

FIELD MANUAL

**CHEMICAL, BIOLOGICAL, RADIOLOGICAL,
AND NUCLEAR DEFENSE**

FOREWORD

SUMMARY OF SIGNIFICANT NEW DOCTRINE AND CHANGES FROM DECEMBER 1968 EDITION

1. The manual has been reorganized into four parts as follows:
Part One, Introduction to CBR and Nuclear Defense, and Parts Two, Three, and Four, Guidance on CBR and Nuclear Defense for the Individual, Unit (company) Commander, and Commander and Staff (above company level), respectively.
2. New doctrine has been provided in the following areas:
 - a. Classification of chemical agents according to the President's policy statement on the Geneva Protocols.
 - b. Basic CBR defense doctrine.
 - c. CBR defense standards of proficiency.
 - d. Chemical protective clothing, including the new overgarments.
 - e. M17A1 chemical-biological protective mask, including replacement criteria for the filter elements.
 - f. Mission-oriented protective posture (wearing of chemical protective clothing and mask in a chemical environment).
 - g. First aid for unidentified chemical agents.
 - h. Unit (company) CBR defense organization and operations.
 - i. Unit CBR hazard detection and warning system, including the M8 automatic chemical agent alarm.
 - j. Unit chemical decontamination.
 - k. Individual actions in a chemical environment.
 - l. Biological defense for the individual and the unit.
 - m. Unit tactical dosimetry in a radiological environment.
 - n. CBR defense organization and responsibilities for the commander and staff above company level.
 - o. CBR agent/material detection and identification organization in a theater of operations.
 - p. Organization for reporting NBC attacks and warnings of CBR hazard areas in a theater of operations.
 - q. Chemical collective protection shelters.
 - r. Personnel decontamination stations.
 - s. Prediction of downwind chemical and biological hazard areas from an enemy attack.

FIELD MANUAL }
FM 21-40 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 17 May 1971

CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR DEFENSE

	Paragraphs	Page
PART ONE. INTRODUCTION TO CBR AND NUCLEAR DEFENSE		
CHAPTER 1. GENERAL	1- 1— 1- 5	1-1
2. THE CBR AND NUCLEAR THREAT (STANAG 2083)		
Section I. Introduction	2- 1— 2- 5	2-1
II. Chemical Weapon Effects	2- 6— 2-15	2-2
III. Biological Weapon Effects	2-16— 2-24	2-7
IV. Nuclear Weapon Effects	2-25— 2-30	2-11
PART TWO. CBR AND NUCLEAR DEFENSE GUIDANCE FOR THE INDIVIDUAL		
CHAPTER 3. INDIVIDUAL CBR DEFENSE RESPONSIBILITIES	3- 1— 3- 4	3-1
4. DEFENSE AGAINST CHEMICAL ATTACK (STANAG 2047)		
Section I. Individual Chemical Protection	4- 1— 4- 6	4-1
II. Individual Defense Measures Against a Chemical Attack	4- 7— 4-12	4-9
III. Individual First Aid	4-13— 4-21	4-12
IV. Individual Chemical Decontamination	4-22— 4-25	4-14
V. Individual Defensive Measures in a Chemical Environment	4-26— 4-30	4-16
CHAPTER 5. DEFENSE AGAINST BIOLOGICAL ATTACK (STANAG 2047)	5- 1— 5- 7	5-1
6. DEFENSE AGAINST NUCLEAR ATTACK AND RADIOLOGICAL HAZARDS (STANAG 2047)		
Section I. Individual Defensive Measures Before and During a Nuclear Attack	6- 1— 6- 3	6-1
II. Individual Defensive Measures After a Nuclear Attack	6- 4— 6- 7	6-2
PART THREE. CBR AND NUCLEAR DEFENSE GUIDANCE FOR THE UNIT COMMANDER		
CHAPTER 7. UNIT CBR DEFENSE ORGANIZATION (STANAG 2047 and STANAG 2103)	7- 1— 7- 6	7-1
8. UNIT DEFENSE AGAINST CHEMICAL ATTACK (STANAG 2002 and SOLOG 125)		
Section I. Unit Defensive Measures in a Chemical Environment	8- 1— 8- 7	8-1
II. Mission-Oriented Protective Posture (MOPP)	8- 8— 8-13	8-4
III. Unit Chemical Agent Detection	8-14— 8-17	8-9
IV. Unit Chemical Decontamination	8-18— 8-21	8-14
CHAPTER 9. UNIT DEFENSE AGAINST BIOLOGICAL ATTACK (STANAG 2002 and STANAG 2047)	9- 1— 9- 7	9-1
10. UNIT DEFENSE AGAINST NUCLEAR ATTACK	10- 1—10-10	10-1
11. UNIT DEFENSE AGAINST RADIOLOGICAL HAZARDS (STANAG 2002, STANAG 2047, and SOLOG 125)	11- 1—11-14	11-1
PART FOUR. CBR AND NUCLEAR DEFENSE GUIDANCE FOR THE COMMANDER AND STAFF		
CHAPTER 12. COMMAND AND STAFF RESPONSIBILITIES FOR CBR AND NUCLEAR DEFENSE	12- 1—12- 4	12-1

*This manual supersedes FM 21-40, 20 December 1968, including all changes.

