravity storage tank or hot water tank is not far from the shelter entry, a pipe and faucet can be installed from the tank to the shelter so that occupants can use water from the tank. Water that has been carefully stored for long periods of time will be as safe to drink as fresh water but may not taste "fresh." Some may want to test their stored water for smell and taste every 3 months, but it is not necessary for health. Odorous as it might become, it will still be usable in an emergency.

Food Supply

The family fallout shelter should be well stocked with food. If families are able to maintain something like normal dietary practices while living in a shelter, the problem of maintaining good health and good spirits will be significantly reduced.

The food stock should supply each adult with a minimum of 10,000 calories during the period of shelter confinement. Infants, invalids, and other persons on special diets will require special foods.

Wherever a person may live—in the country, a city apartment, or a suburban house—a 2-week supply of food is recommended. Licensed community shelters in existing buildings are being stocked by the Federal Government with emergency rations. But for the present, and especially for apartment residents who may have to take quick refuge in the central core or basement of their buildings, it would be a good plan to keep handy a box or basket with rations and water. Readily available canned or packaged foods which do not require refrigeration can be used conveniently in the family shelter.

Family food preference is an important consideration in choosing Foods to be stocked in the home shelter. In an emergency, excitement, fear and worry can cause a loss of appetite just when nourishment is most needed. Having mealtime favorites available can help to overcome the loss of appetite, and, generally speaking, familiar foods contribute to shelter morale.

Foods should, of course, be fresh-tasting when they are used. Properly canned or packaged foods retain a fresh taste for months, sometimes years, but it is recommended that shelter food supplies be used frequently for regular family meals and replaced, so that shelter stocks are always relatively fresh. It is advisable to use up most foods every few months.

Food should be stored in the shelter according to its estimated shelf life. The cans with the shortest shelf life should be put on the shelf easiest to reach. In general, juices have the shortest shelf life, while products canned in oil have the longest.

Some foods that are exceptionally easy to store and have high food value may be stored to supplement the more normal favorites. Powdered milk, although not usually a preferred beverage, should be stocked, along with small cans of evaporated milk.

Small cans and packages of food are generally to be preferred over larger sizes, so that when they are opened all the contents will be eaten at a single meal and there will be no leftovers. The water supply should be supplemented with bottled and canned beverages, including fruit and vegetable juices.

Although means of heating food should be available in the shelter, precooked foods and those that require little or no heating before eating should be chosen in preference to other foods. Cooking or, warming of food must, under shelter living circumstances, be restricted. *Can and bottle openers should not be forgotten!* A knife, a screwdriver, or any sharp object might serve as a makeshift can or bottle opener, but they are certainly not easy to use. A can opener taped to two or three different cans in the shelter food supply will help assure that can openers will be available when they are needed. It may be necessary to leave the shelter quickly. After the attack, a family may suddenly have to move to another location. Therefore, if the supplies of food and water have been kept in boxes, trays, or other containers, they can be carried to a waiting car or truck without delay.

Recommendations for the shelter food supply are listed below. The per-person amounts listed are based upon menus that provide 2,000 calories per day. It is important to remember that some items, such as fruit juices, are corrosive. Foods preserved in glass containers will have a long shelf life. Crown-capped bottles of fruit juices, and fruits and vegetables in glass jars, preferably with glass lids, are long shelf-life items that are easily obtainable. All containers should be stored in an upright position. Precautions against breakage should be taken.

Food	Amount required daily	Quantity required for two weeks	Two-week supply of standard-size containers	Maximum shelf life (months)
Staples:				
Crackers, cookies, pretzels	27	56 oz	2 cans or jars.	36.
Candy:				
(chocolate bars, hard candies).	1 oz	16 oz	1-lb. jar or box.	18.
Sugar	2 tsp	4 oz	¼ lb. (lb. per 4 persons).	36.
Salt	2 tsp	4 oz	¼ lb. (lb. per 4 persons).	Indefinite.
Beverages:				
Instant Coffee or tea	2 cups	2 oz	2 jars	Indefinite.
or				
Chocolate	2 cups	4 oz	2 (1-lb.) pkgs.	Indefinite.
or				
Soft drinks	1½ bottles		24 bottles	Indefinite.
Milk:				
Nonfat, dry	⅓ cup	20 oz	2 pkgs	
evaporated	1 oz (2 tbsp.)	14 oz	4 cans	48.
Juices:				
Orange, tomato, grapefruit, pineapple.	½ cup	64 oz	6 bottles	36.
Fruits:				
Peaches, pears, prunes, apricots.	1 cup	112 oz	4 jars 2 (1-lb.) pkgs.	36–40.
Vegetables:				
Peas, corn, lima beans	½ cup	112 oz	8 cans	60.
Soups:				
Vegetable, pea, noodle, beef, clam chowder, mushroom, other than tomato.	1 cup	112 oz	8 cans	36.
Meats and substitutes:				
Canned beef stew, salmon, tuna, spaghetti and meatballs, baked beans and frankfurters (without tomato sauce), chicken and noodles.	1 cup	208 oz	8 (1-lb. and ½-lb.) cans.	36–48.
Other foods:				
Cheese, peanut butter		7 oz	4 jars	
Jam, jelly, marmalade		7 oz	2 jars	24–30.
Cereals			14 pkgs. (individual serving size).	

In addition to a food stock and can openers, equipment for cooking and serving will he needed. Some cooking pans, disposable tableware— including paper plates, cups and napkins—a measuring cup, and a small electric food heating unit should be stored in the shelter. An electric cooker will work as long as power is available. Open flame in a shelter depletes oxygen supply and its use constitutes a fire hazard. A small camp stove can be provided for outside use after the shelter period has ended. Fuel should not be stored in the shelter.

A sturdy table and chairs will be useful shelter furniture. They should be the type that can be folded and put away after meals to allow maximum floor space for other activities. A second, smaller table for food preparation will prove useful. Of course, this furniture could be used for other activities as well as dining.

Reduction of Combustible Material

Reducing the amount of combustible material in the shelter construction and contents will increase the safety of the occupants. Practical measures include the use of noncombustible furnishings, noncombustible containers for storage of food and supplies, use of wool blankets in preference to cotton or certain synthetic fabrics, use of canvas cots in place of mattresses, and storage of combustible waste in metal containers with tight lids until disposal outside shelter is feasible.

In addition to the fire protection inside the shelters, emergency actions for the protection of the residence could include whitening the windows to prevent thermal radiation from setting fires inside the house, using asbestos tape in place of cotton tape on venetian blinds, and lowering these blinds on warning.

The occupants of family shelters must he prepared to extinguish small fires quickly and, if feasible, to ventilate the shelter. It may be necessary to endure some smoke and heat to avoid high radiological exposure which leaving the shelter might cause. Plans should be made for the possible use of other shelter or refuge space in the event that fires or noxious and lethal fumes make it necessary to leave.

First Aid and Medical Supplies

A first aid kit, fully stocked with medical supplies, belongs in the shelter, as well as a good first aid instruction booklet. First aid supplies should be checked and renewed every few months. The family physician may be consulted about the materials for the shelter first aid kit. If some members of the family are allergic to certain medicines, their allergies should be considered when stocking the first aid kit. Since most drugs are potentially dangerous, they should be stored out of the reach of children.

In general the home shelter first aid kit might include adhesive bandages, roll bandages, elastic bandage for splinting sprained joints, adhesive tape, tweezers,

clinical thermometers, an enema bag, hot water bottles, a quantity of aspirin, a mild laxative, emetic, white petroleum jelly, baking soda (sodium bicarbonate), zinc oxide ointment U.S.P. for skin inflammations, and one-fourth percent phenylephedrine hypochloride solution U.S.P. for nasal spray.

Clothing and Bedding

Although overcoats and blankets do not provide enough mass to shield against the radioactivity of fallout, they can give some protection against fallout contamination.

During winter months, enough blankets and heavy outer clothing should be kept in the shelter to keep each occupant warm without artificial heat.

1f there is dampness in the shelter area, the clothing and bedding stored there must be protected from mildew.

Sanitary Supplies

The shelter should contain sanitary supplies such as toilet tissue, paper napkins, paper towels, plastic and paper bags, clean rags, newspapers, sanitary napkins, waterproof gloves, disinfectants, insecticides, and one or two scrubbing brushes.

Soap and detergents are very useful shelter supplies. Soap not only washes away dirt, hut it is also helpful in washing radioactive fallout off the skin should any particles have been brought into the shelter by its occupants. (A radiation meter can show such contamination.) A small basin and a sponge or two will prove their worth, and so-called dry washcloths (paper impregnated with soap) are very useful shelter items.

Hairbrushes and clothes brushes can be extremely helpful in removing fallout and are generally useful in keeping up standards of cleanliness. Shaving supplies, combs, cosmetics, and other grooming aids are certainly not essential shelter supplies, but may contribute towards maintaining morale.

Cleanliness, however, is vital in the limited space of a shelter. Personal cleanliness is not merely a matter of comfort; it could be a matter of life or death. The familiar, old-fashioned diseases can still kill as surely as blast or radiation, and intimate living makes contagion easy. Probably the biggest single problem is that of the disposal of human waste, which can spread such diseases as typhoid, dysentery, and diarrhea.

The most elemental device is a metal pail with a tight cover. A better expedient, especially where elderly persons are involved, is a Commode made by cutting the seat out of a chair and placing the pail under it. In either case, a supply of plastic bags, obtainable at department stores, is needed. Each bag, placed in the pail with

its top overlapping the pail rim, serves as a pail liner and is easily disposable. A small amount of disinfectant (creosol or household bleach) can help control odors and insect breeding.

A large can with a cover, such as a garbage can, should be available to store the plastic bags after use. After 2 days the container can be placed outside the shelter. At a later time, one of the shelter occupants should bury the waste under 1 or 2 feet of earth. Garbage should be handled and disposed of in the same way.

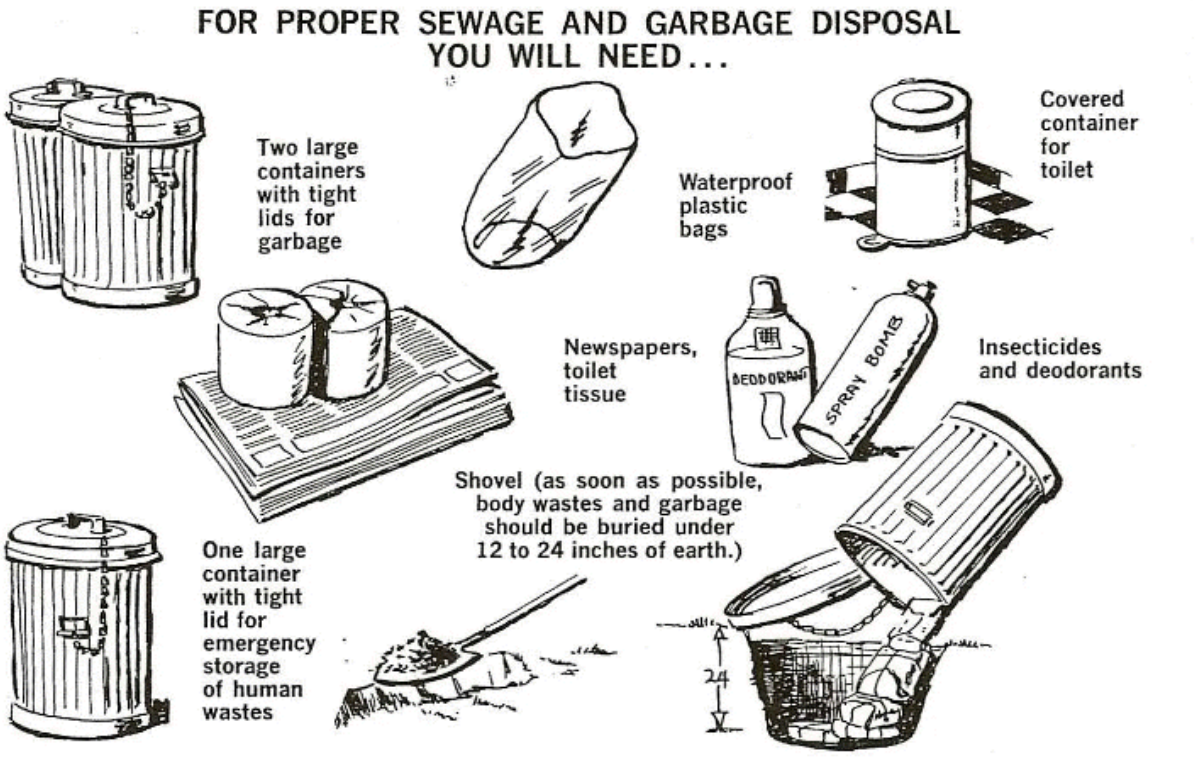


FIGURE 50.—Garbage and disposal.

Garbage and Rubbish Disposal Equipment

A home shelter should contain two or more garbage cans, with lids wired or tied to the cans. A tight-fitting lid is important to keep out flies and other insects and to prevent undesirable odors from escaping from the can.

