CHAPTER 9

CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL (CBR) DEFENSE

Although chemical and biological warfare has been outlawed by international agreements, the potential for such warfare is real. Likewise, radiological or nuclear warfare is an ever-present concern to the Seabees as well as all other U.S. military personnel. The first part of this chapter discusses the effects of chemical, biological, and radiological (CBR) weapons on personnel and equipment. This information includes the symptoms of CBR poisoning and its first-aid treatment. The next section discusses Seabee CBR defense responsibilities in detail. Individual protective measures and CBR defense equipment are discussed in this section. Completing the Seabee's mission while under CBR conditions is also covered in this chapter. The last two topics are CBR defense training and marking contaminated areas.

CBR Defense Readiness Policy states that mission accomplishment in a CBR environment is dependent on two basic requirements:

1. The individual Seabee must have been trained to take whatever action is necessary for survival during a CBR attack

2. Seabee units must have been trained to perform their assigned missions in a CBR-contaminated environment.

So these basic requirements can be fulfilled, CBR training needs to be integrated into all facets of individual and unit training. Sufficient training time must be allocated to ensure that actions required for initial survival and subsequent mission accomplishment are conditioned responses.

EFFECTS OF CHEMICAL WEAPONS

Chemical agents are used to produce death, injury, temporary incapacitation, or irritating effects. (Screening smokes are not toxic unless they are inhaled in large amounts. Incendiaries are used primarily to start fires. These two agents are not discussed further.)

Broadly speaking, there are three types of antipersonnel agents: casualty, incapacitating, and harassing.

CASUALTY AGENTS are highly poisonous and are intended to kill or seriously injure. Included in this group are nerve, blister, choking, and blood agents. Nerve agents, as a group, are probably the most effective because only small doses are needed to produce death. Some agents are so persistent (when dispersed as a liquid) that they can remain effective for several days. They enter the body by the victim's breathing or swallowing or through the skin of the victim. Blister agents cause severe burns, blisters, and general destruction of body tissue. When they are inhaled, the lungs are injured. Choking agents inflame the nose, throat, and particularly the lungs. Blood agents interfere with the distribution of oxygen by the blood.

Some casualty agents have a cumulative effect, which means that successive doses add to the effect of each preceding dose. You might receive a nonlethal dose of a nerve agent, for example, followed within a few hours by another nonlethal dose. The cumulative effects of the two exposures, however, could be sufficient to cause death.

A new development is the NONLETHAL INCAPACITATING AGENT. It renders personnel incapable of performing their duties by interfering with the mental processes that control bodily functions. Reactions vary among individuals. One person might go into shock, and still another might have a feeling of extreme fatigue. These agents are difficult to detect because most of them are colorless, odorless, and tasteless.

HARASSING AGENTS include tear and vomiting gases that cause temporary disability. Tear gases are used mainly for controlling riots, but they have been used in warfare with varying degrees of success. Without a gas mask, the individual is rapidly incapacitated, but the effects disappear in 5 to 10 minutes after the person dons a protective mask or gets to fresh air.

Vomiting gases are useful when the enemy intends to launch an attack with casualty agents. They cause extreme nausea and vomiting, requiring those who have been exposed to remove their masks, thus exposing personnel to the casualty agents.

EFFECTS OF BIOLOGICAL WEAPONS

Biological operations use living organisms to cause disease or death. They act on living matter only. Most organisms that produce disease enter the body of the victim and grow in the human tissues. Some organisms produce toxins (poisons) in food or water, and the poison causes disease after the victim eats or drinks it.

Large-scale biological attacks by an enemy are as yet an untried weapon. As far as it is known, there has been no open attempt by any country to use this form of attack. Biological agents, however, have certain characteristics that favor them over other types of warfare, and the possibility y of their use in the future must be anticipated. Only small amounts of the agents are needed, because the organisms are alive and multiply in the victims. Moreover, they are difficult to detect and slow to identify. A whole ship's company might be infected before the medical department realized a disease existed on board.

The most efficient means of delivering biological agents on a large scale is through aerosols, which generally are invisible and odorless. Aerosols can be released from aircraft in bombs or direct sprays, from surface vessels on onshore winds, or from any number of explosive munitions, such as projectiles, guided missiles, and rockets.

Animals and insects can be used as carriers to spread biological agents.

Another method of quickly infecting large numbers of people is for saboteurs to contaminate a water supply. Diseases, such as typhoid fever, cholera, and influenza, can be spread by infecting water, milk, and food supplies with the proper microorganisms.

EFFECTS OF NUCLEAR WEAPONS

Nuclear weapons produce explosions of great force and heat and release nuclear radiation. Their primary purpose is the mass destruction of property and personnel. Their effects are divided into three categories: blast, heat, and nuclear radiation.

BLAST

Injuries caused by blast can be divided into primary (direct) injuries and secondary (indirect) injuries. Primary blast injuries result from the direct action of the air shock wave (overpressure) on the human body. The greater the size of the weapon, the greater the effective range of the blast wave will be with a subsequent increase in casualties.

Secondary blast injuries are caused mainly by collapsing buildings and by timber and other debris flung about by the blast. Personnel may also be hurled against stationary objects or thrown to the ground by high winds accompanying the explosion. Injuries sustained are similar to those resulting from a mechanical accident, such as bruises, concussions, cuts, fractures, and internal injuries.

At sea, the shockwave or base surge accompanying an underwater burst will produce various secondary injuries. Casualties resemble those caused by more conventional underwater weapons, such as mines and depth charges; but instead of being localized, they extend over the entire ship. Injuries also will result from personnel being thrown against fixed objects or structures. Equipment, furniture, boxes, and similar gear, when not secured properly, can act as missiles and cause many injuries.

Frequently, hemorrhage and shock are serious complications of blast injuries. The importance of shock cannot be overemphasized, because it is often-the main consideration in determining the fate of the patient.

HEAT

Heat from nuclear weapons causes burns. These bums can be grouped into two categories: primary and secondary. Primary burns are a direct result of the thermal radiation from the bomb. Secondary burns are the result of fires caused by the explosion.

As with blast injuries, shock is commonly associated with extensive burns. Burns are also subject to infection, which may produce serious consequences.

Flash burns are likely to occur on a large scale as a result of an air or surface burst of a nuclear weapon. Because thermal radiation travels in straight lines, it bums primarily on the side facing the explosion; but under hazy atmospheric conditions, a large proportion of the thermal radiation may be scattered, resulting in bums received from all directions. Depending on the size of the weapon, second-degree burns may be received at distances of 25 miles or more.

The intense flash of light that accompanies a nuclear burst may produce flash blindness, even at a range of several miles. Flash blindness is normally of a temporary nature since the eyes can recover in about 15 minutes in the daytime and in about 45 minutes at night. A greater danger lies in receiving permanent damage to your eyes caused by burns from thermal radiation,

which may occur 40 miles or more from a large-yield nuclear weapon.

NUCLEAR RADIATION

Nuclear radiation consists of four types: alpha and beta particles, neutrons, and gamma rays.

ALPHA and BETA particles can be ignored as initial radiation because they are very short-range; however, they can be a hazard as residual radiation. Alpha particles have little penetrating power; but if they are ingested into the body, they can cause serious harm. Beta particles also are of little concern unless they are on the body (in dust, dirt, etc.) or get into the body.

NEUTRONS are a direct hazard only during the initial radiation phase and then only in the general area of ground zero. In the residual phase, however, they cause whatever material absorbs them to become radioactive and emit gamma rays and beta particles.

GAMMA RAYS (similar to, but more powerful than, X rays) are the most hazardous form of radiation. They can travel long distances in air and have great penetrating power, making it difficult to provide sufficient shielding to protect personnel.

Radiation hazards are of three types: PENETRATION DOSE, SKIN DOSE, and INTERNAL CONTAMINATION. Penetration doses and internal contamination have the most serious effects. You can be protected against penetration doses by proper shelter. You can avoid internal contamination by wearing the protective mask and not eating or drinking food and water until they are declared safe. Skin doses, which cause injuries similar to burns, can be reduced by your wearing of proper battle dress.

CBR CONTAMINATION DETECTION AND IDENTIFICATION

For Seabees to carry out their mission, they must be able to detect and identify CBR agents immediately. The very nature of CBR agents, however, makes it difficult to detect and identify them.

In a nuclear attack for instance, you know an attack is taking place because you can see it, hear it, and feel it. But you cannot see the nuclear radiation that can be just as deadly over a period of time as the blast itself. In the same invisible way, biological agents can be present with the possibility of no one knowing until it is too late. Recent developments in chemical operations make some of the chemical agents colorless and odorless. You must be able, therefore, to recognize them whenever you or your shipmates are victims.

You must learn the symptoms of each type of attack so you can take the proper action when exposed and so you can apply the correct self-aid and first-aid measures.