	Paragraphs	Page
CHAPTER 13. ORGANIZATION FOR CBR AND NUCLEAR DEFENSE ABOVE COMPANY LEVEL	13- 1-13- 5	13-1
14. OPERATIONS IN A CBR AND NUCLEAR ENVIRONMENT (STANAG 2002, STANAG 2079, STANAG 2103, and STANAG 2112)		
Section I. Detection and Identification of CBR Agents/Materials	14- 1-14- 7	14-1
II. Reporting of NBC Attacks and Warnings of CBR Hazards	14- 8-14-13	14-5
III. CBR Collective Protection	14-14-14-18	14-8
IV. Large-Scale Decontamination	14-19-14-22	14-11
V. Radiological Surveys	14-23-14-30	14-13
VI. Tactical Dosimetry	14-31-14-34	14-15
APPENDIX A. REFERENCES		A-1
B. CBR DEFENSE STANDARDS OF PROFICIENCY		B-1
C. DECONTAMINATING MATERIALS AND THEIR USES		C-1
D. CBR ANNEX TO A UNIT SOP: DEFENSE AGAINST CHEMICAL, BIOLOGICAL, AND NUCLEAR ATTACKS		D-1
D-I. EXAMPLE OF A CB ANNEX TO A COMPANY SOP: DEFENSE AGAINST CHEMICAL AND BIOLOGICAL ATTACKS		D-2
D-II. EXAMPLE OF AN NR ANNEX TO A COMPANY SOP: DEFENSE AGAINST NUCLEAR ATTACK AND RADIOLOGICAL HAZARD		D-5
D-III. LIST OF QUESTIONS SUITABLE FOR THE INTELLIGENCE ANNEX TO A DIVISION SOP: CBR ESSENTIAL ELEMENTS OF INFORMATION		D-9
E. REPORTING NUCLEAR DETONATIONS, RADIOACTIVE FALLOUT, AND CHEMICAL AND BIOLOGICAL ATTACKS (STANAG 2103)		E-1
F. MARKERS FOR CONTAMINATED OR DANGEROUS LAND AREAS (STANAG 2002)		F-1
G. EMERGENCY WARNINGS FOR CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL HAZARDS OR ATTACKS (STANAG 2047)		G-1
H. PREDICTION OF CHEMICAL AND BIOLOGICAL HAZARD AREAS FROM AN ENEMY ATTACK		H-1
INDEX		Index-1

PART ONE
INTRODUCTION TO CBR AND NUCLEAR DEFENSE
CHAPTER 1
GENERAL

1-1. Purpose

This manual provides doctrine on chemical, biological, radiological (CBR), and nuclear defense and on operations in a chemical, biological, and radiological environment.

1-2. Scope

This manual provides guidance on the defensive measures required against chemical and biological agents, and the initial effects and subsequent radiological hazards from nuclear bursts.

a. The manual also provides guidance on defensive measures required against enemy irritant agents (similar to U.S. riot control agents).

b. The manual is divided into four parts as follows:

(1) *Part One, Introduction to CBR and Nuclear Defense*, describes the nature of potential enemy chemical, biological, and nuclear and radiological threats, and the United States CBR and nuclear defensive doctrine.

(2) *Part Two, CBR and Nuclear Defense Guidance for the Individual*, provides guidance for individual defense against an enemy chemical, biological, and nuclear attack, and guidance on the defensive measures required during operations in a chemical, biological, and radiological environment. Detailed techniques and procedures for using individual defensive equipment and material are given in the references listed in appendix A.

(3) *Part Three, CBR and Nuclear Defense Guidance for the Unit Commander*, provides guidance for the commanders of company and comparable size units on defense against a chemical, biological, and nuclear attack and on the defensive measures required during operations in a chemical, biological, and radiological environment.

(4) *Part Four, CBR and Nuclear Defense Guidance for the Commander and Staff*, provides general guidance to commanders above company level and staff officers on CBR and nuclear defense responsibilities and planning, and on organization for CBR defense.

1-3. International Standardization Agreements

This manual is in consonance with the international standardization agreements (STANAG) listed below. These STANAG are identified by type of agreement and number at the beginning of each appropriate chapter or appendix in the manual. The following terms are used to describe the types of agreements: NATO STANAG—STANAG applicable to nations of the North Atlantic Treaty Organization; CENTO STANAG—STANAG applicable to nations of the Central Treaty Organization; SEATO SEASTAG—Southeast Asia STANAG applicable to nations of the Southeast Asia Treaty Organization; ABCA SOLOG—Standardization of Certain Aspects of Operations and Logistics among the American, British, Canadian, and Australian Armies.