If liquids are drained off, garbage may be stored for a long period without developing an unpleasant odor. After liquids are drained off, the garbage should be put into a plastic bag or wrapped in several thicknesses of newspaper before placing it in a container. The wrapping will absorb the remaining moisture.

Special Supplies

As in the case of community shelters, if there are diabetics, chronic invalids, aged or infirm persons in the family, any special medicines or equipment-they will need should be placed in the shelter. The person who is stocking the shelter should keep in mind all special diet problems. Canned or powdered milk, baby bottles, disposable diapers and other special supplies should be included for infants. See Chapter IV.

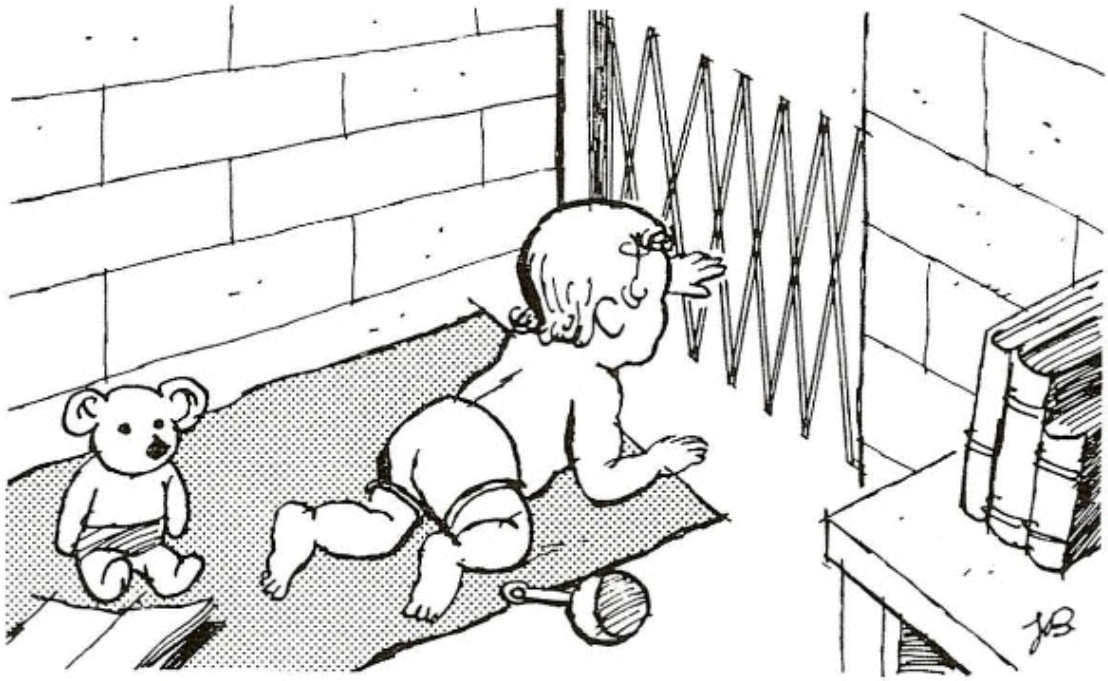


FIGURE 51.—Children should be protected.

Rescue Tools

Before, during, or after a stay in a shelter, persons trapped in wreckage may have to be freed. Tools that can be used for rescue work therefore belong in the shelter. Priority should be given to a shovel, a coil of rope at least 25 feet long, and a crowbar. A broom, a bucket, a large pocket knife, an axe, a wrench, a screwdriver, a hammer, and a pair of pliers should also be stored in the shelter.

Miscellaneous Supplies

A reliable clock and a calendar will enable shelter occupants to record the passage of hours and days. Matches may be needed. They should be kept in a waterproof container. A supply of old newspapers in the shelter can be used for wrapping wastes, for lining waste bags and refuse containers, and for cleaning purposes.

Summary on Supplies

Not every item on the chart on page 91 is vital to survival. (The most essential ones are framed with gray tone.) Even though it might be possible to leave the shelter briefly a day or two after an attack, everyone should prepare to be completely self-sustaining for at least 2 weeks.

The one essential item is water.

Some items such as tools should be kept handy but need not be inside the shelter itself.

SHELTER MAINTENANCE

The family fallout shelter will be ready for use in an emergency if it receives regular housekeeping attention. The shelter should always be clean and uncluttered. The shelter should not be used as a storage catchall. All equipment and supplies in the shelter should be placed out of reach of small children. Supplies and equipment should be checked periodically.

Inspection and Use Drills

Once a shelter is completed, there should be regular inspections. It is strongly recommended that each shelter area be inspected by local fire personnel. Thereafter each family member of adequate age and ability should have responsibilities for certain aspects of shelter inspection. One of these responsibilities might be an inspection to be sure that essential items are in clean, usable condition and in their proper places. Practice drills and shelter inspections should be conducted regularly about once a month.

Security

When the shelter entrance is outside the house, as in the case of some underground or aboveground shelters, security of the contents must be provided.

MULTIPLE USES OF HOME SHELTERS

A home shelter adds an extra room to the house, a room that can serve many purposes for everyday living. As long as this room can fulfill its emergency functions, the family need not avoid using it for other purposes as well. The shelter might serve as an extra sleeping room when guests arrive or as a hobby room, housing stamp, coin, china, bric-a-brac, glassware, or other collections. It can be a playroom for the children, a game room for teenagers, or a den for adults. The shelter can be made large enough to accommodate a bench for woodworking, sewing, or any of a number of handicrafts.

After the shelter has been equipped for emergencies, the family may want to place in it other appliances or equipment that would have little or no use in an emergency, but would enable them to get more everyday enjoyment out of the room. There is no reason for not installing a television set, a record player, or a telephone in the shelter, if they do not take up space that will be needed when the shelter is in use for emergency purposes. Books and family photograph albums, stored on the shelves of a shelter, will provide hours of relaxation during both ordinary and emergency situations.

FIGURE 52.—Shelter supplies.

It is a good idea to keep the family strongbox in the shelter. The box should contain copies of wills, deeds and other personal property, banking and other fiscal records, marriage and birth certificates, insurance papers, savings bonds, other securities, and similar important papers. In normal circumstances, the shelter is a safe, out-of-the-way location for these records; in a disaster or postdisaster period, the shelter is the best possible home location for important records.

LAST MINUTE EXPEDIENTS

The first warning of nuclear attack could be the flash of an explosion. If so, quick action during the next few seconds is essential. People who are inside should move under or behind the nearest desk, table, sofa or other piece of sturdy furniture, preferably in a shadow. This action will provide some degree of shielding from the thermal (heat) rays. The safest position to assume is lying down, curled up on one side with hands over the back of the neck, knees tucked against the chest. Windows should be avoided and the back should be turned to them since they admit thermal rays and also may shatter.

People caught outside should run into a building and assume the same curled-up position, preferably in and facing a corner. If it is not possible to get into a building, the lowest, most protected spot, such as a ditch, gutter or depression in a lawn should be sought. Again, the curled-up position is the safest. The face should be turned away from loose or breakable objects.

People driving an automobile should stop the car immediately and get into a ditch or depression until 5 minutes after the explosion. Those people who are far enough away from the explosion may feel no effect at all. But they should stay put for 5 minutes to be sure. The time available to find protection from fallout depends upon a number of variables. The key considerations are to take shelter in a building or other structure as soon as possible and to keep radiation exposure to a minimum.

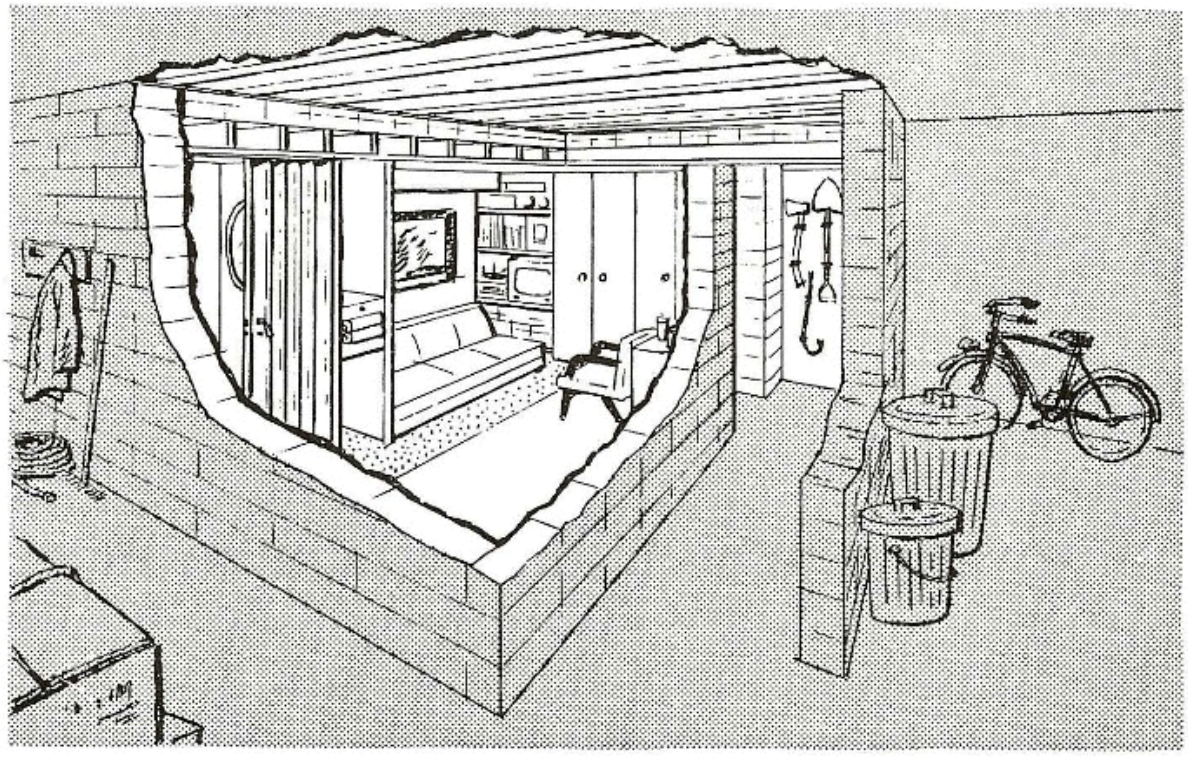


FIGURE 53.—A multipurpose family fallout shelter.

Expedient Defense Against Fallout

For the person who receives warning of an attack but has no plan of action—no shelter to go to, for example—the first actions should be to guard against the hazards of fires set by the thermal rays of a nuclear explosion. It is important to get rid of quick-burning things such as oily rags, curtains, and lampshades. Old newspapers and magazines can be stacked in the basement if plans have been made to improvise a fallout shelter there. Main electric and gas lines should be shut off until the fire danger has passed. If there are venetian blinds at the windows, they should be lowered and shut to bar flying glass and to screen out some of the fierce heat. Buckets, sinks, a bathtub and other containers should be filled with water.

Six general guidelines should be kept in mind for improvising last-minute fallout protection:

1. A basement is usually better than aboveground floors, particularly in private residences. (In large commercial or civic buildings, however, the central areas of middle floors could offer good protection.) An

unimproved home basement may provide a protection factor of from 2 to 10, averaging about 7.

2. A corner of a basement that is below ground level is better than the center of the basement.
3. On aboveground floors, an improvised shelter should be situated away from outside walls.
4. An improvised shelter should be small. The shielding mass should be concentrated immediately around and above the occupant to conserve construction time.
5. It is imperative that shelter occupants stay away from windows and outside doorways because these are weak points in the fallout shield. Also, windows could be shattered, even though they are located many miles beyond the severe blast damage area of a nuclear explosion.
6. If caught out in the open, a person should try to get to some substantial structure such as a large commercial or civic building, a tunnel, or cave. If none of these is readily available, he should look for a culvert, underpass or ditch—anything that will permit concealment below ground level—and improvise a shelter. The mass of an automobile, parked over a depression in the earth, will provide a significant shield. Better yet, a hole can be dug in the ground, the car driven over it, and the loose earth shoveled into the car to provide the overhead shielding.

A Building Provides Fallout Protection

After a nuclear attack, a tall apartment or office building 10 miles or more from the site of an explosion, outside the blast and thermal Effects area, could provide a safe refuge from fallout. The people depicted in figure 54 have taken shelter from radioactive fallout in an office building.