SYMPTOMS OF CHEMICAL AGENT CONTAMINATION

Chemical agents make you a casualty when your body comes in contact with a bigger dose than it can withstand. The limits of tolerance of the human body extend from short periods of exposure and low concentrations of certain agents to extended periods of exposure and high concentrations of certain other agents. Furthermore, the limits of tolerance to specific agents vary with individuals. In any event, your principal concern is recognizing the symptoms and relieving the effects of exposure before the limit of exposure is exceeded.

Nerve Agent Symptoms

Symptoms of nerve agent contamination area runny nose; tightness of chest with difficulty in breathing; contraction of eye pupils; and nausea, cramps, headache, coma, and convulsions. All of these symptoms can take place in 30 seconds when the dose is sufficiently heavy.

Vapors of the G- or V-series nerve agents, even in low concentrations, cause contraction of the eye pupils. This action affects the sight, especially in dim light, and induces a headache. After a brief exposure to the vapors, a feeling of tightness in the chest maybe noticed, which increases deep breathing. The liquid substance does not injure the skin but penetrates it and poisons the body. Contraction of the pupils, in such an instance, may not appear as a warning sign.

A 1- to 5-minute exposure of personnel not wearing protective masks for low concentrations of G- or V-agent vapors causes difficulty in vision. Slightly greater exposure causes headache, nausea, pain in the chest, and more serious visual difficulties. Exposure of unbroken skin to vapor alone, however, entails little danger of serious injury.

Liquid contamination from a nerve agent to the skin is a real hazard. One of the first signs of exposure when liquid contaminates the skin may be excessive sweating and twitching of the muscles at the site of contamination. Small amounts of liquid left undisturbed on the skin can cause death in a matter of a few minutes. The entrance

to the body is even more rapid through the surface of the eye and through the linings of the mouth and nose. A lethal dose can be absorbed as rapidly by getting liquid in the eyes as by inhaling concentrated vapor. When poisonous vapors are swallowed, the first symptoms are excess flow of saliva, intestinal cramps, nausea, vomiting, and diarrhea. When the nerve agent is absorbed into the system after the victim is exposed to liquid or vapor, the symptoms may be generalized sweating, difficulty in breathing, muscular weakness, and eventually convulsions, paralysis, and unconsciousness.

Blister Agent Symptoms

Immediate contact with LIQUID MUSTARD or MUSTARD VAPOR causes no eye or skin pain or any other immediate symptoms. Exposure to mustard gas for more than half an hour, however, produces these symptoms: Half an hour to 12 hours after exposure, the contaminated eyes water, feel gritty, and become progressively sore and bloodshot. The eyelids become red and swollen. Infection frequently results.

Mustard vapor will burn any area of the skin, but the burn will be most severe in moist areas (neck, private parts, groin, armpits, bends of knees, and elbows). Redness of the skin follows in one half to 36 hours after exposure. This condition may be accompanied by intense itching, and blisters may then appear. Stiffness, throbbing pain, and swelling may also be observed.

A few hours after breathing mustard vapor, a victim experiences irritation of the throat, hoarseness, and coughing. After severe exposure, the lining of the respiratory system swells and interferes with breathing. Frequently, pneumonia develops.

When the whole body is exposed to mustard vapor, the body goes into a state of shock. This reaction is accompanied by nausea and vomiting.

NITROGEN MUSTARDS irritate the eyes before they affect the skin or respiratory system. The action of nitrogen mustards on the eyes occurs in a shorter time than does mustard. Even low concentrations of these agents may seriously decrease vision during or shortly after exposure. Later effects are similar to those of mustard. Contact of these agents with the skin produces damage like that produced by mustard, and their effects on the respiratory system are also similar.

Blood Agent Symptoms

Symptoms produced by blood agents, such as HYDROGEN CYANIDE, depend upon the concentration of the agent and the duration of the exposure. Typically, either death occurs rapidly or recovery takes place within a few minutes after removal of a victim from the contaminated area. When the victim inhales a high concentration of a blood agent, the victim begins to breathe more deeply within a few seconds, has violent convulsions after 20 to 30 seconds, stops breathing regularly within 1 minute, then gives occasional shallow gasps, and finally the heart stops only a few minutes after the onset of exposure. After moderate exposure, giddiness, nausea, and headache appear very early, followed by convulsions and coma. Long exposure to low concentrations may result in damage to the central nervous system. Mild exposure may produce headache, giddiness, and nausea, but usually recovery is complete.

The effects of CYANOGEN CHLORIDE combine the properties of two agents: chlorine and cyanogen. The chlorine properties induce coughing, dryness of the nose and throat, tightness across the chest, and smarting and watering of the eyes, resulting finally in the accumulation of fluid in the lungs. Cyanogen is similar to hydrogen cyanide and, like that agent, causes giddiness, headaches, unconsciousness, convulsions, and death.

Choking Agent Symptoms

In low concentrations, choking agents produce an action on the respiratory system that results in the accumulation of fluid in the lungs. This effect may lead to death. High concentrations produce death for the same reason, but the upper respiratory tract may be involved as well. Exposure to choking agents may produce immediate dryness of the throat, coughing, choking, tightness across the chest, headache, nausea, and at times, smarting and watering of the eyes. Symptoms usually are delayed, however, and it is possible that no immediate symptoms will appear when you are exposed to a fatal dose.

Even mild exposure to a choking agent that is accompanied by immediate symptoms may cause fluid to accumulate in the lungs within 2 to 24 hours after exposure. The presence of this fluid is indicated by shallow and rapid breathing, hacking and painful cough, frothy saliva, and an ashen-gray color of the skin.

Vomiting Agent Symptoms

Exposure to vomiting agents is followed soon by a pepperlike burning of the eyes, nose, throat, and air passages. The burning sensation is accompanied by a flow of tears and by repeated coughing and sneezing. These symptoms increase in severity for several minutes, even after the victim dons a mask. The victim becomes sick to the point of vomiting. When the mask is removed, the victim is then exposed to even more hazardous agents.

Tear Agent Symptoms

Tear agents (also called riot control agents) are local irritants which, in low concentration, act primarily on the eyes, causing intense pain and a considerable flow of tears, stinging of moist, warm skin, and irritation of the nose. High concentrations affect the upper respiratory tract and lungs and cause nausea and vomiting. The agents may be either solids or liquids and may be dispersed as vapors or smokes. The newest agent, CS, is the most effective, causing incapacitation 20 to 60 seconds after exposure. Recovery can be expected 5 to 10 minutes after the victim is breathing fresh air.

Incapacitating Agent Symptoms

Incapacitating agents can cause mental symptoms and may also produce physical symptoms, such as staggering gait, dizziness, and blurred vision. Some of these agents cause fainting spells, and others cause severe muscle weakness. The mental symptoms often resemble alcoholic drunkenness; for example, individuals may act silly, giggle, or become angry and belligerent similar to a "fighting drunk." Sometimes incapacitating agents can cause hallucinations. (Like alcoholic "DTs," victims may imagine that they see snakes or enemy soldiers, or they may imagine that colors have changed.) Many of these incapacitating gases prevent sleep. Some people may stay wide awake for 4 days and be mentally confused for the whole period. These agents do not kill, but they can make a man unfit for duty. Many of them do not produce effects until several hours after inhalation. These effects can last from 8 hours to 4 days.

SYMPTOMS OF BIOLOGICAL CONTAMINATION

In the early stages of any biological disease, the general symptoms are fever, malaise, and inflammation.

The degree of fever varies with the individual, depending on his or her resistance, but it does serve as a rough guide to the severity of infection. Often the fever is preceded by a violent chill. Whether the chill occurs or not, the fever is usually one of the earliest symptoms.

Malaise is a feeling of bodily discomfort and weakness. There may be nausea, dizziness, loss of appetite, and general aches and pains.

Inflammation is caused by the reaction of body tissues combating and sealing off an infection. In almost every case, there is pain, redness, and swelling. Some types of infection result in a characteristic rash, making it possible for the doctor to make an early diagnosis.

SYMPTOMS OF NUCLEAR RADIATION

The first symptoms of exposure to nuclear radiation are nausea and vomiting. Later (2 weeks or more) symptoms are diarrhea, loss of hair, loss of weight, sore throat, and skin hemorrhage. Death rates depend on the amount of the dose and the general physical condition of the victim. Unless a very heavy dose is received, ultimate recovery can be expected in most instances.

SEABEE CBR DEFENSE RESPONSIBILITIES

The battalion commander is responsible for planning the overall CBR defensive measures for a Seabee's encampment. The battalion commander then presents to the battalion those requirements for defense measures that should be provided by other forces.

Protective measures used against other weapons give only partial protection against CBR attacks. Provisions must be made for CBR defense, such as the following:

- Greater emphasis must be placed on unit separation, dispersion, and mobility.
- Increased air and ground reconnaissance.
- Training and indoctrination of personnel.
- Warning, reporting, detection, and identification of CBR agents and hazards.
- Individual and collective protection.
- Decontamination of personnel, equipment, supplies, and terrain, when directed.
- Plans for handling mass casualties, to include medical operations and first aid.