<i>Title</i>	<i>NATO STANAG</i>	<i>CENTO STANAG</i>	<i>SEATO SEASTAG</i>	<i>ABCA SOLOG</i>
Marking of Contaminated or Dangerous Land Areas	2002	2002	2002	---
Emergency Warnings of Hazard or Attack	2047	2047	---	110
Rear Area Security and Rear Area Damage Control	2079	2079	2079	---
Radiological Hazards	2083	---	2083	---
Reporting Nuclear Detonations, Radioactive Fallout, and Biological and Chemical Attacks	2103	---	---	123
Radiological Survey	2112	---	2112	---
Minimum Potability Standards for Field Water Supply	---	---	---	125
Organization and Doctrine for Explosive Ordnance Disposal Operations ..	---	---	2314	---

1-4. Recommended Changes

Users of this manual are encouraged to submit recommended changes and comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the manual in which the change is recommended. Reasons will be provided for each comment to insure understanding and complete evaluation. Formal comments on DA Form 2028 (Recommended Changes to Publications), informal comments by letter, and inquiries should be forwarded direct to the Commanding Officer, U.S. Army Combat Developments Command Chemical-Biological-Radiological Agency, Fort McClellan, Alabama 36201.

1-5. Explanation of Terms

The following terms are used in this manual as indicated:

a. CBR Defense. This is a collective term denoting an activity involving defense against enemy employment of chemical and biological agents and radioactive material.

b. Chemical, Biological, or Radiological Environment.

(1) Chemical environment or biological environment refers to the presence of chemical or biological agents in the atmosphere or on the ground as an aerosol or a vapor or as liquid or solid particles.

(2) Radiological environment refers to the presence of radioactive material (mostly gamma emitters) in an area.

c. NBC Defense. This is a collective term denoting an activity involving defense against nuclear, biological, and chemical weapons.

d. Nuclear Environment. This is a form of conflict on a varying scale from nonnuclear war to the use of nuclear weapons in such numbers as to preclude significant ground maneuver. Between these two extremes is an intermediate scale of nuclear weapons employment in which both fires and maneuver are significant elements of firepower.

CHAPTER 2

THE CBR AND NUCLEAR THREAT

(STANAG 2083)

Section I. INTRODUCTION

2-1. The Nature of the CBR and Nuclear Threat

Based upon an evaluation of the potential enemy CBR and nuclear threat during a general war, United States forces will be faced with an enemy capable of employing chemical agents, biological agents, and nuclear weapons that produce radiological contamination.

a. Historical Background. Some nations employed chemical agents during World War I and subsequent military operations, some nations employed biological agents during military operations, and the United States employed two nuclear weapons during World War II.

b. Enemy Employment Doctrine. Accepted enemy doctrine of employment is to use chemical weapons in tactical operations, biological weapons in strategic operations, and nuclear weapons as required.

c. Enemy CBR and Nuclear Threat. United States forces will be faced with the threat of enemy attacks with chemical weapons (para 2-6—2-15), biological weapons (para 2-16—2-24), and nuclear weapons producing radiological contamination (para 2-25—2-30).

2-2. United States CBR and Nuclear Defense Doctrine

The basic United States CBR and nuclear defense doctrine is as follows:

a. Chemical and Biological. If there is an imminent threat of enemy employment of chemical and biological weapons, commanders will direct subordinate units to assume the *mission-oriented protective posture*, described in paragraphs 8-8 through 8-13, if they have not already done so. All enemy artillery and air attacks will be considered probable *chemical* attacks until proved otherwise. This doctrine is predicated on the

necessity for the adoption of a defensive posture that will provide protection against the chemical threat, requiring personnel to be dressed in both chemical protective clothing and masks *before* the chemical attack occurs. This defensive posture also provides protection against the biological threat.

b. Nuclear. If there is an imminent threat of enemy employment of nuclear weapons, commanders will consider the possibility of fallout of radioactive material in addition to the initial nuclear effects and will direct subordinate units to take appropriate defensive actions.

2-3. General Organization for CBR and Nuclear Defense

The normal command and staff structure at all levels of command is used for CBR defense organization and training according to AR 220-58. Each staff section at each command level is responsible to the commander for those phases of CBR defense training and operations within its area of interest. For organization of CBR and nuclear defense at higher levels of command, see paragraphs 13-1 through 13-5.

a. Chemical Officers and NCO. Chemical officers and noncommissioned officers (NCO) and other enlisted personnel are assigned to staffs of major tactical organizations down to brigades; they are also assigned to staffs of logistical commands. Chemical officers are also assigned to support commands and division artillery, and chemical NCO are authorized as augmentations to maneuver battalions. Chemical officers and NCO are assigned to various staff sections at other levels of command and in other type units. Thus, chemical officers and NCO advise the commander and staff on CBR defense matters either directly or through their respective staff

sections. Chemical personnel at all levels of command may supervise CBR defense operations, the CBR defense training of subordinate units, and the conduct of schools for this training. For details of duties and responsibilities of chemical officers and NCO, see FM 101-5, FM 7-30, FM 3-12, and FM 3-1.

b. CBR-Trained Personnel. Commanders of battalion and higher level headquarters that are not assigned a chemical officer appoint a school-trained CBR defense officer on an additional duty basis. Commanders of battalions and comparable headquarters that are not assigned a chemical NCO appoint on an additional duty basis a school-trained CBR defense NCO to perform CBR defense duties in the operations section.

c. CBR Center or Element. Major commanders are authorized CBR positions required to staff a CBR center or comparable CBR element of a tactical operations center. For details of the organization and operations of a CBR center or element, see FM 3-1.

d. Company CBR Defense Organization. For CBR defense organization of company-size units, see paragraph 7-2.