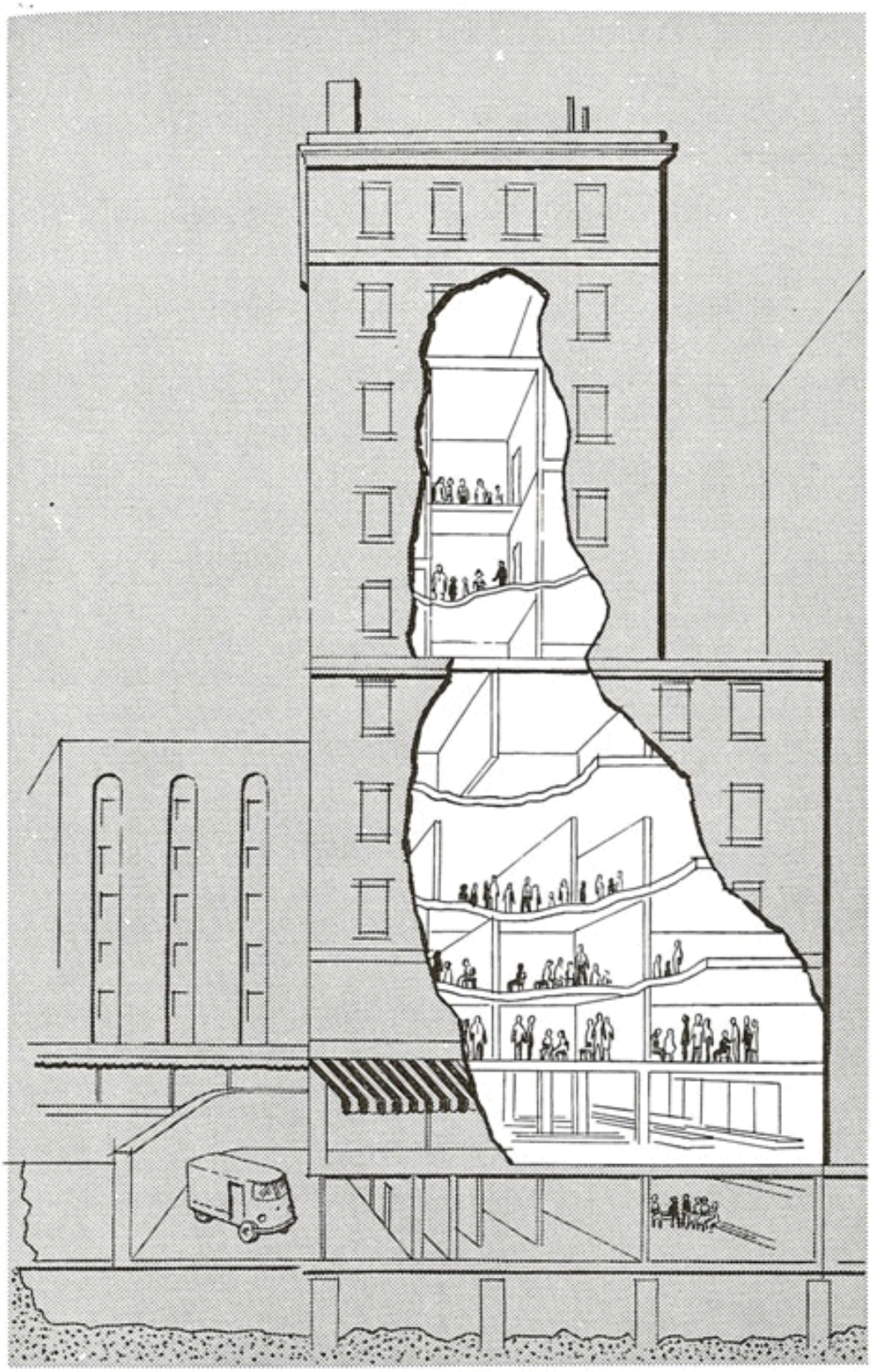


FIGURE 54.—City office building.

Because the gamma rays given off by fallout penetrate much like X-rays, people may take shelter in such a building by putting as much mass material as possible between themselves and the fallout. The fallout has settled on the roof of the building, the ground around the building and on horizontal surfaces of the building. Above ground, people should go to the middle of the building: below ground, they may find adequate shielding in a basement corner. Those in the main basement of the building shown in figure 54 are shielded from radiation by the surrounding earth, by partitions, and by the entire mass of the building above them. On the upper floors, people have shielded themselves by moving into the "core" of the building. They have avoided the floor with the setback and terrace because of the radiation from the fallout accumulated there. (For better protection on any floor, it is advisable to huddle below the window-sill level.) Because the tall building shields lower floors from some radiation, many people have taken shelter on the lower floors. No one has taken cover on the ground or top floors because the shielding there is inadequate.

Improvised Shelter

It is recommended that everyone survey his home and decide which room is most completely surrounded by thick walls and ceilings. After identifying this zone of best protection make plans to add temporary shielding materials around this area, especially overhead. For example, a table could be covered with as many concrete blocks, containers of earth, or other heavy objects as possible, to provide an emergency refuge. It takes time to build a *permanent* shelter area, but if the warning of an impending nuclear attack comes today or tomorrow, there may still be time to *improvise* a shelter. Also a period of international tension or crisis might serve as an unofficial advance warning, permitting people to develop protective expedients.

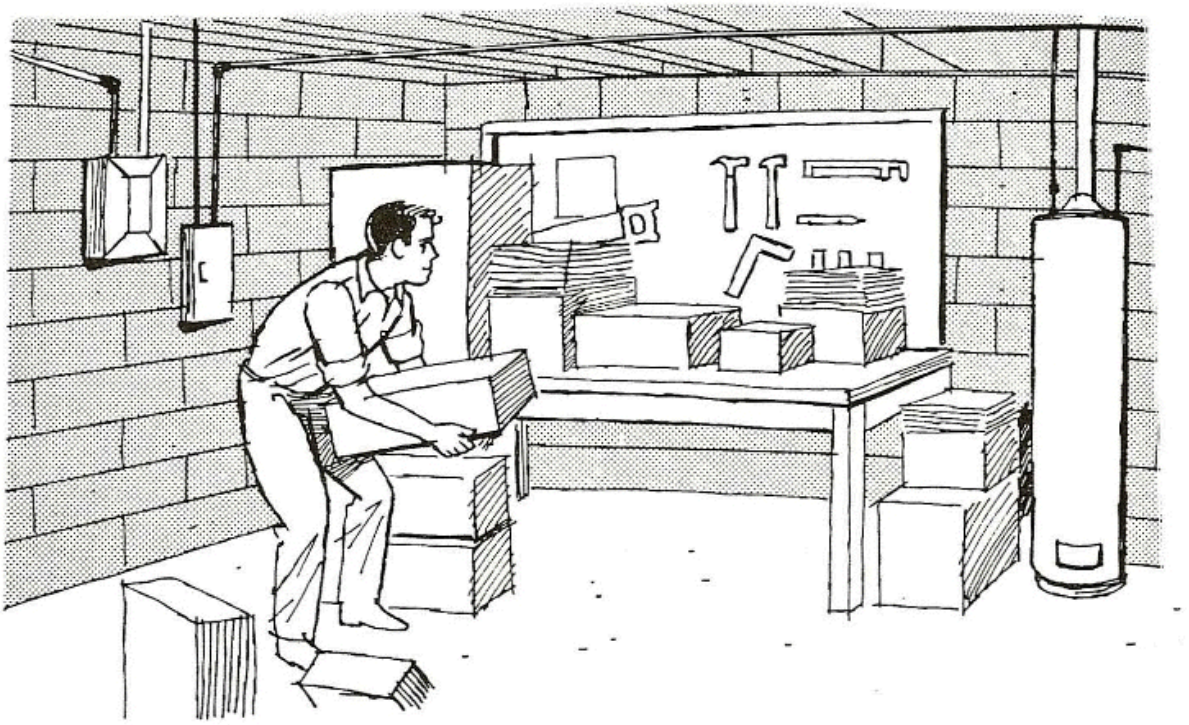


FIGURE 55.—Man improves basement fallout shelter.

Prudent citizens in such a period would improvise the best shelter possible, if they had not already constructed a fallout shelter. A great deal of protection could be added even in the hours which would elapse in many areas between bursts at military bases or cities and the arrival of fallout.

It should be remembered that the walls of an inner room in a building will provide more shielding than the outer walls alone. If no provisions for fallout protection have been made in the structure, the occupants should move quickly to the innermost part of the building. Inner basement areas provide better radiation shielding than inner, aboveground areas.

If there is no basement, a shelter can be improvised by digging a trench in the backyard and covering it with house doors, plus at least three feet of earth. In fact, within about 30 miles of a possible target, the possibility of fires could make such a backyard shelter *preferable* to a shelter improvised in a basement.

Remember, **Improvised shelters are far from ideal. They would be uncomfortable.** ***Time might*** **or** ***might not be available to prepare one.*** **But if a**

shelter had not previously been prepared, a public shelter is not near, ***an improvised shelter could save life.***

FIGURE 56.—Other ways of improvising shelters.

FIGURE 57.—Improvising backyard covered shelter.

CHAPTER VII

EMERGENCE FROM SHELTERS AND REHABILITATION

INITIAL, SHORT TRIPS from shelters should be planned to ensure that the results of the trip would be worth the radiation exposure received, even from the much reduced radiation levels 3 or 5 or more days after the attack. For example, it might be worthwhile to leave the shelter briefly to dispose of accumulated wastes or to check neighborhood conditions. Also, a stock of food or other needed supplies might be located near the shelter area and brought back. Once it has been decided it is necessary to leave the shelter, the people to make the first trips should be selected.

WHEN TO LEAVE THE SHELTER

Initial recovery begins when local shelter occupants are able to leave their shelters for short periods. There is no way to set a specific time when it will be safe for the entire population to leave shelter, since radiation levels will vary, depending upon the attack pattern and winds prevailing at the time of attack. Therefore, local government emergency operations centers will usually advise shelter managers about emerging from shelters.

The first trips outside will probably be supervised by radiological monitors. Since radiation levels may vary from area to area, these monitors will measure radiation outside the shelter to ensure that it is within safe limits. Personnel radiation dosages should be limited by rotating the people who make the trips. In this way, no one person will receive excessive exposure. (Again, so far as possible, avoid exposure to children and to adults not past child-bearing age.)

In general, people should not expose themselves to significant radiation levels unless 'Such action is essential for the welfare of shelter occupants or for the rehabilitation of the community. Limited exposure may be justifiable when necessary for securing essential supplies, decontaminating needed facilities, repairing and rebuilding damaged structures, or evacuating a shelter during a sudden emergency. In these cases, the shelter manager must make the decision, based on a reasonable balance between a probable danger from exposure and group requirements.

In an area where fallout is present, the radiological monitor should give radiation measurements to the shelter manager at specified intervals. The shelter manager should also be kept informed on the amounts of radiation exposure received by

each occupant so that no individual or group receives an excessive amount of radiation.

FIGURE 58.—Using survey instruments.

In most cases, the shelter manager must make the decision as to when occupants may leave temporarily or permanently. The general rule is that the longer the wait, the less the danger. In addition, it is desirable for the shelter staff to find ways to make shelter living progressively less uncomfortable or more varied. Good light and reading materials, better food, recreation, and other conveniences will probably assume increasing importance in the days or weeks following an attack. Such activities could actually protect health by minimizing demands from occupants that the shelter be vacated earlier than may be safe.

Comfort could be increased, in group shelters in existing buildings, by allowing occupants to go to other floors or areas not designated as shelters, but still affording substantial protection.

If occupants are to remain in the shelter, the shelter staff must ensure that all understand why. The reasons will differ according to the local situation, but they must be clearly and honestly presented to the occupants.

People in home shelters should remain inside until assured by radio, by contact with local authorities, or by other means that radiation has decayed to safe levels, or that clear areas have been established nearby and that it is safe to go there.

PRECAUTIONS WHEN DEPARTING FROM SHELTERS

Even when occupants are able to leave their shelters during the day, they may have to return to the shelters to sleep and eat. Their homes may have been destroyed or seriously damaged. Dangerous radioactive "hot spots" may make it advisable to spend several hours behind shielding each day. These conditions could last for a considerable time. The shelter may, therefore, have to serve as a welfare center or as temporary housing for some occupants for several additional weeks or months.

Therefore, before permanently closing a community shelter, the shelter manager will have to be sure that all occupants are able to return to their homes or that satisfactory arrangements have been made for their assignment and transport to lodgings elsewhere. Plans for closing the shelters would be coordinated with the overall postshelter emergency plans of the local government.