CHEMICAL DEFENSE

The best defense against a chemical attack is constant monitoring with equipment to detect chemical agents as soon as possible. To provide adequate time to take protective measures, commanders should use all available chemical detection equipment.

The protective measures taken by individuals and units when operating under the threat of chemical attack or in a chemical environment are governed by the nature of the threat, mission, situation, and weather. Movement of troops and supplies should be planned so contaminated terrain is avoided to the maximum extent possible. Contaminated terrain is crossed only when absolutely necessary and then as quickly as possible. Preferably, you should move in vehicles at speeds and intervals that minimize contamination. When the situation and mission permit, heavy work-rate activities of personnel dressed in chemical protective clothing and equipment should be minimized. Essential work should be planned for the coolest part of the day, when possible.

Protective Measures before Chemical Attack

In any combat situation, the commander should designate a level of Mission-Oriented Protective Posture (MOPP) for the unit. MOPP is discussed in detail later in this chapter. The following protective measures must be taken before a chemical attack.

EXTENDED WEAR OF PROTECTIVE CLOTHING.— Based on the MOPP level designated by the commander, the individual may have to adapt to requirements for wearing his or her protective clothing and equipment for extended periods. The amount of time required to put all of these items on during a chemical attack exceeds the amount of time required to receive a casualty-producing dose of chemical agent.

M9 CHEMICAL AGENT DETECTOR PAPER.— The M9 chemical agent detector paper (fig. 9-1) detects the presence of liquid chemical agents encountered by the individual. It does NOT detect chemical agent vapors. The paper indicates the presence of a nerve agent (G and V) or a blister agent (H and L) by turning a red or reddish color.

The M9 paper is self-adhesive; you can attach it to most surfaces. When you attach it to clothing, place it on the upper portion of the right arm, left wrist, and either the left or right ankle to allow adequate representation of contamination encountered by the Seabee. When you place it on a piece of equipment, it must be in a location free of dirt, oil, and grease and where it cannot be stepped on. The M9 paper may be used in any weather, in temperatures above 32°F or 0°C. However, take care not to expose it to extremely high temperatures, scuffs, or certain types of organic liquids and DS2, as they all cause false readings. If spots or streaks on the paper appear pink, red-brown, red-purple, or any shade of red, assume it has been exposed to a chemical agent.

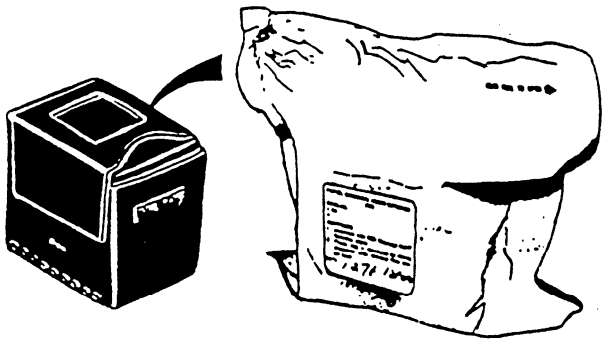


Figure 9-1.—M9 chemical agent detector paper.

ALERTNESS AND PROFICIENCY.— Individuals must remain alert and constantly aware of the chemical threat, especially when duty requirements preclude the wearing of full protective equipment. Individuals must understand the chemical alarms and signals and be proficient in attaining the maximum level of protection when alerted to a chemical attack.

PROTECTION OF INDIVIDUAL EQUIPMENT.— To the extent possible, individuals must protect equipment and supplies against liquid chemical agent contamination by keeping them organized and covered. Hastily constructed fighting hole covers, ponchos, shelter halves, or other suitable materials can be used for protection. Individuals should wear full protective clothing and equipment when sleeping and, to the extent possible, cover themselves and their equipment before they go to sleep.

Protective Measures during Chemical Attack

A chemical attack may come directly in the area in which individuals are located or upwind from that area In either case, when alerted to a chemical attack they must take the following immediate defensive actions:

- Stop breathing.
- Don protective mask
- Give the alarm.
- Continue the mission and wait for further orders.

- When the situation permits, assist others who need help.

Protective Measures after Chemical Attack

Whether an attack comes in the form of a vapor, aerosol spray, or a liquid agent, remain in protective gear and continue your mission. When the time and the mission permit, give first aid to casualties in the immediate vicinity, and report the local casualty status to the appropriate authority. All personnel must await the commander's order for unmasking. After a chemical attack DO NOT UNMASK UNTIL AUTHORIZED BY YOUR IMMEDIATE COMMANDER. In the absence of command guidance, the procedures described below should be followed.

PROCEDURE WHEN A DETECTOR KIT IS AVAILABLE.— Use a chemical agent detector kit to test for the presence or absence of chemical agents.

After determining the absence of agents, two or three individuals should unmask for 5 minutes, then remask. Check for chemical agent symptoms. If no chemical agent symptoms appear in 10 minutes, the remainder of the troops may safely unmask. Bright light causes contraction of the pupils that could be erroneous y interpreted as a nerve agent symptom.

PROCEDURE WHEN A DETECTOR KIT IS NOT AVAILABLE.— Observe animal life within your surrounding area for symptoms of chemical agent poisoning. If the local animals appear affected by a chemical agent and if it does not impede your mission, move to an area where the animals appear normal before you attempt the procedures listed below. These procedures should also be used in an extreme emergency. Two or three individuals should be selected to take a deep breath, hold it, break the seal of their masks, and keep their eyes wide open for 15 seconds. They then should clear their masks, reestablish the seal, and wait for 10 minutes. If no symptoms appear after 10 minutes, these same individuals should again break the seal, take two or three breaths, and clear and reseal the mask. After another 10-minute wait, if no symptoms have developed, these same individuals should unmask for 5 minutes and then remask. After this procedure, if no symptoms have appeared, the remainder of the group can safely unmask. However, remain alert for the appearance of any chemical symptoms. If symptoms occur, resume the wearing of masks.

Protection of Unit Equipment and Supplies

Because contaminated equipment and supplies pose a threat to personnel, covers should be used to protect equipment and supplies stored outdoors, if possible. The following guidance is appropriate for combat, combat support, and combat service support units.

EQUIPMENT.— Important items of equipment must be covered. Plastic sheets serve as excellent covers because they are nonporous. If plastic material is not available, tarpaulins or other suitable material may be used. If nothing else is available, dense foliage will provide some protection.

PACKAGED FOOD ITEMS.— Vapor, aerosol spray, or liquid chemical agents can contaminate food. The type of food, type and amount of agent, and effectiveness of protective measures influence the edibility of food. Food not in protective packages generally presents the major problem. Chemical agents may penetrate packaged food when it is left exposed over an extended period of time.

UNPACKAGED FOOD ITEMS.— Oily and fatty unpackaged foods are particularly vulnerable to chemical contamination. These foods are protected from contamination when stored in containers, such as field iceboxes and refrigerators, if the sealing gaskets are serviceable. As a rule of thumb, CONTAMINATED UNPACKAGED FOOD MUST NOT BE EATEN!

WATER.— Medical personnel are responsible for recommendations on the potability of water. Water that is not in sealed containers may become contaminated. Water suspected of contamination should not be consumed until tested and declared safe.

First Aid and Self-Aid

First aid includes the immediate actions required to prevent further injury or complications from the effects of chemical agents. First aid necessarily includes the prompt removal of agents from the eyes and decontamination of the skin to avoid casualties from lethal liquid agents. Therefore, first aid must include performing self-aid, or personal decontamination, automatically and without orders when it is required. First aid also includes the use of appropriate medications or actions to reduce the effects of the agent, such as the use of the nerve agent antidote injector for nerve agent poisoning. Each individual must be thoroughly trained in both first aid and personal decontamination so he or she can perform these actions quickly.

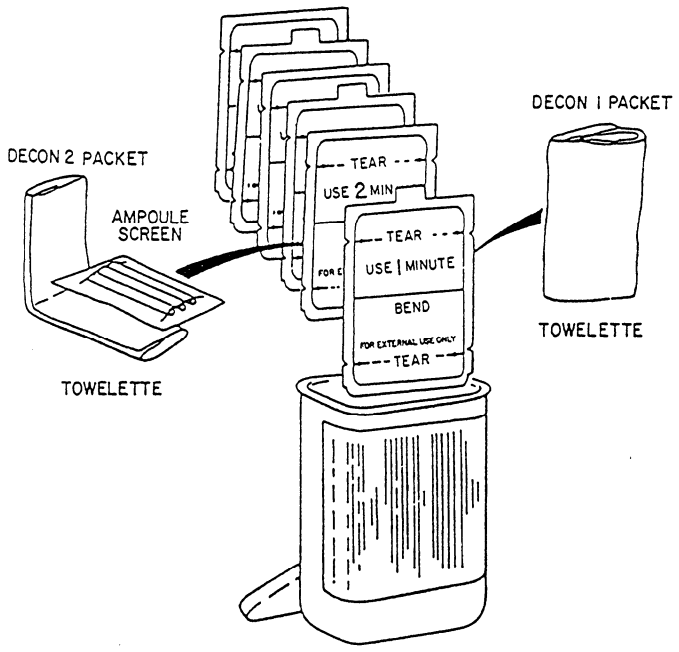


Figure 9-2.—M258A1 skin decontamination kit.