Section II. CHEMICAL WEAPON EFFECTS

2-6. General

Chemical agents are chemical compounds that are used in military operations to kill, incapacitate, or seriously injure personnel through their chemical properties. Specifically *excluded* are U.S.-type riot control agents, chemical herbicides, smoke, and flame. Enemy chemical agents are classified according to their action and effects. In general, increased doses of a specific agent will produce a corresponding increase in the severity of the effects; for example, effects produced by nerve agents may range from disability to death, depending on the dose received. The characteristics of the types of known enemy chemical agents and irritant agents are shown in figure 2-1, and important characteristics are described below. Detailed descriptions of the agents are included in paragraphs 2-7 through 2-13.

a. Respiratory Effects. Some chemical agents produce their effects through the respiratory system and are dose dependent. The dose received

2-4. CBR and Nuclear Defense Responsibilities

Defense against chemical, biological, and nuclear attacks is a command responsibility. Units must be trained, equipped, and supplied for defense against these types of attacks to increase the unit's capability to operate in a chemical, biological, or radiological environment.

2-5. CBR and Nuclear Defense Planning

CBR and nuclear defense planning begins with an orderly analysis of all available information and directives to form a basis for establishing standing operating procedures (SOP) and operational, training, and logistical directives necessary for continued operations in a chemical, biological, or radiological environment. With the advice of chemical staff personnel, the commander makes his estimate of the enemy chemical, biological, and nuclear threat; the degree of preparedness required to meet this threat; and the measures necessary to implement the higher commander's CBR defense decisions. CBR defense planning is normally coordinated at separate brigade or division and higher levels. The bases for CBR defense planning at unit level are SOP and directives from higher headquarters, which provide intelligence of the enemy's capability and intent to use chemical, biological, and nuclear weapons.

depends upon the amount, or concentration, of agent in the air and the length of time the individual is exposed to the concentration. For example, either prolonged exposure to low vapor concentrations or brief exposure to high vapor concentrations can produce harmful effects.

b. Skin Effects. Some chemical agents can produce their effects by the absorption of liquid agent through the skin. Harmful effects may result from failure to recognize and avoid liquid contamination or from failure to remove or neutralize liquid agent contamination on the skin or on the clothing or equipment being handled.

c. Cumulative Effect. Some agents have a cumulative effect, and repeated exposure to a normally noncasualty-producing (low) dose may eventually produce harmful effects.

d. Effects of Individual Activity. The effects of chemical agents are influenced by individual activity. The degree of activity will affect the rate of breathing which, in turn, affects the

TYPE OF AGENT	HOW NORMALLY DISSEMINATED	MEANS OF DETECTION ¹	SYMPTOMS IN MAN	EFFECTS ON MAN	RATE OF ACTION	INDIVIDUAL ²		PROTECTION REQUIRED	EQUIVALENT US AGENT ³	
						FIRST AID	DECONTAMINATION		SYMBOL/NAME	CHARACTERISTICS IN THE FIELD
A. TYPES OF ENEMY CHEMICAL AGENTS⁴										
NERVE	Aerosol or vapor	Automatic chemical agent alarm and chemical agent detector kits to detect vapors and aerosols; chemical agent detector paper to detect liquids.	Difficult breathing, drooling, nausea, vomiting, convulsions, and sometimes dim vision.	Incapacitates; kills if high concentration is inhaled.	Very rapid by inhalation; slow through skin.	Give atropine injection. Artificial respiration or resuscitation may be necessary.	None needed	Protective mask and protective clothing	GA--Tabun GB--Sarin GD--Soman	Colorless
	Liquid Droplet			Incapacitates; kills if contaminated skin is not decontaminated in time.	Delayed through skin; more rapid through eyes.				Flush eyes with water; use skin pad from M13 kit or wash skin with soap and water.	
BLISTER	Liquid droplet		Mustard; nitrogen mustard--no early symptoms. Lewisite; mustard-Lewisite--searing of eyes and stinging of skin. Phosgene oxime--irritation of eyes and nose.	Blisters skin, is destructive to upper respiratory tract; can cause temporary blindness. Some agents sting and form welts on skin, and others sear eyes.	Blistering delayed hours to days; eye effects more rapid. Mustard, Lewisite and phosgene oxime very rapid.	None	Flush eyes with water; use skin pad from M13 kit or wash skin with soap and water.	Protective mask and protective clothing	HD--Mustard HN--Nitrogen mustard L--Lewisite HL--Mustard-Lewisite CX--Phosgene oxime	Pale yellow droplets Dark droplets Dark, oily droplets Dark, oily droplets Colorless droplets
BLOOD	Vapor (gas)		Convulsions and coma.	Incapacitates; kills if high concentration is inhaled.	Rapid	Inhale amyl nitrite. Artificial respiration may be necessary.	None needed	Protective mask	AC--Hydrogen cyanide CK--Cyanogen chloride	Colorless
CHOKING	Vapor (gas)		Coughing, choking, nausea, and headache.	Damages and floods lungs.	Immediate to 3 hours	For severe symptoms, avoid movement and keep warm.	None needed	Protective mask	CG--Phosgene	Colorless
INCAPACITATING	Aerosol		May look like smoke at point of release.	Unpredictable, irrational behavior.	Temporarily incapacitates, mentally and physically.	Delayed	Remove excessive clothing in temperatures above 78°F.	Wash with soap and water.	Protective mask	BZ
B. TYPES OF ENEMY IRRITANT AGENTS⁵										
VOMITING	Aerosol	May look like smoke at point of release.	Coughing, nausea, vomiting, and headache.	Irritates and physically incapacitates.	Rapid	Move vigorously to lessen duration of effects.	Wash with soap and water.	Protective mask	DM--Adamsite	White to grayish yellow smoke
IRRITANT	Aerosol	May look like smoke at point of release, turning colorless. Instant eye irritation.	Coughing and copious tears.	Irritates respiratory tract, eyes, and skin.	Instantaneous	Face the wind with eyes open; do not rub eyes.	Flush eyes, face, and skin with water.	Protective mask	CS and CN--Riot control agents	White cloud