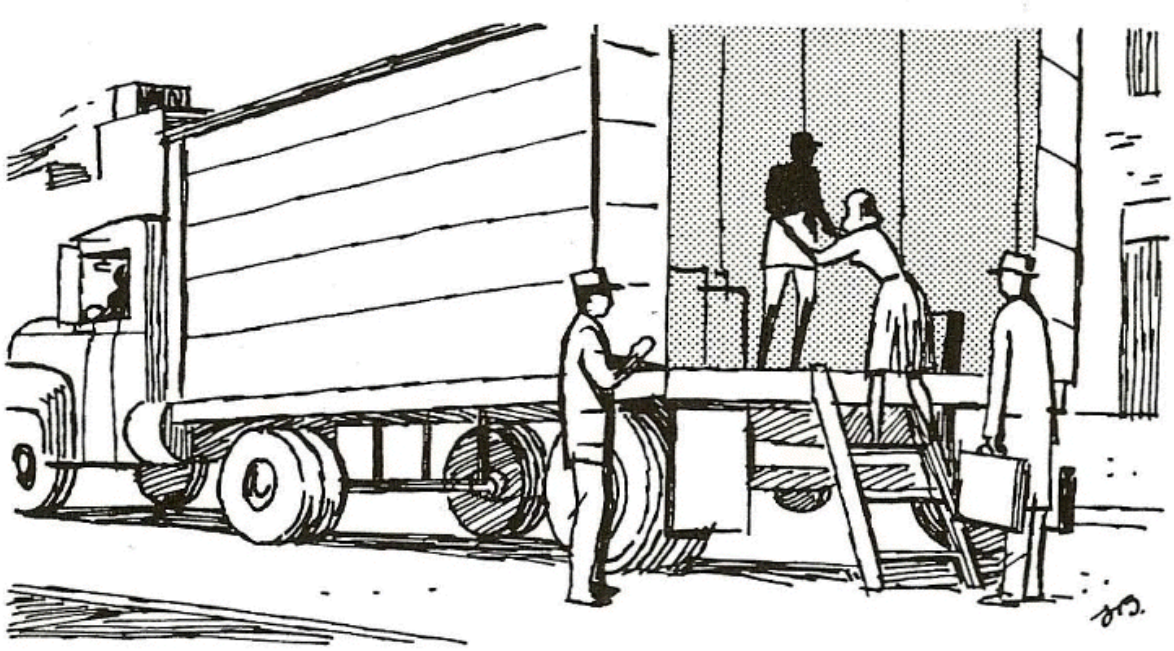


FIGURE 59.—Moving to a safe area.

When survivors first emerge from shelters, close to an attack area, they may find situations similar to those on the morning after a community has been struck by an earthquake or a hurricane. Most normal community services will have ceased. There may be the same danger of disease or the same need for food and water, information, and medical help that exists after a natural disaster. Injured survivors may be seeking medical attention for physical injuries; perhaps some will be emotionally disturbed. There may be a great deal of uncertainty and confusion.

After a nuclear attack there may be additional perils. Radioactive fallout could leave some areas or objects close downwind of nuclear bursts contaminated for long periods of time. It may, therefore, be necessary in some areas to evacuate the population for a period up to several months, and to provide lodging, food and other necessities for them in other areas.

During the time the community was confined to shelters by high levels of radioactivity, it is probable that only temporary arrangements were made for disposing of human wastes, garbage, and other refuse. Now there will be a chance to bury it or otherwise dispose of it permanently.

Waste disposal should be undertaken in conformity with local community ordinances. It is probable that arrangements will be made to bury, burn, or dump wastes in selected locations. Careful attention should be given to this operation because improper disposal may cause disease.

It is also vital to know what the community wants done with wastes contaminated with fallout. "Wastes are dangerous; everyone should follow community disposal rules."

An immediate problem will be to get agricultural activity back to normal, since the raising of food crops and livestock may be handicapped in some areas by radioactivity in the soil. Chapter IX deals with some of the special problems of farm communities after a nuclear attack.

During this period of initial recovery, attention will be focused on local problems. Nearly everyone will need more food, water, and other vital supplies. Among the first steps in the local community's recovery effort will be, probably, the establishment of safe, uncontaminated areas where people can gather for organization into work groups. Here the community will again begin to function as a community.

Among the immediate tasks faced by a local community will be decontamination, for even after radiation has decayed enough to allow a return to community life, fallout may still be present in some areas to the extent that it creates a special hazard to health.

Trained people will direct decontamination activities. If help is needed, individuals will be instructed in the use of equipment and in specific decontamination techniques. Personal exposure will be limited carefully and will be checked by radiological monitors.

FIGURE 60.—Radiological monitors surveying area.

If the water supply permits, paved areas may be decontaminated with firehoses, street flushers using high-pressure nozzles, or with motorized street sweepers. Roofs may be decontaminated with firehoses. Unpaved areas may be decontaminated by preparing and scraping off or plowing under a thin top layer of soil. In large open areas, this could be done with large earth-covering equipment such as motorized scrapers and motor graders. In smaller areas around houses and trees, bulldozers, tractor scrapers, shovels and wheelbarrows could be used. Another method would be to cover a contaminated area with clean earth.

In decontaminating paved areas, crews could flush the particles into storm drains or ditches where they could either be covered with clean earth or picked up and hauled to the dumping area. The scrapings from the unpaved areas could be dumped in a pile at a safe distance from occupied areas or hauled away. The dumping area might be a gully, refuse area, or even a vacant lot roped off at a safe distance. Area decontamination makes heavy demands upon manpower and other vital resources. Consequently, in a postemergency situation, decontamination

priorities will have to be set carefully and work will be undertaken on the projects or areas most vital to the welfare of the community.

Beyond the areas of heavy fallout from surface nuclear explosions, community decontamination may not be necessary. However, in these outlying areas, Civil Defense organizations will be setting up staging areas where people and equipment can be mobilized to travel into, decontaminate, and otherwise aid more severely affected areas. During this period, workers will try to reach areas where radioactive fallout is present, perform whatever vital tasks are necessary, then leave before their accumulated dosages rise past the danger point.

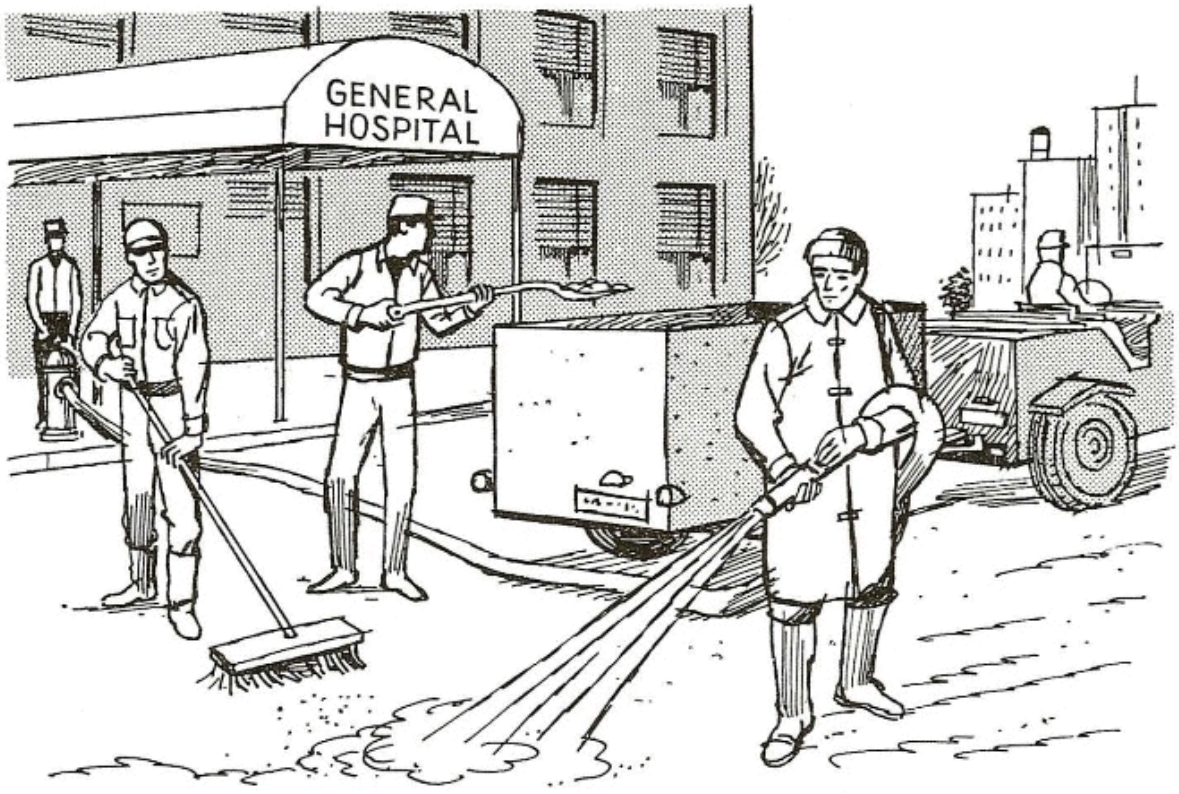


FIGURE 61.—Decontaminating a hospital area.

In areas where there have been only airbursts of nuclear weapons, so little fallout will have been produced that the central countermeasures during this phase will not be decontamination, but repair of damaged buildings and facilities.

SURVIVOR REGISTRATION AND INFORMATION

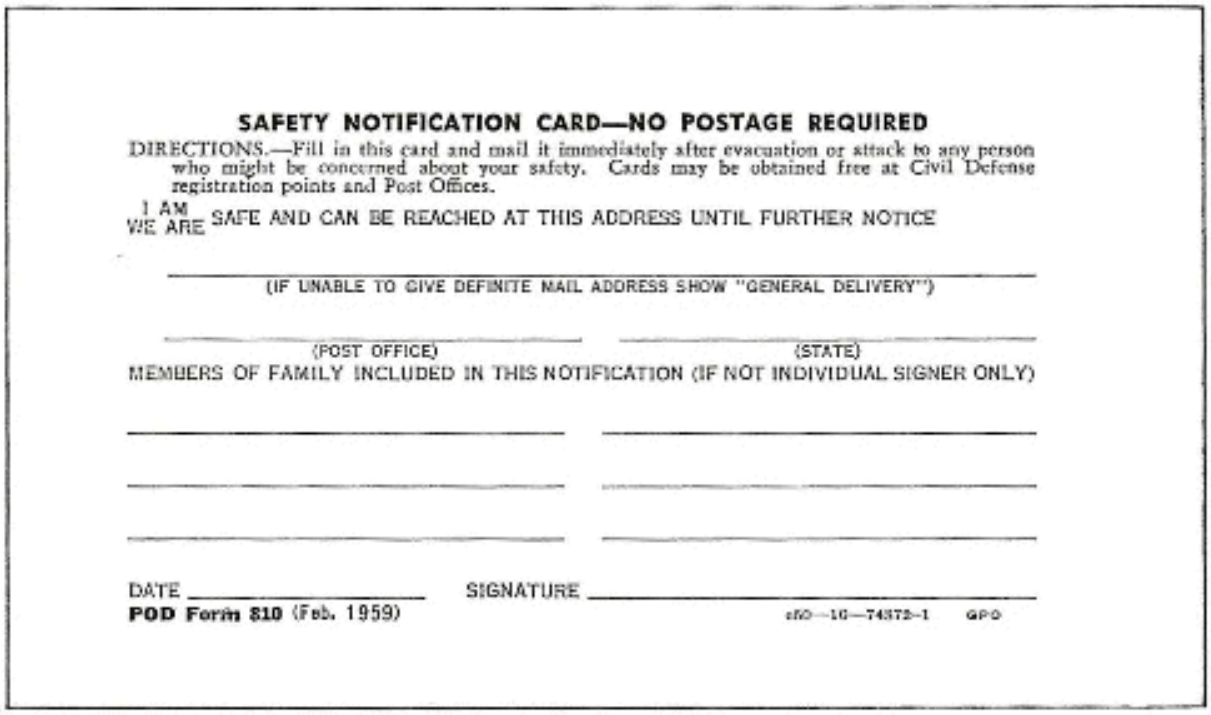
After emergence from shelter, everyone will undoubtedly want to obtain information and help. Such assistance will be available at the nearest location designated by local government. Police officers may be available to give directions, with auxiliary police assisting regular police officers. It will be important to obey directions of those on police duty, whether or not they are in uniform. While walking in a suspected contaminated area, a person should try to stay in the middle of streets or roads and avoid contact with anything that might be contaminated.

FIGURE 62.-Auxiliary policeman keeps two people from dangerous area.

If traveling in an automobile should be possible, the windows and vents should be kept closed. Cars may pass rescue teams at work getting people out of buildings or other structures where they have been trapped. The driver or other passengers should not pause to assist members of rescue teams unless they specifically ask for help.

Upon arrival at the welfare center, which may be located in a school, a community shelter, a hospital, a factory, or a government building, advice will be available on where to obtain food, water, and medical assistance. It is advisable to check bulletin boards, signs, or posters in the welfare center, because valuable information may be posted at entrances or in corridors. All notices should be read carefully.

Depending on the size of the community, there will probably be some delays in completing registration for assistance. If so, patience is essential. Those who are taking names must be extremely careful as they note down information from and for people. It is of greatest importance that this information be correct for the sake of the individual as well as for the community. Everyone will want to find out about relatives and friends. They, in turn, will want to know what has happened to their loved ones.



SAFETY NOTIFICATION CARD—NO POSTAGE REQUIRED

DIRECTIONS.—Fill in this card and mail it immediately after evacuation or attack to any person who might be concerned about your safety. Cards may be obtained free at Civil Defense registration points and Post Offices.