UNIDENTIFIED CHEMICAL AGENTS.— In most cases, the individuals are not able to identify the chemical agent used in the attack. When exposed to an enemy chemical attack while dressed in chemical protective clothing and equipment, he or she is not normally concerned with immediate decontamination.

When the skin of an individual becomes contaminated, it must be decontaminated immediately. Skin decon is the neutralization or removal of contamination from exposed portions of the skin. The individual performs the decon by using M258A1 skin decon kit (fig. 9-2). This kit is designed for chemical decon, but it can be used to remove radiological contamination. If the contaminated person is incapacitated, another person must perform the decontamination so that he can survive.

For decontaminating skin, each Seabee receives the M258A1 kit in a hard plastic case. Avoid getting decontaminants into eyes, open wounds, or mouth. If contaminants enter these areas, flush them with water. If symptoms appear, seek medical attention as soon as possible. The kit is normally attached to the protective mask carrier or the load-bearing equipment (LBE). It contains three sets of foil-packaged towelettes saturated with different decontaminating solutions. These solutions neutralize most nerve and blister agents.

Protect the kit from temperatures above 110°F (43°C) and below 32°F (0°C). The solutions are flammable and unstable in storage at temperatures above 110°F (43°C) or for prolonged periods of time in sunlight.

Shelter is necessary to prevent further contamination during the decontamination process. If no overhead cover is available, throw a poncho or shelter half over your head before beginning decontamination.

CAUTION

Do not let the solution from the M258A1 kit get in your eyes!

NERVE AGENTS.— If you are told that your pupils are getting very small or if you are having trouble breathing and your chest feels tight, use the atropine nerve agent antidote kit (NAAK), Mark I.

The injectors contain medications to treat the initial symptoms of nerve agent poisoning. But, most importantly, it will check the more serious effects of nerve agent sickness. The injectors are antidotes, not a preventive device; therefore, only use the injectors when you actually experience symptoms of nerve agent poisoning. (See fig. 9-3.) The directions for use are as follows:

1. Put on the protective mask.

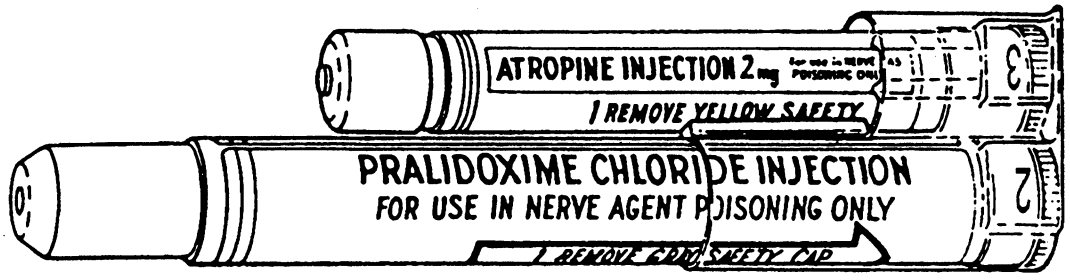


Figure 9-3.—Nerve agent antidote kit (NAAK), Mark I.

2. Remove a (NAAK), Mark I, from the protective mask carrier.

3. Inject the thigh with the first injector from the kit (atropine, small autoinjector). (See fig. 9-4.) Hold the injector against the thigh for at least 10 seconds. Remove the injector.

4. Follow immediately with the second injector (2-PAM chloride, large injector) and inject the thigh. Hold the injector against the thigh for at least 10 seconds.

5. Remove the injector and place each injector needle through the pocket flap of the overgarment. Bend each needle to form a hook.

6. Massage the injection site, if time permits.

7. The interval between injecting each set of auto-injectors is 10 to 15 minutes when symptoms persist or recur. A Seabee must not administer more than three NAAK sets. The administration of more than three sets must be authorized by medical support personnel.

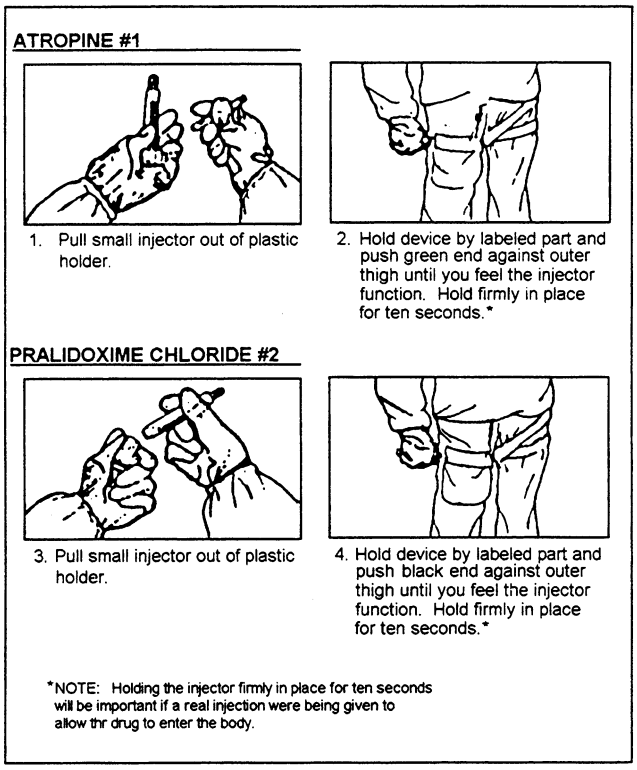


Figure 9-4.—Instructions for use of NAAK, Mark I.

WARNING

If within 5 minutes after the administration of any set of injections your heart beats very rapidly AND your mouth becomes very dry, **DO NOT** give yourself another set of injections.

When an individual experiences severe symptoms from nerve agent poisoning and is unable to administer self-aid, a buddy must perform the following aid measures:

1. Mask the casualty.

2. Using the NAAK belonging to the victim, administer three sets of injections immediately and in rapid succession in the thigh muscle of the leg.

3. Hook the expended autoinjectors to the overgarment pocket flap of the victim.

4. Administer the back pressure arm-lift method of artificial ventilation if breathing is difficult or has ceased.

5. Seek medical attention as soon as possible.

Continue to perform your duties if you feel relief from the atropine and can breathe freely again. Dryness of the mouth is a good sign. It means that you have had enough atropine to overcome the dangerous effects of the nerve agent.

If you should get a splash of liquid nerve agent in your eyes, instant action is necessary to avoid serious injury. Obtain water as fast as possible, tilt your head back so your eyes look straight upward, slowly pour water into the your eyes, and flush them out. Hold your eyes open with your fingers, if necessary. Pour the water slowly so the irrigation lasts not less than 30 seconds. This irrigation must be done in spite of the danger of breathing nerve gas vapor. Don your mask quickly after irrigation is complete. Then, if the symptoms of nerve gas poisoning develop, give yourself an injection from the NAAK, Mark I.

If liquid nerve gas gets on your skin or clothing, fast action is needed to get rid of it. Immediately use the M258A1 decontamination kit. Then carry on with your combat duties. Meanwhile, watch for muscles twitching in the contaminated area. If twitching does not develop in the next half hour and there is no tightness in your chest, you have been decontaminated successfully.

If twitching of the muscles in the area of contamination does develop, do not wait for other symptoms to appear. Give yourself the injections from the NAAK, Mark I, at once. If no other symptoms develop, one series of injections is enough. The atropine

does not relieve the local twitching of muscles, but this twitching is not dangerous.

Avoid water and food that may be contaminated with nerve agents. Let the medical personnel check the food and water for safety before you consume them. If you have swallowed contaminated food or water and all of the following symptoms occur-increased flow of saliva, nausea, pains in the stomach, and tightness in the chest–give yourself the injections from the NAAK, Mark I.

BLISTER AGENTS.— Casualties of blister agents, such as HD (distilled mustard), exhibit redness and inflammation of the eyes. Usually several hours after exposure, reddening of the skin appears, followed by the appearance of blisters. There is NO first aid for blister agents other than decontamination. Blister agent effects are delayed for several hours todays. To decontaminate your eyes, flush with plain water repeatedly. Any blister agents on the skin and clothing should be removed using the M258A1 decontamination kits. Seek medical care as soon as possible. If evacuation to a medical facility is required, blister agent casualties receive the same treatment given other bum victims.