¹For US doctrine on detection of chemical agents on the battlefield, see paragraph 7-3b(1).

²For details of individual first aid and decontamination, see paragraphs 4-13 through 4-21.

³US agent symbols are used in this figure only for convenience and for reference. For details of equivalent US chemical agent and riot control agent characteristics, see TM 3-215.

⁴Mixtures of chemical agents, such as nerve agents and choking agents, may be used.

⁵Although irritant agents are not considered chemical agents, they have been used routinely in combat.

Figure 2-1. Characteristics of and defense against types of enemy chemical agents and irritant agents.

amount of agent inhaled and the ability to hold the breath while masking. The effects of some chemical agents on the skin are more rapid for active, perspiring individuals than for inactive individuals.

e. Contamination Effects. Some chemical agents can contaminate personnel, equipment, and terrain, and can cause casualties when in contact with or absorbed through the skin either directly or through vapors produced by the contamination.

f. Persistency Effects. Some chemical agents are persistent. The persistency (duration of effectiveness) of a chemical agent is dependent on its physical properties; the weather conditions; the method of agent dissemination; and the type and condition of the terrain, material, and equipment upon which the agent is deposited. The terms "persistent agent" and "nonpersistent agent" express the relative duration of effectiveness of chemical agents in the area of release. These terms do not refer to the duration of effects of agents on personnel.

g. Environmental Effects. All chemical agents are affected by the environment; their effectiveness will vary according to the weather or terrain conditions. For more detailed information see TM 3-240.

h. Means of Detection. All known enemy chemical agents can be detected. Chemical agent detection equipment is used as a means of detecting agents on the battlefield. The sense of smell must *not* be used as a means of detection because some chemical agents are so lethal that a few breaths will produce casualties.

2-7. Nerve Agents

Nerve agents directly affect the nervous systems of man and are highly toxic in both liquid and vapor forms. Whether these agents are absorbed through the skin or inhaled, the physiological effects are similar. These agents cause a runny nose, tightness of the chest, difficult breathing, excessive sweating, drooling, nausea, vomiting, dimness of vision (especially at night), sometimes pinpointing of the pupils of the eyes, convulsions, and death. The vapor is readily absorbed by the eyes and by tissues in the nose and throat. The liquid readily penetrates the skin, eyes, and tissues of the body. Characteristics and effects of nerve agents are described below.

a. Most nerve agents are quick acting when

inhaled, with some symptoms developing in 1 to 2 minutes after inhalation. They act more slowly when penetration is through undamaged skin.

b. When the eyes are exposed to a nerve agent vapor or aerosol, the pupils will become pinpointed. However, pinpointing of the pupils of the eyes may not occur for 5 to 10 minutes (or even longer) after exposure of the eyes to a very low vapor concentration of the agent.

c. When the skin is contaminated with nerve agent, the pupils of the eyes may remain normal or become only slightly reduced in size.

d. Nerve agents are generally odorless, colorless, and tasteless.

2-8. Blister Agents

Blister agents affect the eyes and lungs and blister the skin. Some types are painless, other types sting, and still other types form welts. They may appear as colorless to dark brown, oily liquid droplets but are normally invisible in vapor form. Characteristics and effects of blister agents are described below.

a. In liquid or vapor form, these agents may burn or blister any part of the body they contact, either external or internal. The degree of damage depends on the type and concentration of the agent, weather, degree of activity, and exposure time.

b. They are effective even in small quantities and produce delayed casualties. A drop of mustard-type agent the size of a pinhead may produce a blister 1 inch in diameter. Unprotected personnel exposed to a low vapor concentration of mustard-type agent for a period of time may eventually become casualties.

c. They have a marked effect on the eyes, producing redness, inflammation, and frequently temporary blindness.

d. Mustard-type agents are quickly absorbed by the skin. Reddening of the skin may appear any time up to 12 hours, depending on the degree of contamination and the weather conditions. Blisters may appear in a day or less following reddening. Healing time varies from about 6 days to as much as 8 weeks in severe cases of mustard-type agent burns, particularly in those cases involving moist skin areas such as the crotch and armpits.

e. Inhalation of blister agents causes serious

damage to tissues in the mouth, nose, throat, and lungs.

f. They often have a more serious effect than is immediately apparent. Exposure to some mustard-type blister agents may go unnoticed because these agents may cause no immediate pain and signs of injury may not appear for hours. The vapor of other type blister agents irritates the eyes and respiratory tract immediately, and the liquid stings the skin and produces pain within a few seconds.

g. Some mustard-type blister agents are odorless and others may have an odor like that of horseradish or garlic; other blister agents may have a disagreeable or biting odor.