I AM / WE ARE SAFE AND CAN BE REACHED AT THIS ADDRESS UNTIL FURTHER NOTICE

(IF UNABLE TO GIVE DEFINITE MAIL ADDRESS SHOW "GENERAL DELIVERY")

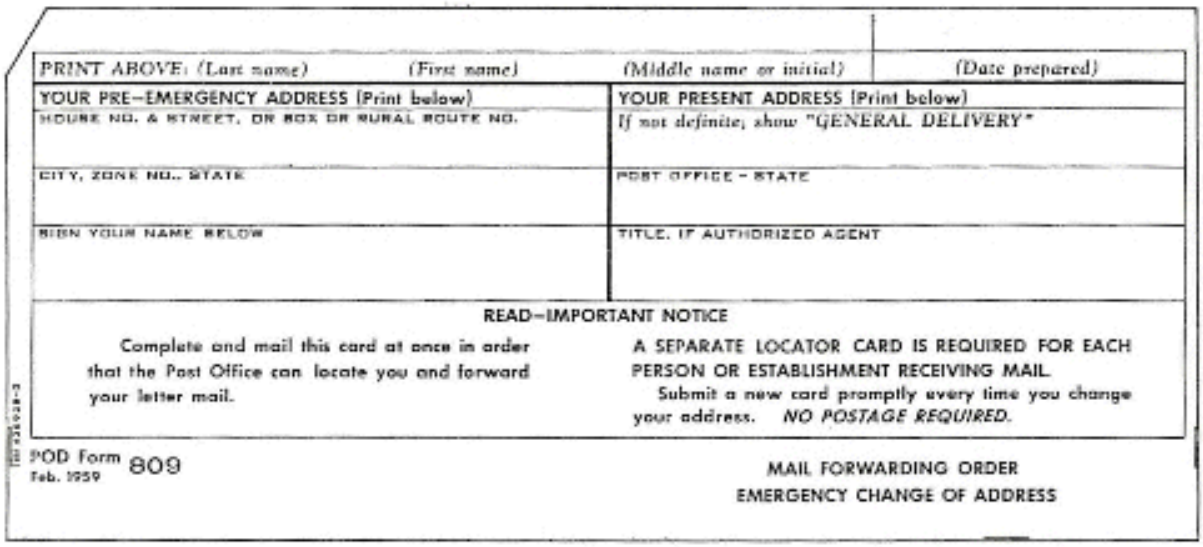
(POST OFFICE) (STATE)

MEMBERS OF FAMILY INCLUDED IN THIS NOTIFICATION (IF NOT INDIVIDUAL SIGNER ONLY)

DATE _____ SIGNATURE _____

POD Form 810 (Feb. 1959) 16O—16—74372-1 GPO

FIGURE 63.—Post Office Safety Notification Form, face.



PRINT ABOVE: (Last name) (First name) (Middle name or initial)	(Date prepared)
YOUR PRE-EMERGENCY ADDRESS (Print below)	YOUR PRESENT ADDRESS (Print below)
HOUSE NO. & STREET, OR BOX OR RURAL ROUTE NO.	*If not definite, show "GENERAL DELIVERY"*
CITY, ZONE NO., STATE	POST OFFICE - STATE
SIGN YOUR NAME BELOW	TITLE, IF AUTHORIZED AGENT

READ—IMPORTANT NOTICE

Complete and mail this card at once in order that the Post Office can locate you and forward your letter mail.

A SEPARATE LOCATOR CARD IS REQUIRED FOR EACH PERSON OR ESTABLISHMENT RECEIVING MAIL. Submit a new card promptly every time you change your address. *NO POSTAGE REQUIRED.*

POD Form 809
Feb. 1959

MAIL FORWARDING ORDER
EMERGENCY CHANGE OF ADDRESS

FIGURE 64.—Post Office Emergency Change of Address Form, back.

Among other forms that may be filled out during registration are a Post Office Emergency Change of Address and Safety Notification Form. This form will help people to locate loved ones and friends in other areas by mail.

At the time of registration, every opportunity should be taken to obtain authoritative information about the local situation. Police, Civil Defense personnel, or other authorities should be able to give Official reports. Only limited information may be available. It may be days or weeks before complete details of what has happened are known.

FIGURE 65.—Rumors aid the enemy.

Perhaps there will be rumors or stories circulated to the effect that the war is over or that most of the country has been destroyed. The source of each story should be questioned. Nothing should be accepted as fact until official confirmation has been obtained. The person who has a radio with him may try to get news and instructions, but he should be wary of news concerning surrender or betrayal. After an armed attack, an enemy may try to make us believe that we have been defeated, that we have surrendered, and that further resistance is useless. It is important to remember that this move to undermine our morale may be an important part of the attack.

FOOD, CLOTHING, AND HOUSING

After an individual has completed registration, he will learn more regarding welfare assistance. Governments have plans to assure all citizens get an equitable part of available resources and to meet vital community and individual requirements. Community shelters may be kept open to provide housing for those people who are unable to return home because of destruction or radioactive "hot spots." Other survivors may, choose to live with friends or relatives until it is possible to return home or until other permanent arrangements can be made.

Clothing may be needed. Every effort should be made to obtain adequate clothing for homeless survivors. No local source should be overlooked.

Food and water will probably be the greatest survivor need after emerging from shelter. At the same time, it will be important to limit the possible adverse effects of eating heavily contaminated food and water. Therefore, food and water supplies will be controlled and checked by local authorities. Survivors will be fed in large groups at feeding centers or will be issued approved rations as appropriate. Individuals should cooperate with the control measures set up by the local Civil Defense organization by avoiding unnecessary contact with radioactive materials and by not consuming unchecked food and water unless necessary for survival.

After attack, open-water sources may be contaminated by germs as well as fallout. Because such water sources will be important to survivors, local authorities will test them periodically and will recommend necessary action. Simple purification methods exist. Cloudy or unclear water should be strained through several thicknesses of paper towels or clean cloth, or else be allowed to settle in a deep container and then siphoned off. These expedients are not advisable for fission product removal in "heavily" contaminated areas because radioactive iodine and other soluble fission products will pass through these homemade filters. Under such circumstances, individuals should listen carefully to health officials or to local authorities for instructions on water purification. After that, water may be freed of germs with water purification tablets; or by boiling vigorously for a few minutes; or by adding 20 drops of iodine to a gallon of clear water or 40 drops to a gallon of cloudy water. Then it should be left to stand for 30 minutes. Liquid household bleaches of the sodium hypochlorite type can also be used. The label usually gives instructions.

Radiation itself does not. affect water. It is only when radioactive particles get into the water that the water becomes dangerous, because the particles may be taken into the body.

Decontamination of water can be carried out by the simple filtering process described above, or by running the water through one of the devices that are sold to soften water for home use.

Food stored indoors should be reasonably safe to eat. That is especially true of food in freezers and refrigerators, which should, of course, be kept closed as much as possible. Packaged foods, generally, will be edible if fallout particles are removed from the package or can. It would be best to eat perishable foods first, especially if electricity and gas are cut off. Bread is still edible even when moldy; sour milk is drinkable. Fruits and vegetables with "rotten spots" cut out are safe to eat. If they have been exposed to fallout, they should be wiped, washed, and peeled. Finally, washwater and peelings should be disposed of.

RESTORATION OF PUBLIC UTILITIES AND ESSENTIAL SERVICES

During the period of reconstruction, radiation levels will be low enough to permit unrestricted outside activities. Attention will be devoted to restoring services needed for the establishment of vital community activities. Major activities will probably include repairs to damaged facilities and construction or improvisation of new ones. However, other community tasks may also be undertaken, and the importance and priority of any activity will depend upon local conditions.

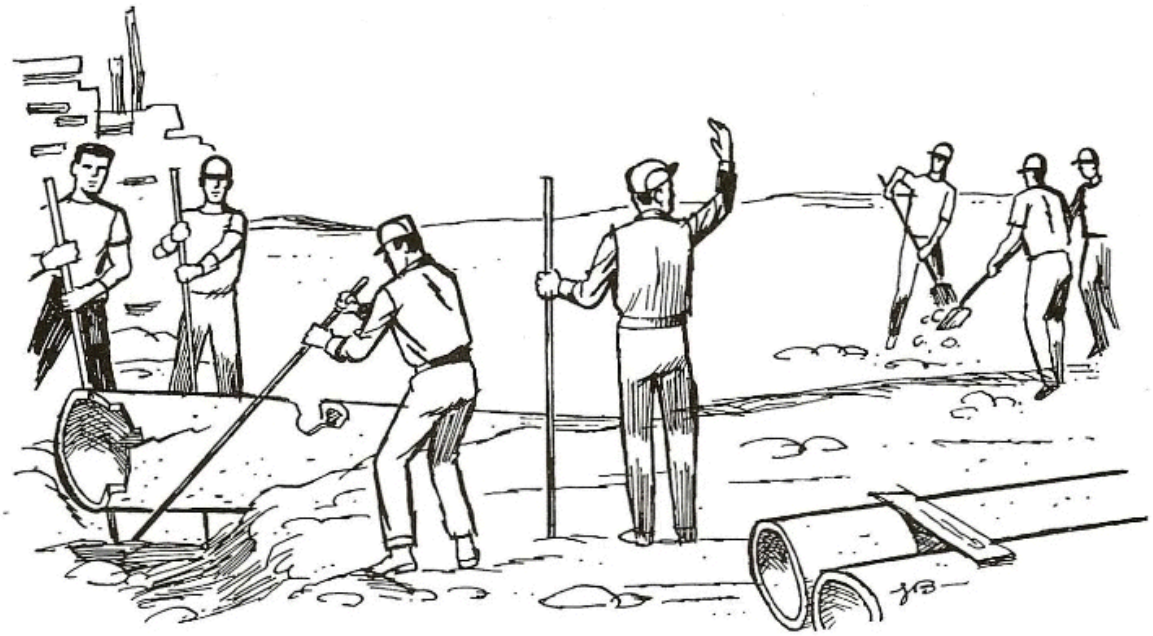


FIGURE 66.—Group of men repair water or sewer pipe.

The problems or tasks facing most communities may include preparation of casualty lists, establishment of food distribution systems, sanitation projects, restoration of public utilities and the preservation of law and order. Communities that are well organized will be able to meet these problems and will recover in the

shortest time. In such communities, projects are likely to be well coordinated. Necessary priorities will have been established and followed in both planning and operations.

SELF-SUFFICIENCY

All communities should plan to be self-reliant in the event of a nuclear attack. Surviving communities may be on their own for several weeks after the attack. It is quite possible that the roads, railroads, and bridges connecting one community with another, and with State and Federal Government centers may be destroyed or may have been made too dangerous to use by heavy concentration of fallout. All aircraft may be needed elsewhere.

As a result, many areas may not receive from the rest of the Nation the immediate assistance they may have learned to expect after a localized natural disaster. When a hurricane, flood or tornado strikes part of the Nation, unaffected communities can always be depended upon to rush assistance to the stricken areas. But no community will be unaffected after a nuclear attack. Every community will have recovery problems and may need critical supplies and manpower.

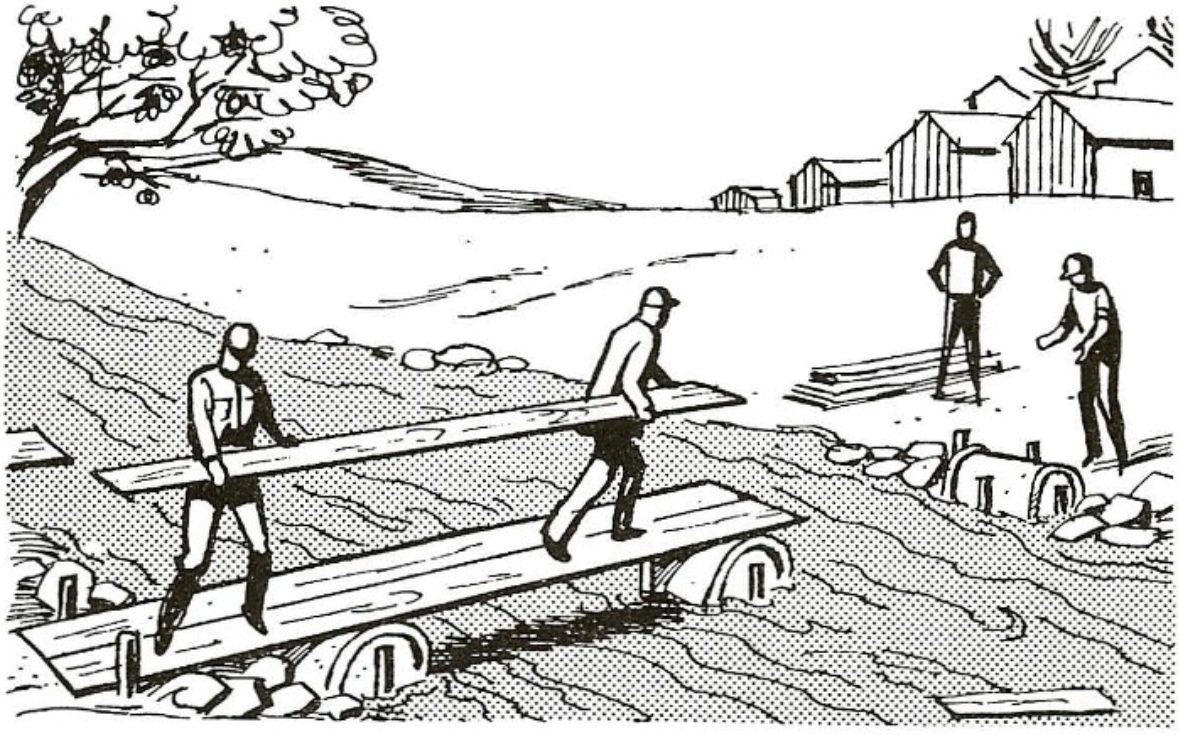


FIGURE 67.—Building a temporary bridge.