BLOOD AGENTS.— Agents, such as AC and CK, enter the body by inhalation and produce symptoms ranging from convulsions to coma. They act on the body by interfering with the ability of oxygen-carrying cells to transfer oxygen to other body tissue. They may have an imitating effect on nasal passages.

There is currently no self-aid or buddy aid treatment for blood agent symptoms. Affected personnel should seek medical attention.

CHOKING AGENTS.— This agent produces coughing, choking, nausea, and headaches in casualties. Delayed effects include rapid and shallow breathing, painful cough, discomfort, fatigue, and shock. First aid includes immediate masking. Masking may prevent further damage. No specific first aid other than efforts to prevent shock is available.

VOMITING AGENTS.— For protection against vomiting agents, put on your mask and wear it in spite of coughing, sneezing, salivating, or nausea. If necessary, briefly lift the mask from your face to permit vomiting or to drain saliva from the facepiece. Clear your mask each time you adjust it to your face and before you resume breathing. Carry on with your duties as vigorously as possible; this helps to lessen and to shorten the symptoms. Combat duties can usually be performed in spite of the effects of vomiting agents.

TEAR AGENTS.— When liquid or solid agents have entered your eyes, force your eyes open and flush them with water. Put on your protective mask, cover the outlet valve and voice meter, and blow hard to clear the mask. Keep your eyes open as much as possible. When your vision clears, continue to perform your duties. When it is safe to remove your mask, blot away tears, but do not rub your eyes. Now face into the wind.

INCAPACITATING AGENTS.— By the time a victim who is exposed to an incapacitating agent realizes something is wrong, he or she may be too confused mentally to handle his or her own decontamination. These cases should be taken to medical personnel immediately. If many people are affected, it may be necessary to confine them temporarily under guard to prevent accidents. These personnel must not be allowed to enter critical or dangerous spaces until complete recovery is achieved, because these victims may not be responsible for their actions. In addition, some of these agents prevent sweating, which increases the danger of heat stroke on hot days.

Personnel Decontamination

Decontamination can be accomplished by the removal, neutralization, absorption, or weathering of the chemical agent. The primary purposes of decontamination are to prevent casualties and to remove obstacles that may prevent mission accomplishment.

Individual decontamination or self-aid is performed by an individual with materials on hand. It is performed on himself or herself and the equipment he or she uses. It is performed as soon as practical and is usually sufficient to allow the individual to carry on his or her assigned mission. The M258A1 is used for limited decontamination of all items of individual clothing and equipment.

Unit decontamination is an organized effort performed by personnel of the unit, with equipment available to the unit, when directed by the commander, and under the supervision of trained CBR specialists. All officers and qualified CBR specialists should be prepared to act as supervisors of decontamination teams when required.

Support-Level Equipment Decontamination

Equipment decontamination stations are located as far forward upwind as possible and are normally run by a specialized decontamination team or unit.

BIOLOGICAL DEFENSE

Protective measures against a biological threat include training, immunization of personnel, and strict personal hygiene.

Biological Defense Training

Training for defense against biological agents must stress the necessity for an alert and questioning attitude toward any indication that biological agents may have been used. Although knowledge of these agents is important, there must be no unreasonable fear of disease from a suspected biological attack. Personnel should be instructed not to repeat or exaggerate rumors. Seabees should also know the following facts about a biological attack.

- It is normally impossible to recognize or detect.
- It may be used to supplement other types of attack
- It may be used to cause either delayed death or incapacitation for strategic purposes.

Prevention of Disease

Casualties from a biological attack can be reduced by using the following preventive measures:

- Strict personal hygiene
- Immunization
- Quarantine of contaminated structures and areas
- Instruction in the proper care of cuts or wounds
- Use of approved sources of food and drink

High standards of personal hygiene and, when practical, avoidance of practices that produce a run-down condition. This assists personnel in fighting an infection. The importance of good protective mask discipline and proper field sanitation measures must be emphasized.

Indications of a Biological Attack

These are indications of a biological attack.

- Low-flying aircraft that appear to be producing a mist or spray
- The function of any type of spray device
- The function of a submunition, such as a bomblet, that appears to have no immediate effect
- Unusual types of bomblets found in the area
- Swarms of insects, such as mosquitoes, suddenly appearing after an aircraft has dropped containers that did not appear to have immediate effect

Defensive Measures after a Biological Attack

Units are not equipped with devices to indicate a biological hazard. After a suspected biological attack, individuals must continue wearing their protective masks until authorized to remove them by competent authority.

DECONTAMINATION OF PERSONNEL.— After a suspected biological warfare attack individuals can decontaminate themselves by showering with soap and hot water. The fingernails and toenails should be thoroughly cleaned and the hairy parts of the body should be thoroughly scrubbed. Contaminated clothing must be washed in hot soapy water when it cannot be sent to a field laundry for decontamination. Cotton items may be boiled.

DECONTAMINATION OF OUTDOOR AREAS.— Sunlight kills most microorganisms and usually decontaminates unshaded outdoor areas. However, shaded areas may remain hazardous from several hours to several days. Decontamination of a large area is not feasible.

DECONTAMINATION OF INDOOR AREAS.— Personnel in a shelter or building that is suspected of being contaminated with biological agents should wear their protective masks until they leave the building.

GUARDING AGAINST CONTAMINATION.— All exposed surfaces are assumed to be contaminated. Sealed containers, such as bottles and cans containing food and water, should be washed down and boiled before opening.

REPORT SICKNESS PROMPTLY.— Prompt reporting of sickness serves two major purposes:

1. It gives medical personnel the opportunity to identify the biological agent to which the individuals were exposed. Once the disease has been identified, effective medical measures can be taken.

2. It helps to prevent the spread of disease from person to person.

TREATMENT OF CASUALTIES.— There are no self-aid measures for the diseases that are caused by agents. In comparison to measles, the symptoms of biological warfare diseases appear in a like manner. Although it maybe a matter of days before the types of biological warfare agents are identified, medical personnel will direct the decontamination of these casualties.

Even though the Navy provides preventive shots for some diseases, additional shots have been developed that will be given to all hands if biological warfare ever occurs. If you contract a disease from biological warfare in spite of the shots, the sickness should be mild, and medical personnel will ensure that you receive the best treatment available.

NUCLEAR DEFENSE

On a nuclear battlefield, units must be dispersed to the greatest extent possible consistent with the situation and the mission. Dispersed units present smaller targets and, hence, are less vulnerable. In contingency planning, the positioning, movement, and missions of units may require adjustment by the commanders to minimize the effects of nuclear bursts while maintaining the ability to continue construction operations and hold defensive positions. Defensive measures for individuals and units should include protection from blast, heat, and initial and residual radioactive fallout.

Defensive Measures before a Nuclear Attack

When a nuclear attack is imminent, the best defense is to dig in. Earth is one of the best shielding materials available in the field. Seabee defensive positions, which vary from individual fighting holes to improved defensive positions, should be prepared whenever the tactical situation permits. Read chapter 7 for detailed information on constructing fighting holes and shelters.

FIGHTING HOLE.— A properly constructed fighting hole provides excellent protection against initial radiation. The deeper the fighting hole, the more protection it provides. An overhead covering of earth or other material will help reduce the amount of thermal and initial nuclear radiation and fallout material from reaching the individual. However, this cover must be sturdily constructed to withstand the blast wave.

FIELD SHELTERS.— Tunnels, caves, and storm drains provide effective shelter. Culverts and ditches can be used in an emergency, although they offer only partial protection. Vehicles made of steel, such as tank and armored personnel carriers, provide some protection. Buildings usually are not strong enough to provide effective shelter, but the middle floors or basement of a reinforced concrete or steel-frame building offers protection from all effects except the blast. Personnel should avoid the areas around windows and other openings.

SUPPLIES AND EQUIPMENT.— Individual equipment and supplies not being worn should be placed in the fighting hole. None of this equipment can be left unsecured because the blast wave converts them into lethal missiles. Unit supplies, particularly explosives and flammables, should be dispersed within the unit area and protected or shielded. Debris must be kept to a minimum and not be allowed to collect because it could become afire hazard. Objects, such as radios, generator tools, and gas cans, must always be secured to minimize the danger of flying debris caused by the blast wave.

Defensive Measures during a Nuclear Attack

A nuclear attack may come without warning. The first indication will bean intense light. Heat and initial nuclear radiation come with the light and the blast follows. There is little time to take protective measures since the blast wave travels at the speed of sound (about 1,000 feet per second). Individual defensive actions must be automatic and instinctive. Unit activities will be suspended for a short period while all personnel take cover. When a surprise attack is a possibility, all personnel not engaged in essential activities should remain undercover as much of the time as possible. Individuals who are exposed when a nuclear detonation occurs should do the following:

- Immediately drop flat on the ground (facedown) or to the bottom of a fighting hole.
- Close your eyes.
- Protect exposed skin from heat by putting hands and arms near or under your body. Keep your helmets on.
- Remain down until after the blast has passed and debris has stopped falling.
- Stay calm, check for injury, check weapons and equipment for damage, and prepare to continue the mission.