2-9. Blood Agents

Blood agents usually are disseminated as gases or vapors and are absorbed into the body by breathing. They affect the circulatory and respiratory systems by preventing the use of oxygen in the blood by the body cells. They cause symptoms ranging from convulsions to coma. After inhaling a *high* concentration of blood agent, individuals may become unconscious and die within minutes. The agents are colorless as gases; some may have a faint odor of peach kernels and some may irritate the nose.

2-10. Choking Agents

Choking agents usually are disseminated as gases and are absorbed into the body by breathing; they affect the respiratory system by damaging the lungs. In extreme cases, they cause the lungs to become filled with liquid, and produce the following symptoms: coughing, choking, feeling of tightness in the chest, nausea, headache, and watering of the eyes. Delayed effects, occurring 2 to 24 hours after exposure, usually follow a period during which the individual experiences no initial effects. These delayed effects include rapid and shallow breathing, painful cough, discomfort and fatigue, shock, and frequently death. These agents usually are colorless as gases and may have an odor similar to that of new mown hay.

2-11. Incapacitating Agents

Incapacitating agents usually are disseminated as aerosols and are absorbed into the body by breathing. They produce temporary physiological or mental effects that prevent individuals from performing their duties for hours or days after

exposure to the agent has ceased. The agent produces its effects through the respiratory system and causes temporary incapacitation, normally with complete recovery. Some of the common symptoms of incapacitating agents are: confusion, headache, drowsiness, and a slowing of mental and physical activity.

2-12. Vomiting Agents

Vomiting agents are not considered chemical agents as defined in paragraph 2-6. Normally they are disseminated as aerosols and produce the following symptoms: coughing, sneezing, irritation of the nose and throat, aching gums and teeth, and salivation and headache; high concentrations cause nausea and vomiting. The agent aerosol may be white or yellow at the point of release and usually becomes colorless when mixed with air. In low concentrations, these agents may smell like burning fireworks.

2-13. Irritant Agents

Irritant agents are not considered chemical agents as defined in paragraph 2-6. Normally they are disseminated as aerosols and produce immediate irritation of the eyes, accompanied by tears; irritation of the nose; and a stinging sensation on warm, moist skin. Some irritant agents produce instant and extreme irritation of the eyes, copious tears, coughing, difficult breathing, and a runny nose. During hot weather, high concentrations or constant, repeated exposures may produce mild burns of the skin. High concentrations may also produce nausea, vomiting, and dizziness.

2-14. Methods of Disseminating Chemical Agents

Chemical agents may be disseminated by ground munitions, dropped from aircraft in bombs or bomblets, or released as spray from aircraft or missiles. Some of the weapon systems that the enemy might use to disseminate chemical agents are shown in figure 2-2. In addition to the listed munitions, improvised devices may be used to disseminate some chemical agents.

2-15. Enemy Use of Chemical Agents

A better understanding of chemical defense requirements may be gained by being aware of the conditions under which the enemy employs chemical agents, how weather and terrain affect these agents, and some of the means of agent dissemi-

TYPE OF AGENT ¹ ↓	MUNITIONS								
	ARTY/MORTAR	MISSILE	ROCKET	AIRCRAFT SPRAY	BOMB or BOMBLET	GRENADE	LANDMINE	DISPERSER	CANDLE or POT
A. WEAPON SYSTEMS FOR DISSEMINATING CHEMICAL AGENTS									
NERVE	■	■	■	■	■	■	■	■	■
BLISTER	■	■	■	■	■	■	■	■	■
BLOOD	■	■	■	■	■	■	■	■	■
CHOKING	■	■	■	■	■	■	■	■	■
INCAPACITATING	■	■	■	■	■	■	■	■	■
B. WEAPON SYSTEMS FOR DISSEMINATING IRRITANT AGENTS									
VOMITING	■	■	■	■	■	■	■	■	■
IRRITANT	■	■	■	■	■	■	■	■	■

¹Mixtures of chemical agents, such as nerve agents and choking agents, may be used.