Many communities may be isolated—cut off from outside help, supplies, or information. Within a given area, it may be impossible to reach certain small towns, villages, or even a few houses at a distance from the others. At higher levels of government, authorities will be concerned with larger isolated areas—areas from which they can obtain no information or areas that cannot be reached with men and supplies. Thus, any community group from that of a few neighbors, to that of several States, may temporarily lose contact with or support from the outside world.

REPAIRS

It is possible that many communities will experience blast damage to buildings, utilities or transportation. Fires may add to the problem. In such circumstances, the community must determine how it can most effectively undertake repairs. While firefighting units work to bring fires under control, other groups will begin to repair damage. In areas where buildings have been completely destroyed, debris clearance will be a major operation. Plans must be made to give reconstruction efforts the most effective priority. It may not always be clear why a certain group or type facility must get priorities on equipment and manpower, but authorities will recognize a special need to revive one industry before another.

If the community is faced with a shortage of surviving workers, a special force of rebuilders may have to be organized. A person may find it necessary to work temporarily at an unfamiliar job, a job which seems quite unsuitable to his particular abilities or knowledge. It is at a time like this, then, that an individual will be called upon to show great patience and to put forth the best possible effort in whatever task must be done, until he can return to his normal occupation. By just such efforts did West Germany recover in the "miracle" of the late 1940's.

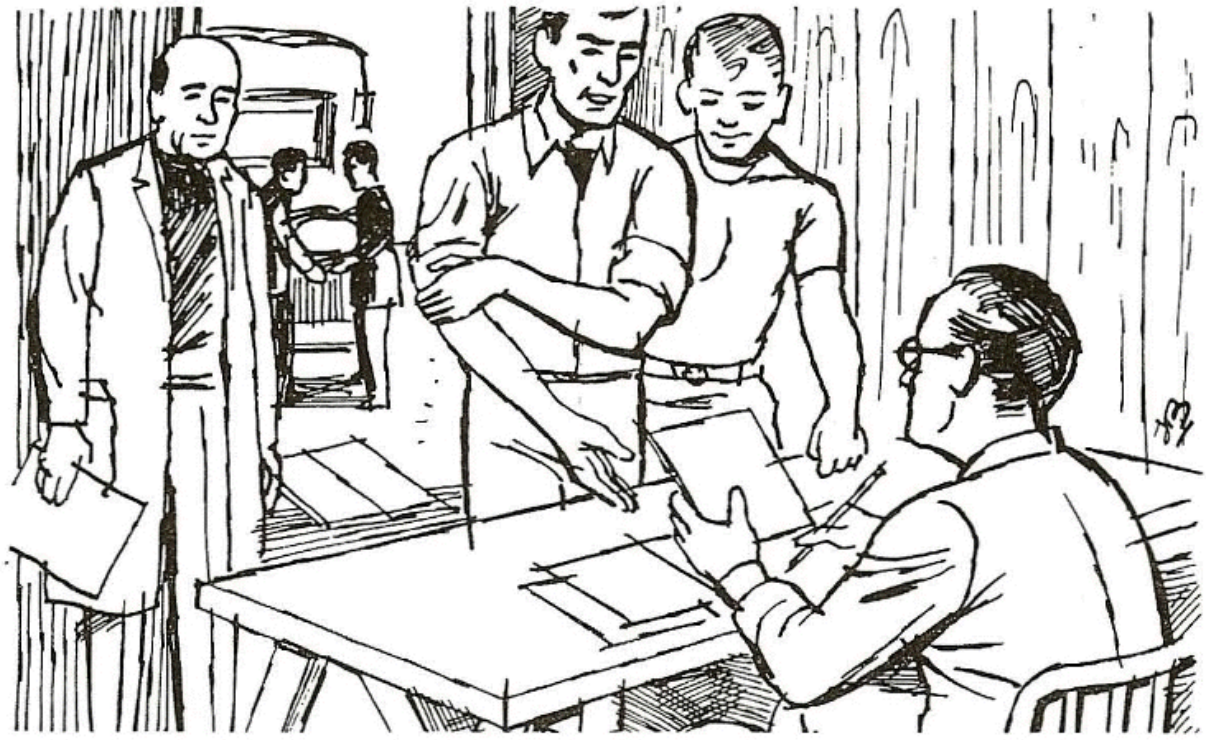


FIGURE 68.—Local official talks to survivors about job vacancies.

COMMUNITY, STATE, AND NATIONAL RECOVERY

The period of final recovery begins when the major initial hazards resulting from the effects of the weapons used in the attack have disappeared and all the more urgent and critical countermeasures have been started (if not completed). Even then, however, there may still remain the danger that people may eat, or otherwise absorb into their bodies, long-lived radioactive elements such as strontium 90, cesium 137, and carbon 14. Special decontamination methods and disposal and exposure-control precautions may be needed to eliminate this danger.

During final recovery, economic aid programs, retraining, and tax incentive programs may be required. Through such programs the nation will be able to increase its rate of recovery. Community plans may already include many provisions for stimulating local recovery efforts.

There are those who insist that even if many people did survive a nuclear war, civilization would be completely destroyed. The postattack world, they say, will be one of savagery and ruin. They believe no nation will be able to recover its industrial power, its health, or its standard of living. This view is contradicted by

the lessons of World War II. The postwar recovery of industrial nations like Great Britain, Russia, West Germany, and Japan are but a few major examples.

War must surely be avoided if it is at all possible. The destruction resulting from a nuclear attack on the United States would be heavy. But, for a modern industrial nation, it. is entirely possible to rebuild after suffering extreme devastation. The United States final recovery will, then, depend heavily on American will and determination to survive as a nation.

MUTUAL AID PROGRAMS

Several States have organized intercounty and interstate plans to provide quick help in emergencies. These plans are designed so that, during final recovery, support from outside can be sent without any legal or administrative complications. For example, New York, New Jersey, and Pennsylvania have agreements providing that, after a disaster, help can move swiftly and smoothly from one State to another. The plan fixes responsibility and makes unnecessary any special orders, signed documents, or new requisitions at the time of the disaster.

OFFICE OF EMERGENCY PLANNING

The Office of Emergency Planning (OEP) assists in planning the utilization of national resources for both immediate and long-range objectives. It helps State and municipal governments to establish emergency lines of succession. Plans are to include provisions for the management of resources and the stabilization of the economy. In addition to planning for use of national resources, the OEP assists in the area of communications, with emphasis on telecommunications and the assignment of radio frequencies for the purpose of national security.

Throughout the Nation, States and local communities must prepare by organizing their plans and resources beforehand. In each community there must be a careful survey of all farms, industries, and other producing properties, as well as all available supplies and materials. Each community must know what it can do in emergencies to meet its own needs and the needs of others.

NATIONAL STOCKPILING

To aid national recovery after a nuclear attack or any other major disaster, certain raw materials and manufactured goods need to be immediately available; they must be stored where they can be easily reached and put into use. For this purpose, the Federal Government has already placed, in various locations across the country, more than $8 billion worth of tools, equipment, and materials. In addition, the government has a large stock of emergency foods in the Commodity Credit stockpiles.

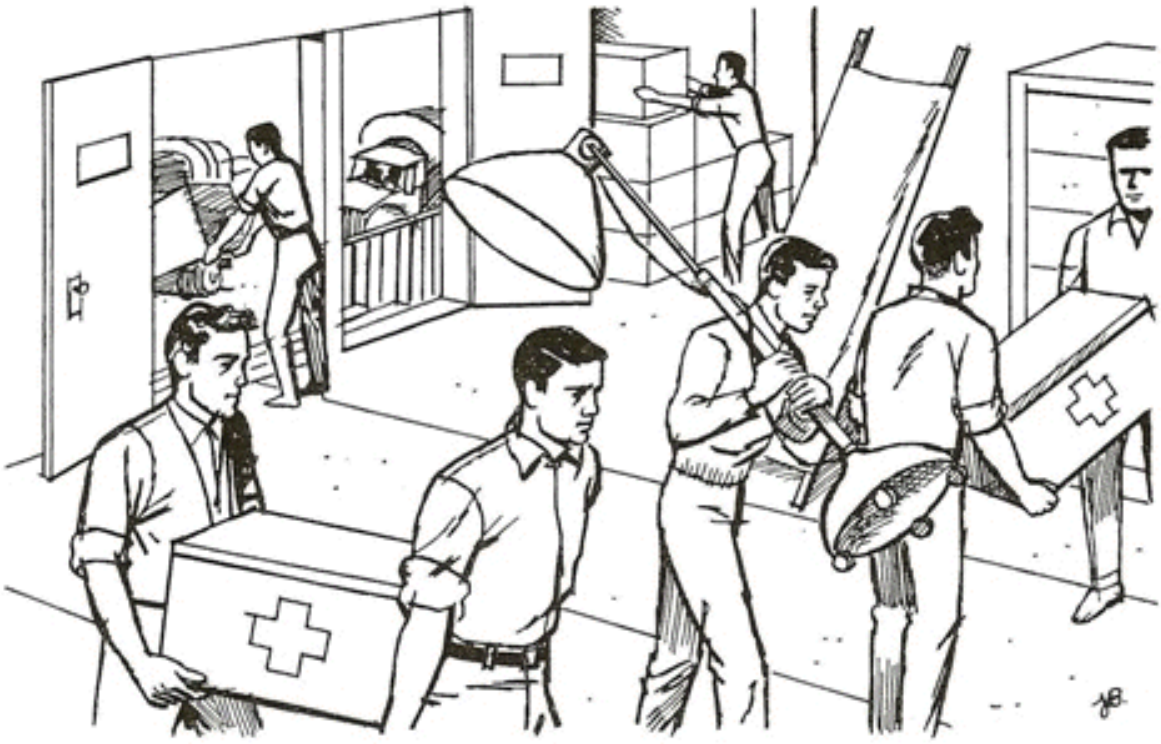


FIGURE 69.—Volunteers put emergency hospital equipment into place.

FIGURE 70.—Tunnel containing crates of stockpiled materials.

The Federal Government has placed foods, medicines and recovery supplies in readiness for emergencies everywhere. Into Federal warehouses have gone more than 160,000 tons of medical supplies.

Medical stocks include over 2,000 emergency hospitals, each with a capacity of 200 beds. These hospitals, of course, do not replace regular hospitals and are not designed to meet ordinary community needs. They are meant to supplement ordinary hospitals. Each emergency hospital is completely crated to take up minimum storage space. Supplies include everything from bandages to X-ray machines. Each hospital can be easily transported and set up in any large building. These hospitals are now stored in or near schools, government offices, and other public buildings, outside of anticipated areas of need. They are also made available when needed for use in major natural disasters.

In government warehouses and in underground storage places such as mines and caves, there are limited stocks of machine tools, emergency power generating and transmitting equipment, earth-moving vehicles such as bulldozers and power shovels, and construction materials such as steel beams, lumber, and concrete.

An interesting example of an unusual stockpile material is clear vinyl plastic. Sheets of this material are stored in many locations for use in emergencies. After an attack or a major disaster, many windows will be shattered in otherwise little-damaged buildings. Sheets of vinyl can be used to cover window openings temporarily, letting in light while keeping out wind and cold. During daylight hours, these temporary windows reduce the need for electric lights until regular repairs can be made.

INDUSTRY

After an attack, industry and other resources must be organized for rapid recovery. There will be an enormous amount of work to be done. Normal business and industrial operations must be reestablished as quickly as possible, to insure the production of essential defense and recovery items. OCD has an industrial Civil Defense program. Under it, major industrial and commercial groups are aware of the potential problems and have planned and taken basic actions to meet them.

CHAPTER VIII

LOCAL CIVIL DEFENSE AND COMMUNITY SHELTER PLANS

IF NATIONAL CIVIL DEFENSE MEASURES are to be effective, they must be organized and carried out at the local level. *The program, stands or falls in communities and neighborhoods.* Shelter areas must be identified, marked, and equipped. Individuals must accept the responsibility to aid each other in case of an attack.

The local Civil Defense Director, a man of many duties and responsibilities, is usually appointed by the mayor or a comparable official in urban and suburban communities. In rural areas the appointment is often made by the local county judge or by boards o£ commissioners. In every case, the Civil Defense Director needs the cooperation and help o£ everyone in the community in order to carry out an effective program.

The local Civil Defense Director is in charge of all the community shelters in his area. During peacetime, the director or his representatives regularly visit the areas designated as community shelters and make sure they are being properly maintained. Also, the director oversees placing the shelter signs which indicate the location of each shelter and placing stocks of food, water and equipment in them.