Defensive Measures after a Nuclear Attack

Following a nuclear attack, designated individuals should begin fallout monitoring, so fallout arriving in

the unit area can be detected quickly. When warned of the arrival of fallout and the tactical situation permits, individuals should take cover and remain protected until instructed otherwise.

A handkerchief or similar cloth maybe worn over the nose and mouth. If dust particles make breathing difficult or cause discomfort, the protective masks should not be used as a dust respirator. If it is necessary to remain in an area having fallout, individuals should dig in quickly, sweep fallout particles away from the area around fighting holes, and remain covered until fallout stops.

The skin and clothing of individuals exposed to fallout or who have traveled through a radiologically contaminated area may cause a skin rash. If the situation prohibits complete decontamination, then field-expedient methods should be used to reduce the radiation hazard. Some of these methods that remove alpha- and beta-emitting particles include the following:

- Removal and vigorous shaking of clothing or brushing the clothing with brushes (avoid breathing dust)
- Removing dust from the hair and from under the fingernails
- Wiping exposed skin with a damp cloth

All personnel should bathe and change clothing as soon as the tactical situation permits. Remember that runoff water is contaminated, and appropriate defensive measures should be taken.

The requirement for decontamination of individual equipment, vehicles, weapons, and ammunition can be reduced, if, before fallout arrives, they are covered with materials such as tarpaulins, shelter halves, or ponchos. An effective way to remove radiological contamination is to wash it with water.

Contamination Avoidance

Contamination avoidance can help minimize exposure by doing the following:

- Limiting the duration of exposure by reducing the amount of time in the hazardous area
- Delaying entry time until radiation decays enough to permit safe passage or occupancy or both
- Avoiding and bypassing contaminated areas

First-Aid Treatment

The casualty-producing effects of a nuclear explosion are blast, heat, and nuclear radiation. First-aid measures are limited to those for burns caused by thermal radiation and injuries caused by the blast. There are no immediate lifesaving measures for the treatment of radiation sickness or blindness caused by the intense light.

When the tactical situation prohibits you from going to a decontamination station, you must remove most of the radioactive material with whatever you have on hand. If you become heavily contaminated, the following measures are recommended:

1. You must remove your outer garments. Shake them vigorously or brush them off. Be sure the clothing is held downwind. This will remove most of the radioactive material unless it is wet and muddy.

2. When it is too cold or wet to remove your outer clothing, brush or scrape them carefully.

3. The same procedure should be used to decontaminate your equipment.

Personnel Decontamination Station

Complete personnel decontamination is conducted at a personnel decontamination station (PDS). The PDS is setup in a secure, uncontaminated area, located as far forward as the tactical situation permits. Personnel from both the decontamination and the supported unit operate the PDS under the supervision of the Chemical, Biological, and Radiological Defense Officer (CBRDO), NOBC 2765 or the Disaster Preparedness Operations and Training Specialist, NEC 9598.

SEABEE CBR DEFENSE EQUIPMENT

NOTE

The following information was current when it was written. Because of the frequency of change in CBR defense equipment, consult the Disaster Preparedness School (NCTC, Gulfport, Mississippi, or Port Hueneme, California) nearest you for the latest information.

Individual CBR defense equipment consists of permeable protective clothing, protective footwear covers, protective masks, skin decontamination kits, and atropine.

CBR Permeable Protective Clothing

This two-piece overgarment consists of one coat and one pair of trousers. It is packaged in a sealed vapor barrier bag to provide protection while not in use against rain, moisture, and sunlight. Refer to the bag for detailed instructions for using the protective clothing. The coat and trousers are made of material having an outer layer of nylon and cotton and an inner layer of charcoal-impregnated polyurethane foam that gives protection against vapors, aerosols, and small droplets of nerve and blister agents. The overgarment is intended to be worn over the duty uniform; however, in high temperatures, it may be worn directly over the underwear. The overgarment is not designed to be decontaminated and reimpregnated for reuse. It is discarded within 6 hours after being contaminated with liquid chemical agents or after 14 days of wear.

Chemical Protective Footwear Covers (Overboots)

Overboots (fig. 9-5) are worn over standard combat boots. They protect the feet from contamination by all known chemical agents, vectors, and radiological dust particles.

The overboots are impermeable and have unsupported butyl-rubber soles and butyl sheet-rubber uppers. When insulated boots (cold weather "Mickey Mouse" boots) are worn with the overgarment, the overboots are not necessary. The insulated boots provide adequate protection in a chemical environment.

Chemical Field Protective Masks

These masks, when properly fitted and worn with the hood, give protection against field concentrations of all known enemy chemical agents in vapor or aerosol form. They do so by filtering contaminated air to remove the agents, not by producing oxygen. When the air has a low-oxygen content or when individuals are in tunnels or caves with a heavy concentration of aerosolized particles, such as burning smoke mixtures, the protective mask does not provide breathable air. These masks also do not protect against ammonia vapors or carbon monoxide.

The MCU-2/P, MCU-2A/P mask is the standard field protective mask. Masks are shipped from the manufacturer with the following components:

1. MCU-2/P mask

Figure 9-5.—Chemical protective footwear covers (overbooks).

2. Ml waterproof bag
3. Mask carrier
4. Clear facepiece outsert
5. C_2 canister

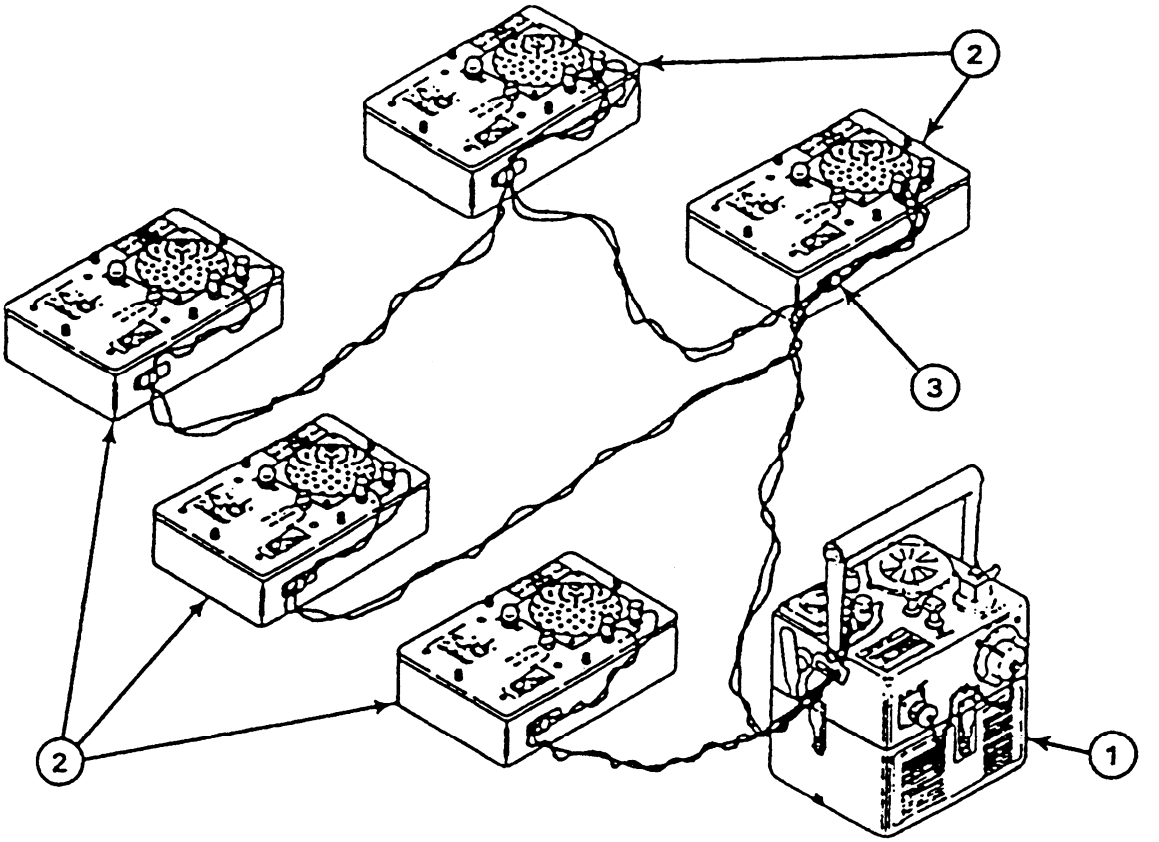
The following are accessories for the mask:

1. Protective hood
2. Optical inserts
3. M4 winterization kit

The MCU-2/P has one C_2 canister that is designed for protection against normal field concentrations of all known toxic chemical agents and is considered adequate for all foreseeable field use. Canisters must be replaced carefully under the following circumstances: when directed by higher headquarters; after prolonged usage; once every 15 days after initiation of chemical warfare; when they impose severe impedance to breathing; after immersion in water; upon visual examination, when they are found to be damaged or unserviceable; or when the lot numbers do not match.