Figure 2-2. Probable enemy weapon systems for disseminating chemical agents and irritant agents.

nation. It is likely that enemy forces will employ mixtures of chemical agents, possibly with screening smokes. As a guide for possible enemy doctrine on the employment of chemical agents, see

FM 3-10 for U.S. doctrine on the employment of equivalent chemical agents.

a. Objectives. In a general war, the enemy may employ chemical agents to disable, kill, de-

moralize, or harass personnel and to contaminate areas, equipment, and supplies. In stability operations, the enemy is likely to employ irritant agents, vomiting agents, or combinations of these agents in smoke.

b. Weather and Terrain. Weather conditions have a significant effect on the behavior of chemical agents when they are released. Chemical agents may be used in most weather conditions and at any time of day or night. However, there are certain conditions and times when they can be employed most effectively; the most favorable conditions usually occur at night, during early morning, at dusk, and when there is a heavy overcast and the winds are steady and light. Smooth terrain usually is more favorable for employment of chemical agents than rough terrain, and low places generally are more favorable than high areas since chemical agents have a tendency to linger and settle in low places.

c. Techniques of Enemy Chemical Attacks. The

purpose, type, and primary effect of an enemy chemical attack may be evaluated by determining the weapon system and employment technique that are used.

(1) *Persistent-effect chemical agents.* If the enemy chemical attack consists of liquid droplets from airburst artillery munitions and bomblets, spray from aircraft, or liquid droplets from bulk-filled missile warheads, chemical agents with a primarily persistent effect are probably being used. The chemical agents may include persistent nerve agents, blister agents, or combinations of these agents.

(2) *Nonpersistent-effect chemical agents.* If the enemy chemical attack consists of vapors and aerosols from point-detonation or near-surface detonation of artillery munitions, bombs, or bomblets, chemical agents with a primarily nonpersistent effect are probably being used. The chemical agents may include nerve agents, blister agents, blood agents, choking agents, or various combinations of nonpersistent aerosolized agents.

Section III. BIOLOGICAL WEAPON EFFECTS

2-16. General

Biological agents are microorganisms that are used in military operations to cause disease among personnel, animals, or plants and, to a lesser extent, cause deterioration of materiel. Although these agents act on different targets and produce varying effects on the targets, the ultimate objective of enemy use of biological agents is to reduce the ability of military personnel to fight. This objective may be accomplished by destroying or degrading military manpower and by creating food and supply shortages. This manual is primarily concerned with the threat of enemy use of biological agents against military personnel directly.

2-17. Characteristics of potential Enemy Antipersonnel Biological Agents

Potential enemy antipersonnel biological agents consist of groups of generally living microorganisms, such as bacteria, rickettsia, and viruses. The individual microorganisms within these groups are affected differently by their environment. Most of them are easily destroyed by sunlight or other adverse environmental conditions within hours, while others remain effective for longer periods of time under the same conditions. The majority of the possible enemy biological agents can be disseminated in aerosol

form and are thus readily spread by the winds. Others can be transmitted by vectors such as mosquitoes.

2-18. Effects of Antipersonnel Biological Agents

The effects of enemy antipersonnel biological agents generally are the same as for any known diseases with which a specific agent is associated, such as typhoid or influenza. A diagnosis of the disease may be made by a medical officer on the basis of signs, symptoms, and clinical findings associated with a specific biological agent. The effects can vary from minor incapacitation, such as from a common cold, to prolonged illness which may result in death, such as from plague. See TM 3-216 for a description of diseases that can be produced by possible enemy antipersonnel biological agents.

a. Biological agents are capable of producing disease, the severity of which depends on the following: the characteristics of the specific agent, the dose received, the route of entry of the agent into the body, what defenses the body may have against that specific agent, the speed and type of treatment, and the ability of the agent to break down body defenses and to interfere with normal body functions.

b. The effects of biological agents, as with all diseases, are delayed for varying periods of time. This delay, normally referred to as the incubation period, generally is expressed as a range of time, with each agent having ranges associated with the specific disease; it is measured from the time the agent enters the body until the body first shows symptoms of the disease.

c. The effects of antipersonnel biological agents may be altered in several ways. Massive doses of the agent may shorten the incubation period and change the progress of the disease. The introduction of biological agents into the body through an unnatural route of entry rather than through the natural route for that disease may change the symptoms so that the disease would not be recognizable by a physician. The combination of two or more biological agents may mask identification of either agent, with the resulting disease producing a set of symptoms that is not wholly associated with either agent.

2-19. Factors that Affect Infection

In most cases, the normal healthy body is capable of overcoming the invasion of small quantities of disease-producing microorganisms or germs. However, the body's defenses are a relative matter; it is generally expected that they will not be able to overcome the mass invasion of disease germs likely to be encountered from an enemy biological attack. Some of the factors involved in the infection of individuals by biological agents are: the route of entry of the agent into the body, the dose required to cause infection by that route of entry, and the potency of the agent at the time it enters the body.

a. *Openings in the Body.* The three basic openings through which a biological agent may enter the body are—

(1) *The respiratory tract*, which is the most susceptible to invasion by biological agents. Once biological agents enter the respiratory tract, they can easily pass into the bloodstream and rapidly spread throughout the body.

(2) *The broken skin*, which does not provide protection against biological agents. However, the unbroken skin provides excellent protection against biological agents. Certain agents that are introduced through a wound in the skin or a bite by vectors, such as insects, may enter the bloodstream and produce serious disease.

(3) *The digestive tract*, which is the least susceptible point of entry for biological agents.

b. *Body Defenses.* The infective dose requirements, progress of the disease, severity of the disease, and symptoms can be drastically altered by specific immunity of the target personnel. Immunity to a specific disease can be natural or acquired either by previous exposure or by inoculation.