The local Civil Defense Director is also in charge of recruiting shelter managers and members of shelter management staffs who are appointed and trained during peacetime. He is responsible for recruiting radiological defense personnel and must assure himself that all shelter staff members have attended and completed appropriate training programs provided by Federal, State, and local organizations.

He makes continual inspections and tests of local warning systems, including both the communications network and the sirens, whistles, or horns that are used to sound a warning throughout the community. Many communities maintain a NAWAS station at local police headquarters. Location of the NAWAS station at police headquarters means that police radio dispatchers, on duty 24 hours a day, can continually monitor the warning network.

The Civil Defense Director is also responsible for a host of other programs. *He needs help, both in* volunteer workers and securing the budget he must have to make preattack preparations in the community effective.

PLANS AND PROGRAMS

Each community should have a local Civil Defense Director and a civil defense plan. This local plan should be an expression of Federal and State programs at the local level. The local plan is prepared after a survey of local resources and an analysis of local Civil Defense needs have been made.

Community Shelter Plans

The Civil Defense Director and local leaders must determine as accurately as possible where the people of the community are during working hours, during leisure hours, asleep and awake, winter and summer.

The local Civil Defense Director sees to it that the places which immediately qualify as community shelters are properly licensed, marked and stocked.

While shelters that immediately qualify are marked and stocked, community leaders should be working to provide some form of temporary protection wherever large numbers of people are concentrated at any time and, at the same time, should be working to increase the permanent, adequate shelter capacity in these same areas.

In many communities there will be certain large basements, warehouses, warehouse inner rooms, or other chambers, which have been noted in the National Survey but which do not qualify for Federal supplies because they offer limited protection. Those areas that have a protection factor of 40 or above are being marked with shelter signs. These shelters are being stocked with Federal supplies. Stocking of shelters with less than a 100 protection factor by the Federal Government is dependent upon local need and funds available for supplies. Communities, of course, can stock such shelters on their own initiative.

There are other shelter spaces that are surrounded by enough mass for adequate shielding, but are not large enough to meet Federal requirements. That is, they have a protection factor of 100 or better, but a capacity of less than 50 persons. These spaces, too, can serve as part of the local community shelter plan until better facilities can be provided, and may be stocked with food and water by the community or neighborhood.

Use of shelters with a protection factor of less than 100 is particularly indicated when a study of the community shows that there are large numbers of people who, during at least a part of each day, are too far from PF 100 community shelters to use them.

While the community continues to increase its effective shelter capacity, shelter staffs must be recruited and trained. The Office of Civil Defense aids State and local agencies in the preparation by offering instructor training to those who will in turn teach local people. At the OCD Schools, courses are now offered for Shelter Management Instructors and Radiological Monitoring Instructors, and the same courses will be offered in many States by University Extension services. The graduates of these courses will teach shelter managers and radiological monitors at schools operated by States and communities. The OCD Schools also teach courses in Civil Defense Management and in Planning and Operations for State and local Civil Defense Directors.

FIGURE 71.—RADEF Monitors must be trained.

THE INDIVIDUAL'S CIVIL DEFENSE ROLE

First and foremost, every citizen has a personal Civil Defense responsibility— the responsibility for his own protection. Every individual must become capable of caring for himself in an emergency and ready to contribute to the organized community survival effort. Each family must train and prepare to meet its own emergency problems. Each family must also prepare itself to assist others in need.

Contributions to Community Survival

In the event of an attack upon our country, every individual should be ready to do all he can to help himself, his family, his friends, and neighbors to survive. Everyone can, and must, make a contribution to the survival of the community. If possible, volunteers should take training now for a position of special Civil Defense responsibility. The person who cannot take this advance training can set an example for others at the time of an emergency by following the directions of those who have been trained.

CIVIL DEFENSE SKILLS NEEDED

Local Civil Defense Directors need volunteers for shelter staff positions. At the time of an attack, the people who enter community shelters will be given tasks to perform and duties to carry out. These people, however, will carry out their tasks most effectively if they are led by personnel who have received special training during the preattack period.

Trained persons will be needed to operate radiological and communications equipment, to keep order during the period of shelter confinement, to direct the distribution of food, water, and other supplies, and to carry on activity programs. Persons in the community should volunteer to take the necessary training now, before any emergency arises.

Those who volunteer to serve as auxiliary police may be on duty in the shelters during the period of shelter confinement and in the community during the postattack period. They may be called into service during other community emergencies. They will be given thorough training by members of the regular police department. It is desirable that there be two to four regular policemen or trained auxiliary policemen in each community shelter, so many trained auxiliary policemen are needed.

Fire-prevention teams and light duty rescue teams will be needed for duty in community shelters. They may be trained by members of the local fire department in each community.

FIGURE 72.—Local fire departments train members of fire fighting teams.

Wherever possible, doctors, nurses, and others with some professional medical training will be assigned to different community shelters in an area, in order that each shelter might have some type of professional medical help. This ideal distribution is not likely to be found very often, however, even in preattack surveys, to say nothing of the distribution in event of an attack. Therefore, the local Civil Defense Director will constantly be seeking individuals with Medical Self-Help or First Aid training for assignment to this type of duty in shelters.

Persons with electronics training will also be in heavy demand for special community shelter assignments. Persons with some understanding of electronics are best able to learn to operate, maintain and understand radiological and communications equipment.

It is highly desirable, particularly in suburban neighborhoods, that women volunteer to take training in Medical Self-Help, radiological monitoring, first aid, and communications. An emergency might arise during a time when most men of the community were away at work. In that case, community shelters in such areas

would be occupied, and the shelter operated entirely, or almost entirely, by women.

CHAPTER IX

SURVIVAL ON THE FARM

IN A WAR, RURAL AREAS would probably not be direct targets of explosive bombs and missiles. However, there are two ways in which they would be endangered. Bombs or missiles that "missed" their targets could fall on rural areas, and, if nuclear weapons were used, winds could carry deadly radioactive fallout to farmlands hundreds of miles from the target areas. No farm is so far away from a potential target that it can be considered safe from radioactive fallout. The problems of survival on the farm are, in many ways, more complex than those faced by a city or town resident. The urban dweller is individually responsible for some protective measures, but relies on his local government and his employer to supply part of the protection for the people, and protection for his place of employment. Farmers and their families are necessarily responsible for a much larger part of the protection of themselves and their means of livelihood.

It is important to the welfare of the Nation, in the event of an attack on this country, that industry and business be protected to the extent possible in order that essential production be quickly reestablished. Likewise, it is essential not only that farmers and their families survive, but also that preparation be made to continue to produce food and other necessary agriculture products. For these reasons, this chapter discusses both the measures for protection of the farm population, and measures that would help the farmer to continue food production.

Many of the planned measures and procedures are too complicated to be adequately described here. However, it is important for all of us to know that the continuing production of food, following an attack, is not a forgotten part of Civil Defense preparations. By Executive Order, the President of the United States has given the U.S. Department of Agriculture (USDA) definite responsibilities for the protection of food and agriculture against nuclear attack. The USDA has developed guides for agricultural leaders and farmers. Also, USDA representatives in each county, working with local Civil Defense officials, are responsible following an attack for applying USDA guidance to the situations that actually exist, area by area.

THE RURAL WARNING PROBLEM

Because most farms are far from community centers and are often widely separated, warning that an attack is likely to occur, or has occurred in some part of the country, is a special problem in rural areas. Even the most powerful sirens

and horns that it would be practical to build and use would not have the necessary range. Many makeshift warning systems have been suggested. They include: use of partyline telephones (which are rapidly being replaced with more modern equipment); and systems of signal lights, or signal flags similar to those long used in coastal areas to warn of conditions likely to be dangerous to shipping and small craft. None of these appear practical for general rural use. Conventional AM radio can give needed warnings, but, of course, it is not practical to have a radio available and turned on all the time.

The Office of Civil Defense is continuing development and tests of a warning system that shows promise. It is the NEAR system discussed in Chapter II. Successful development and testing, followed by nationwide installation, would provide good warning to most rural areas, since about 90 percent of the farms use commercially generated electric power.

Until an effective warning system for rural areas is in being, for many farmers the first warning of attack might be direct evidence of a nuclear explosion—intense light in the sky, lasting from a few seconds to nearly a minute, the sound of the explosion, or both. No matter what the nature of the initial warning, authorized radio transmission is expected to be the means of receiving detailed information, appropriate advice and directions.

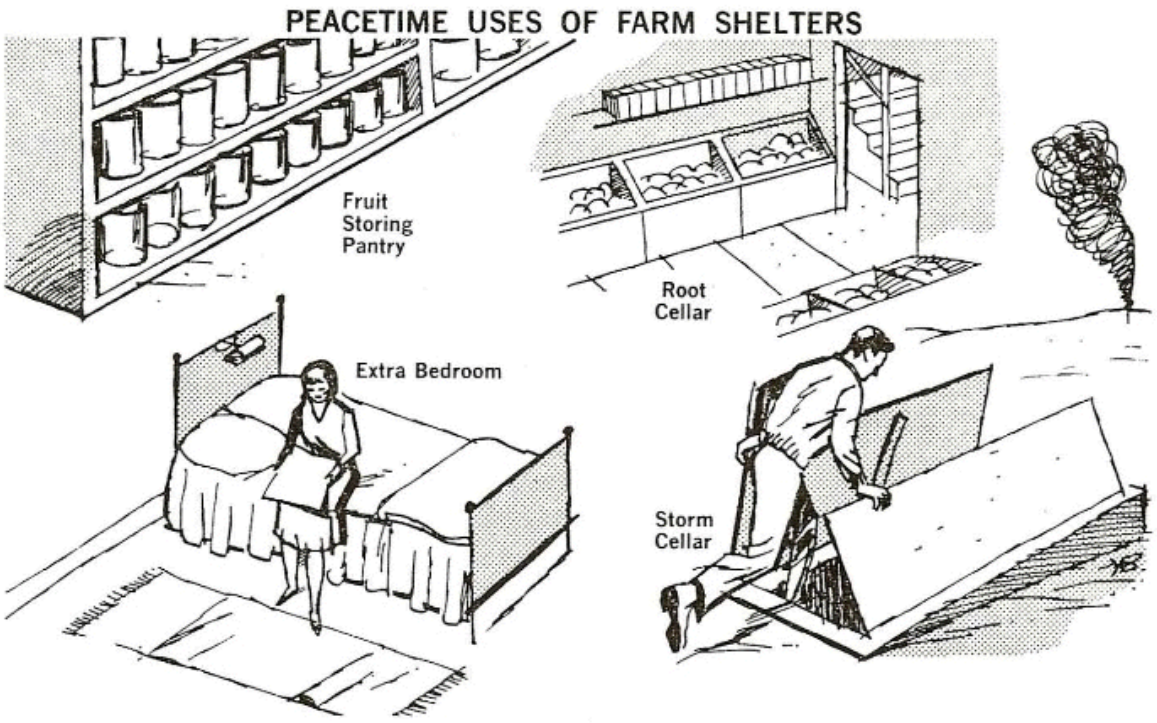


FIGURE 73.—Peacetime uses of farm shelters.

THE FARM SHELTER

Many farm families live too far away from population centers to make use of community shelters, and would need to care for poultry or livestock at the earliest time that it could be done without too great an exposure to radiation. Therefore, family shelters are needed. Good shelter, conveniently located, is particularly important for the farmer because he, like city firemen, policemen, public works employees, etc., may have to work in fallout radiation areas long before most people would need to leave shelter. Good shelters can keep the radiation dose while in shelter to a very small amount. Thus, a maximum amount of work in unprotected areas would be possible since very little of the allowable exposure would be received while in shelter.

Shelters for farm families are similar in principle to family shelters built elsewhere. However, there may be variations in type of construction and location of the shelter to better fit individual situations or needs. For example, existing structures such as a root cellar or "cyclone cellar" may provide excellent fallout protection and be readily adaptable to use as a fallout shelter. Where early care of livestock would be required it would be well to have the shelter close to or connected with the protected area for housing livestock. Since the arrival of fallout is somewhat delayed, the arrival time depending upon distance from the nuclear explosion and wind speed at that time, a shelter can be satisfactorily located a few hundred feet from the house. The USDA, assisted by OOD, has developed guidance concerning types of shelter satisfactory for various farm needs.

The requirements for providing emergency shelter supplies, including food and water, are similar to those for other family shelters. However, the farmer, performing some emergency tasks, would probably require more food and water than persons remaining quietly in shelter.

Many farms are so completely dependent upon electricity that even a brief loss of commercial power can cause serious problems. An item of emergency equipment to be considered is a gasoline powered electric generator. If provided, it should supply 60 cycle, a.c. current at a voltage or voltages matching those of the most essential equipment. Its capacity must be adequate to handle the essential load. Such equipment might be located in a shielded compartment of the shelter, the exhaust being vented to the outside. Gasoline storage should be outside the shelter and its capacity should be great enough to last through the emergency period.

PROBLEMS OF FALLOUT ON THE FARM

The following section of this chapter is only an *introduction* to the solutions of problems of fallout on the farm. They are presented here in order that those of us who would depend on the farmer for continuing production of suitable food, after

an attack, understand what can be and what is being done to assure that food. Also, for those actively engaged in farming who have not yet prepared for an emergency, it can be a first step toward knowing how to prepare for such an emergency.