Skin Decontaminating Kit M258A1

An M258A1 is issued to each individual during operations in a toxic chemical environment. It decontaminates both nerve and blister agents. The use of this kit was discussed earlier in this chapter. The kit contains three towelettes of each type (a total of six). Each pad is sealed in tearaway impermeable foil packets. A single M258A1 kit contains materials to allow the individual three complete decontamination.



(a) Use the figure as a guide for connecting more than one M42 Alarm to an M43 Detector.

(b) Allowing about 1 foot of slack at the end of each cable, string WD-1/TT telephone cable between M43 Detector (1) and M42 Alarm (2) as shown in figure.

(c) About 9 inches from end of telephone cable, tie each telephone cable to D-ring (3) on its M42 Alarm (2).

(d) Strip about 1 inch of insulation from the end of each wire to be connected.

NOTE

Maximum cable length must not exceed 400 meters from the detector to farthest alarm.

Figure 9-6.—M42 remote alarm connected to M43 detector.

NAAK, Mark I

Three NAAK, Mark I, injectors are carried by the individual in the top outside pocket of the mask carrier. These injectors are used for nerve agent first aid. This solution has a relatively high-freezing point and should be removed from the carrier and placed inside the field uniform in cold weather (below 45°F).

CBR UNIT EQUIPMENT

Each Seabee unit should have the equipment discussed below.

Automatic Chemical Agent Alarm M8A1

The M8A1 automatic chemical agent alarm consists of the M43A1 detector unit and the M42 alarm unit. This unit is the primary means of detecting chemical agents arriving in a unit area from an upwind chemical attack. It can detect chemical agents in vapor and aerosol form and can alert personnel by audible and visual signals. It is issued to platoons, companies, and similar units.

The M43 detector unit of the automatic chemical agent alarm continuously samples the air at its location and indicates the presence of nerve agents. The M43 gives an audible alarm. The M42 remote alarm unit provides both an audible and visual alarm when connected by wire to the M43 detection. The M42 audible alarm can be turned off manually. Up to five M42s can be connected to the M43 (fig. 9-6). Maximum cable length must not exceed 400 meters from the detector to the farthest alarm.

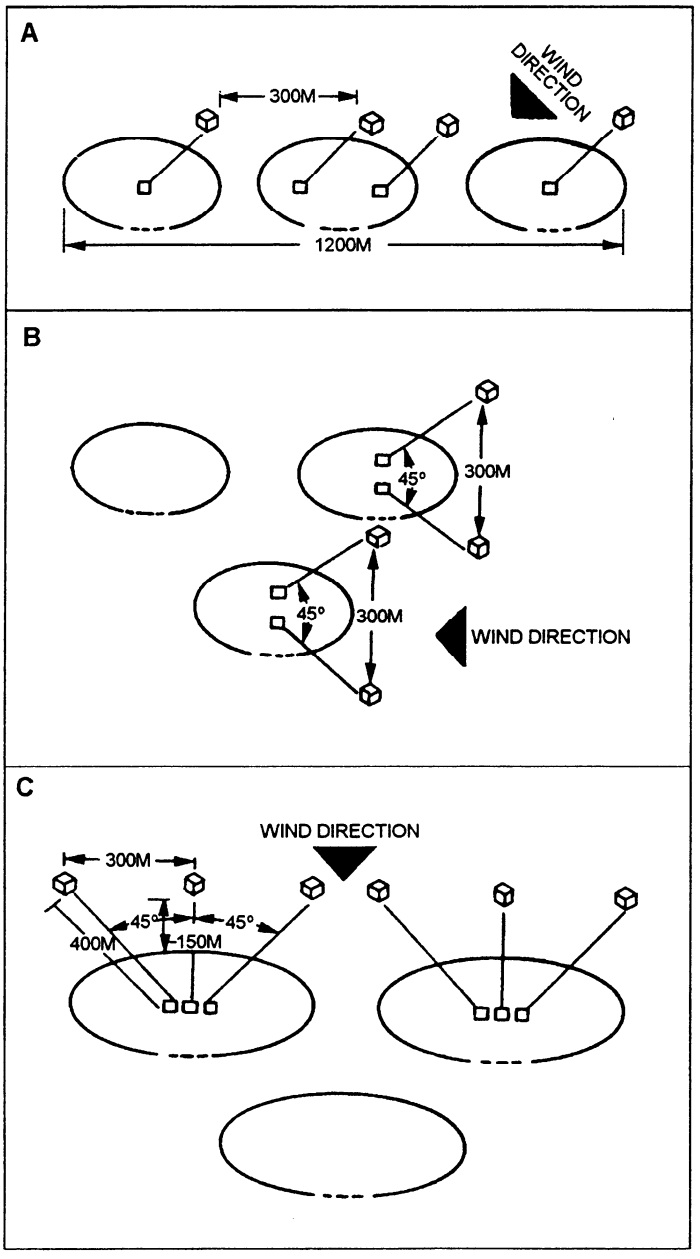
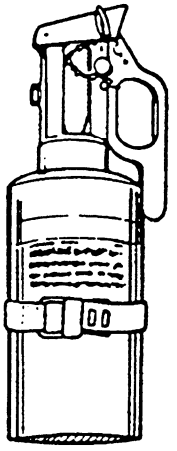


Figure 9-7.—Dep1oyment of automatic chemical agent alarms.

Figure 9-7, view A, shows a situation where four detectors are emplaced with three platoons online. Note the orientation on the wind direction. The detector is oriented on wind direction, not on the direction of the enemy. When the automatic chemical agent alarms are mounted on vehicles, consideration must be given to wind direction for the protection of the main body.

Figure 9-7, view B, shows an array using four detectors with the wind direction coming from the right flank of the unit. A significant difference between a four-detector may and a six-detector array is that with only four detectors the may must be shifted when the wind direction shifts greater than 20 degrees.

Figure 9-7, view C, shows a company in a defensive position with six detectors deployed. The actual number of alarm systems per unit varies depending upon the table of allowance (TOA). The 300-meter distance between the M43 detectors reduces the possibility that agent clouds might drift through holes in the array. This array provides a high probability of detecting an off-target attack within a reasonable warning time.



WARNING

DS2 IS FLAMMABLE. DS2 ALSO CAN SEVERELY BURN THE SKIN, CAUSE BLINDNESS, AND / OR DETERIORATE THE BATTLED DRESS OVERGARMENT. DO NOT USE IT NEAR AN OPEN FLAME OR ALLOW IT TO TOUCH SKIN OR CLOTHING. PERSONNEL HANDLING DS2 MUST WEAR PROTECTIVE CLOTHING AND EYE PROTECTION.

Figure 9-8.—ABC-M11 portable decontaminating apparatus.

NOTE

Remember that the detector is oriented on wind direction, **NOT** on the direction of the enemy.

IM-143/PD or IM-143A/PD Dosimeter

This is the standard tactical dosimeter in use today. It is a direct reading instrument capable of detecting and recording a total dose of up to 600 rads. It is termed a *pocket* dosimeter and is about the size and shape of a fountain pen.