Under the direction of the U.S. Department of Agriculture, training and more detailed guidance for farmers are being provided through the Agriculture Extension Service, including the County Agriculture Agents and Home Demonstration Agents.

Radiation Exposure Control

As an emergency worker, the farmer must be willing to accept some risk in assuring that he will be able to continue agricultural production. However, *his guiding principle should be to keep radiation exposures to the lowest practical limit consistent with saving community, family, and self.* During the first days and weeks in a fallout area the principal hazard would be the gamma radiation from fallout. General information concerning the severity of the hazard can be expected, by radio, from the local Civil Defense organization. However, radiation dose rates can vary a great deal over relatively short distances and while performing tasks under varying degrees of protection. For these reasons, a farmer may wish to own radiation measuring instruments so that he may check on his particular radiation hazards and keep track of his actual radiation exposure. Relatively inexpensive instruments suitable for these purposes are commercially available. The chart below shows the effects, or penalties, to be expected from various exposures to gamma radiation received in four days or less. The farmer must realize that the hazard decreases with the passage of time, that tasks that can be put off to a later time will involve less hazard and that he must save a part of his allowable exposure for continuing performances of low hazard tasks that must be performed as he resumes near-normal farming.

RADIATION DOSE (ROENTGENS)	EFFECT
50	Smallest dose detectable in an individual by laboratory methods.
75-100	May cause transient nausea on day of exposure in 10% of the people exposed.
200	Largest dose that does not cause illness severe enough to require medical care in the majority of people (90-95%)
450	Will cause death to about 50% of the people exposed, 3 to 4 weeks after exposure.
600	Will cause death to almost everyone so exposed, 2 to 3 weeks after exposure.

CARE OF LIVESTOCK AND POULTRY

Like men, animals are injured by both beta and gamma radiation

and where practicable should have protection. As with men, the gamma radiation can be a greater early hazard than beta radiation. Figure 74 shows the expected effects of various gamma radiation doses on large numbers of livestock and poultry.

Ideally, shelter should be provided for all of them. In many instances this is not practicable, and, to a degree we might have to face heavy losses of flocks and herds in the areas of very heavy fallout, and rebuild from the fraction that can be protected and from those that were in less contaminated areas. However, many existing farm structures provide some protection and their use in an emergency could, in many areas, make the difference between the survival and the loss of livestock. Also the protection provided by existing structures can often be materially improved at nominal cost. Trench-type silos combined with shelters can provide good protection and ready access to feed at relatively low cost.

Of course, livestock in barns and shelters must have food and water during the shelter period. Stored feed, hay, silage, grain, and concentrates, should be quite free from fallout. Well water should be safe.

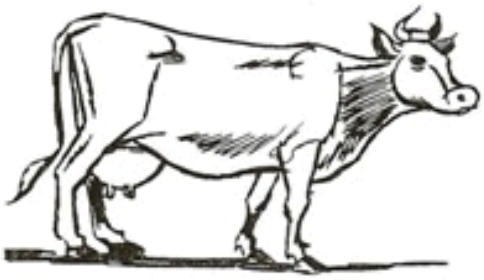
If warning time, and the estimated time before the arrival of fallout were short, attempts to move livestock to barn or shelter might not be practical.

Part of the livestock may necessarily be left in the open—unprotected. They would face three hazards: Gamma radiation from the area around them; beta radiation from fallout particles sticking to their skins, or hides; and internal radiation from fallout on the grass they ate. In many areas, subjected to only moderate fallout, part or all would survive.

Swine

600 Roentgens

Cow

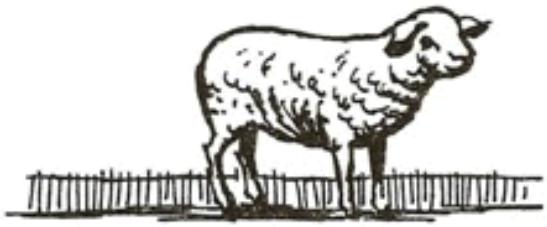


550 Roentgens

Chicken

900 Roentgens

Sheep



525 Roentgens

FIGURE 74.—Medium lethal radiation doses.

The effects of gamma radiation would probably be the controlling factor. There could be some injury to skin or hide. Fortunately, from surface nuclear explosions over typical soil or rock, only a small fraction of the fallout is expected to stick to foliage. Fallout is only partially soluble in water and most of the particles would soon sink to the bottom of a stream or pond and the dissolved material would be greatly diluted. The hazard to the animal, from fallout taken into the body with forage or water, seems to be less serious than it was once thought to be. Some of the radioactive material of the ingested, or eaten, fallout is absorbed by the body and concentrated in bones or glands. Some appears in the milk of producing dairy cattle.

When radiation levels have decreased enough to permit care of unsheltered livestock, they should be supplied with uncontaminated feed (stored) and water if possible until wind and weather have removed most of the fallout from the grass, until new growth of grass overshadows the old, and flow of streams has further diluted the contamination of their waters. If it can be done without undue radiation exposure to the farmer, washing the fallout off the livestock might be attempted. The process is difficult and likely to be only partially successful.

FIGURE 75.—Animals also need shelter protection.

FOOD FROM EXPOSED AND CONTAMINATED ANIMALS

Animals that have been in barn or shelter, and have had only stored food and uncontaminated water, would be excellent sources of food. Meat, dairy and poultry products should be wholesome, in the full sense of the word.

Apparently healthy animals that have been unprotected, have grazed on contaminated pasture and drunk water from open supplies can still serve as sources of food. However, certain precautions must be observed.

If needed for food during the emergency period, an animal could be slaughtered, and dressed with care, to prevent transfer of contamination from the hide or intestines to the meat. Internal organs such as the liver and spleen should be discarded. The muscle meat would not contain concentrations of radioactive substances that are likely to be dangerous to humans. The USDA Meat Inspection Division has developed procedures to be used by its inspectors to assure wholesome commercial supplies of meat.

Milk produced by cattle grazing on contaminated grass is likely to contain sufficient amounts of radioactive substances to be hazardous for consumption by humans, particularly children. Some of it could be processed into dairy products and stored until, by the process of radioactive decay, little of the radioactivity remained, and the stored food was suitable for human consumption. Guidance from agricultural and public health experts would be required for direction of those procedures. Decisions on use of such procedures must be based on actual situations-the degree of the milk contamination, availability of other food, etc. Finally, some experimental procedures have been used successfully to remove radioactive substances from milk. On a commercial scale such decontamination of milk may be practical.

FOOD WITH SURFACE CONTAMINATION

Food ready for harvest at the time of fallout might be lost. The problem would be chiefly the danger of harvesting it. For example, if a waiting period of three weeks would be required for radiation to decrease to levels permitting prolonged work in an orchard, ripe fruit would be lost.

However, many kinds of food nearing maturity, at the time of fallout, could be harvested and used. Fruit and many vegetables growing above ground could be washed, removing most of the fallout particles. Monitoring of samples would show the effectiveness of the washing. If too much radioactivity remained, peeling would remove it. Salvage of some leafy vegetables would not be practical,

but removal of the outer leaves of cabbage and head lettuce would remove the fallout. Root vegetables—potatoes, carrots, etc.—would give little trouble. Washing and peeling before use are normal procedures. Monitoring of grain would be required before use. However, it should be noted that threshing of grain, and cleaning processes before milling, are designed to remove dust. It can be expected that most of the fallout particles would be removed with the dust. If still unfit for human use, the grain would probably be suitable for industrial use or feed for poultry and livestock. Remember, animals concentrate the more harmful radioactive material in their bones and in organs that we need not eat. The amount of radioactive material animals would get in this way could be kept small enough to avoid "radiation sickness." Usually, animals would be slaughtered and processed before delayed effects developed.

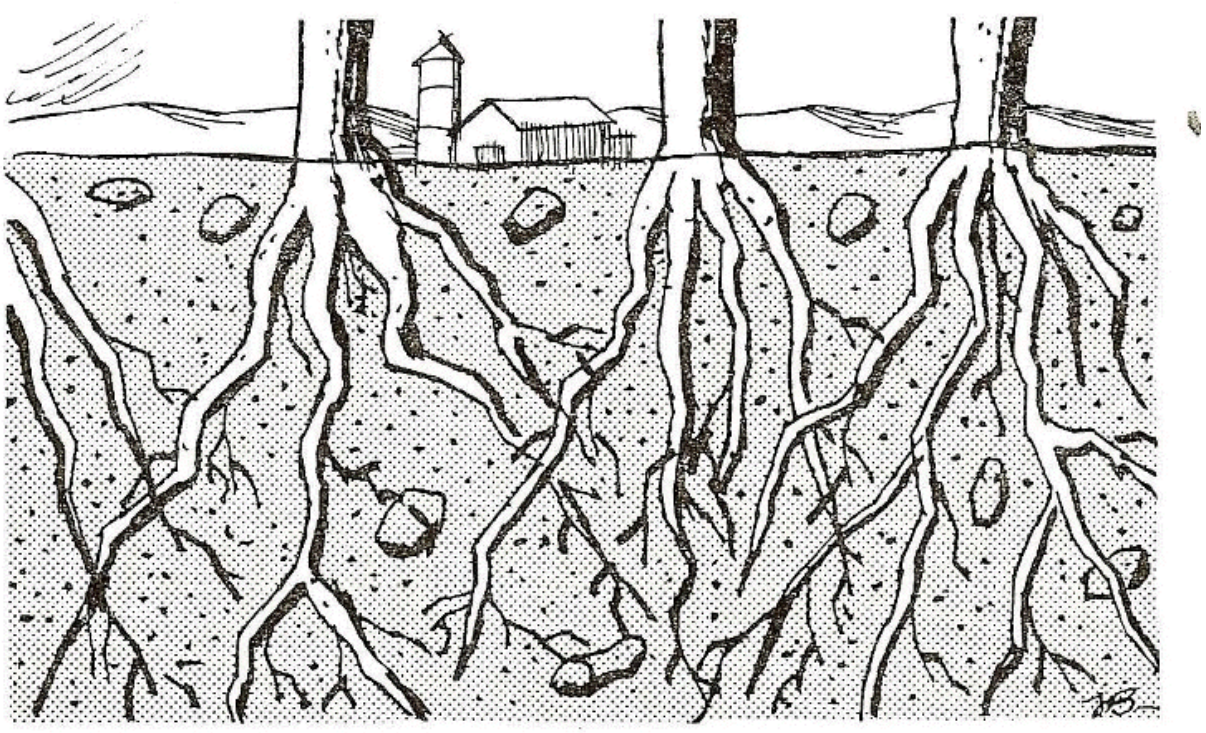


FIGURE 76.—Roots absorb radioactive material from soil root mat.

FOOD FROM CONTAMINATED LAND

Crops grown on land contaminated with fallout take up from the soil some of the long half-life radioactive materials, along with minerals needed for their growth. The most hazardous of these is radioactive strontium (strontium 90). Chemically, it. is similar to calcium which is needed by plants, animals and man. The roots of plants cannot quite "tell the difference" between the two, and take up some

strontium 90 along with the calcium. Some plants build much higher concentrations of calcium, and strontium, into their tissues than others. They also store more of it in some parts of the plant than in others. Small amounts of strontium 90 can be taken up from contaminated soil by successive crops for years. If man continues to eat plant food containing considerable amounts of strontium 90, enough of it can be concentrated in his bones to materially increase the *chance* of his developing delayed disease such as bone cancer or leukemia. That is a hazard that should be reduced to the lowest possible level.

REDUCING THE STRONTIUM 90 HAZARD

Through study and research, man has learned many facts and principles that can be applied to reducing this hazard. Continuing research is expected to provide still greater capability. So far, decontamination of soil on a large scale has not proved to be very practical. For growth of shallow rooted crops, deep plowing would place the fallout about 18 inches below the surface and might reduce the uptake of strontium 90. However, the productivity of some soils would probably be drastically reduced by deep plowing. The addition of lime or gypsum and fertilizer to soil makes more calcium available and can materially reduce the uptake of strontium.

At present, the most effective procedure for reducing this hazard would be selective use of agricultural lands and selective use of agricultural products.

In the selective use of land, edible crops taking up the largest amounts of calcium would be grown on the least contaminated land. Edible crops of low-calcium content would be grown in areas of greater contamination, and crops for industrial use would be grown in areas of still higher contamination. The relatively small, most highly contaminated areas could be taken out of production.

The selective use of agricultural products can be illustrated with the uses of grain. Grain with negligible or very low strontium content would be used for human food and feed for dairy cattle, that with greater content for livestock and poultry feed, and the grain least acceptable as food would be used in industry.

In summary: Survival on the farm—survival of most farm families and agricultural production—can be achieved. Required are: farm shelter for farmer, his family and livestock; application of suitable work schedules to control gamma radiation exposures; knowledge and application of farm safety and remedial procedures; and, effective Civil Defense capability, including radiological services and expert agricultural guidance.

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