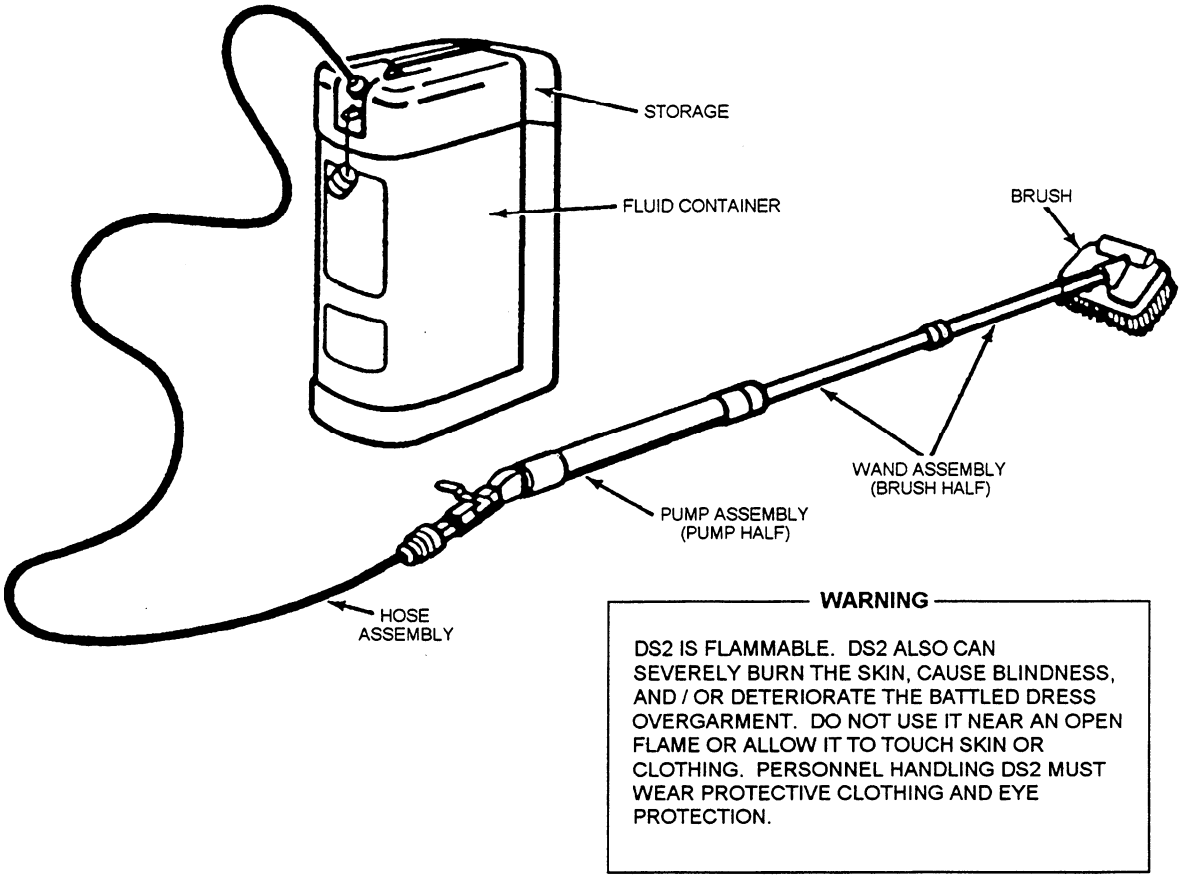


Figure 9-9.—M13 portable decontaminating apparatus.

AN/PDR-27 Radiac Set

It contains a low-range dose rate of a Geiger-Mueller type of instrument, used for monitoring contamination of personnel, food, and equipment. It measures gamma and detects beta radiation.

ABC-M11 Portable Decontaminating Apparatus, DS2

The ABC-Ml1 apparatus (fig. 9-8) decontaminates small areas, such as the steering wheel or other equipment, that Seabees must touch. It is a steel container with an aluminum spray-head assembly and a nitrogen-gas cylinder that provides the pressure. It is filled with 11/3 quarts of DS2, which is sufficient for covering 135 square feet. The effective spray range is 6 to 8 feet. After each use, refill the Ml1 with DS2 and fit it with a new nitrogen cylinder. It is now ready to use again.

M13 Portable Decontaminating Apparatus

Use the M13 apparatus to decontaminate vehicles and crew-served weapons larger than .50 caliber. The Ml 3 (fig. 9-9) is about the size of a 5-gallon gasoline can. It comes prefilled with 14 liters of DS2 decon agent. Decon capability is 1,200 square feet. A hose assembly, pump assembly, wand assembly, and brush are attached to the fluid container for disseminating DS2. The brush is for removal of thickened agents, mud, grease, or other material.

MISSION-ORIENTED PROTECTIVE POSTURE

Mission-oriented protective posture (MOPP) is a flexible system of protection against chemical agents, used to facilitate mission accomplishment in chemical warfare. MOPP requires the individual to wear protective equipment consistent with the chemical threat, the work rate imposed by the

Table 9-1.—MOPP Levels before Chemical Attack

MOPP LEVEL	OVERGARMENT	OVERBOOTS	MASK WITH HOOD	GLOVES
1	WORN, OPEN OR CLOSED BASED ON TEMPERATURE	CARRIED	CARRIED	CARRIED
2	SAME AS MOPP-1	WORN	CARRIED	CARRIED
3	SAME AS MOPP-1	WORN	WORN, HOOD OPEN OR CLOSED BASED ON TEMP	CARRIED
4	WORN, CLOSED	WORN	WORN, HOOD CLOSED	WORN

mission, and the temperature. (See table 9-1 for MOPP levels.)

All combat operations are conducted under the mission-oriented protective posture system. Of course, when there is no threat, then there is no protection requirement, but this is still a MOPP. At the other extreme, when there is a continuing, immediate threat of chemical attack and the enemy has the capability to produce an unacceptable casualty level among unprotected troops, the troops may be required to wear protective clothing and equipment for extended periods. In this case, some form of safe area must be provided, so troops can perform the necessary functions that require removal of some or all of the protective gear.

MOPP FLEXIBILITY-LIMITING FACTORS

The flexibility of MOPP in providing individual protection is limited by the temperature of the surrounding area, fatigue level of the troops, the degree to which the troops need to use their senses, and personal needs.

Heat Exhaustion

Individuals operating a moderate-to-heavy work rate while in chemical protective gear may experience heat exhaustion (dizziness and fainting) at any time, especially during periods of high temperature.

Fatigue

Individuals in frill chemical protective clothing and equipment tend to experience fatigue resulting from such factors as mask breathing resistance, increase in body temperature from work energy and solar heat, and psychological and physiological stress. This condition of fatigue increases the need for rest and sleep to maintain individual alertness and efficiency.

Senses

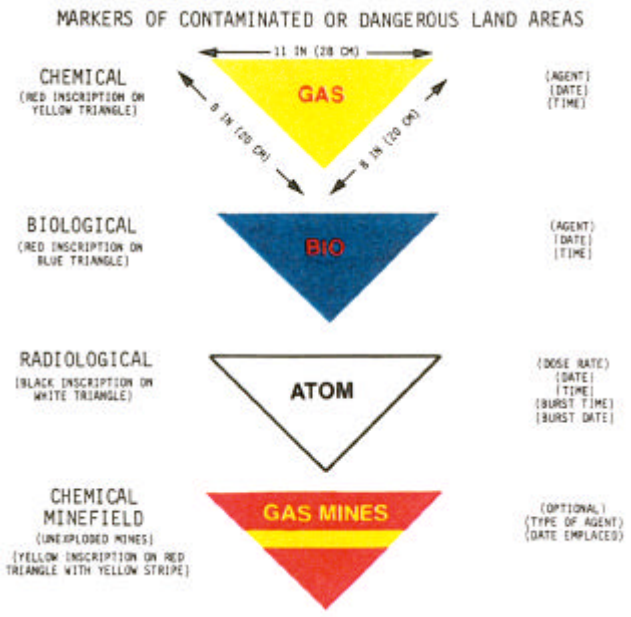
Individuals required to perform duties involving their senses or related functions, such as manual dexterity, visual activity, and voice communication, operate at varying levels of efficiency, depending on training and proficiency while in full protective gear.

Personal Needs

Individuals cannot be in full chemical protection for indefinite periods and still attend to certain personal needs, such as eating, caring for wounds, shaving, and eliminating of bodily wastes.

MARKING OF CONTAMINATED AREAS (STANAG 2002)

The markers, or signs, are used in areas containing radiological, biological, and chemical contamination. The colorings and markings of the signs are according



C3.178

Figure 9-10.—CBR contamination markers.

to STANAG 2002 and are shown in figure 9-10. The base of the triangle should be about 11 inches (28 cm) and the opposite sides about 8 inches (20 cm). The signs are in the shape of a right isosceles triangle (90 degrees by 45 degrees by 45 degrees) and are made of plastic, wood, metal, or other rigid material, with holes or "ears" that are used for hanging them about the ground. They are placed on wire boundary fences, poles, trees, or rocks.

CHEMICAL CONTAMINATION MARKERS

The triangle is yellow on both sides. The word *GAS* in red 2-inch (5 cm) block letters is placed on the side of the markers facing away from the contamination (front). Fluorescent paint is used, when available. The name of the agent, if known, and the date and time of detection are also placed on the front of the marker at the time of emplacement with paint, marking pencil, or grease pencil.

BIOLOGICAL CONTAMINATION MARKERS

The triangle is blue on both sides. The letters *BIO* in red (fluorescent paint, if available) 2-inch (5 cm) block letters are placed on the side of the marker facing away from the contamination (front). The name of the agent, if known, and the date and time of detection are also placed on the front of the marker at the time of emplacement.

RADIOLOGICAL CONTAMINATION MARKERS

The triangle is white on both sides. The word *ATOM* in black 2-inch (5 cm) block letters is placed on the side of the markers facing away from the contamination (front). The dose rate, date, and time of reading, and the date and time of burst, if known, are also placed on the front of the marker at the time of emplacement.

CHEMICAL MINEFIELD MARKERS

The triangle is red on both sides. On the side facing away from the contamination (front) appear the words *GAS MINES* in yellow 1-inch (2.5 cm) block letters (fluorescent paint, if available) with a horizontal yellow l-inch (2.5 cm) stripe underneath the lettering. The chemical agent in the mines and the date of emplacement may also be inscribed on the front of the marker if desired by the commander.