2-20. Factors that Influence the Effectiveness of Biological Agents

The ability of biological agents to survive in the atmosphere as an aerosol is influenced by many factors, which are discussed in detail in paragraphs 2-23 and 2-24. Some of the more significant of these factors are—

a. *Light.* Most biological agents are destroyed by exposure to sunlight (ultraviolet light).

b. *Temperature.* Many biological agents die more rapidly in high temperature than in low temperature.

c. *Moisture.* Many biological agents die more rapidly when the moisture (relative humidity) in the air is low than when it is high.

2-21. Methods of Disseminating Biological Agents

Since most biological agents are living organisms, the delivery system must be capable of disseminating the agents, alive, and in a manner so that the organisms will spread over the target area. Antipersonnel biological agents can be delivered by enemy ground, air, or sea-launched munitions. Probable enemy methods of delivery are illustrated in figure 2-3. The basic methods for disseminating the agents are either through the generation of an aerosol or by the use of disease-carrying vectors.

a. *Aerosols.* Aerosols are particles composed of many organisms, or individual organisms, which are dispersed into the air and transported by air currents. To be effective as an aerosol, biological agents must be disseminated so that when they reach the target area, a percentage of the organisms remains alive and capable of causing disease.

(1) *Explosive bomblets.* Explosive bomblets normally consist of a small, low order explosive burster, which is surrounded by biological agent fill and is inclosed in a thin metal or plastic-type case. The bomblets are designed to disperse over a wide area when released. Upon impact the burster explodes and disseminates the agent as an

aerosol. The heat and shock from the explosion usually kill some of the organisms.

(2) *Generators.* Biological agent generators normally consist of a container that has a source of pressure which replaces the explosive charge, a nozzle device, and an agent fill. The container is designed to disperse in flight as a bomblet, or it may be covertly set up in the target area. When the generator is activated, the pressure forces the agent fill through the nozzle device and creates an aerosol. The generator does not kill as many of the organisms as an explosive bomblet does and is relatively quiet in operation.

(3) *Spray tanks.* Spray tanks can be carried by aircraft or by missiles. They contain a large quantity of agent and are capable of producing effective aerosols over extremely large areas. Like the generator, the spray tank uses some form of pressure and a nozzle device to create the aerosol. The agent loss in dispersion is roughly equal to that of the generator.

b. Vectors. Vectors, such as insects, which carry disease can be delivered to the target area in containers by aircraft or missiles. The container ruptures on impact and releases the vectors. The vectors seek out a host—man—and transmit the disease organism through the skin. Biological agents dispersed by vectors can infect personnel who are protected by the chemical-biological protective mask; they can produce disease throughout the life span of the vector within any area the vectors travel. Possible vectors that can carry disease germs are mosquitoes, mites, ticks, and lice.

2-22. Biological Weapons Delivery Techniques

Biological weapons are difficult to counteract, and an understanding of possible delivery techniques is helpful in defending against them. Known characteristics of a biological attack are described below. Local indications of a biological attack are described in paragraph 5-5.

a. Multiple-Point Source Biological Munitions. Biological bomblets or containers can be distributed over a fairly large area as follows:

(1) Missile-delivered warheads may contain bomblets which are distributed over an area by bursting the warhead at a predetermined height. The bomblets disperse to cover a generally circular area.

(2) Aircraft can deliver bomblets in a va-

riety of ways: by releasing the bomblets all at one time, by releasing them at intervals from dispersers, or by ejecting them out in various directions from bomblet dispersing devices.

(3) Aircraft can release bombs that contain clustered bomblets which are released at predetermined heights by a time fuze.

b. Line-Source Biological Munitions. Biological munitions can be delivered in a line to disseminate the biological agents over a large area downwind of the line of release.

(1) Elevated line-source biological agents can be released from spray tanks mounted on aircraft.

(2) Ground line-source biological agents can be released from bomblets that are ejected from dispensers mounted on aircraft or missiles at controlled rates. The bomblets impact in a line and burst to release the agent. Agents can also be released along the ground by a vehicle.

2-23. Effects of Meteorological Conditions

The most favorable conditions for employing biological agents normally exist at night, from about 1 hour before sunset to 1 hour after sunrise.

a. Temperature. Moderately cool temperatures favor the survival of most biological agents. Certain vectors, such as insects, will normally be less active during cool to cold temperatures than in hot weather.

b. Atmospheric Stability. Inversion conditions favor the downwind travel of biological agent aerosols to great distances. Lapse conditions produce turbulence that causes agent aerosols to lift and disperse quickly. Neutral conditions produce effects intermediate between inversion and lapse.

c. Wind. Biological agents can be employed effectively at most windspeeds. However, downwind coverage is generally greater in high winds than in low winds under the same atmospheric conditions.

d. Sunlight. Sunlight usually is very destructive to biological agents, except insect-borne disease germs, and thereby reduces the area coverage of agent aerosols.

e. Moisture in the Air. Moisture in the air influences the rate at which most microorganisms decay or die. In general, most biological agent aerosols can be expected to be more effective



	<p>AIRCRAFT SPRAY</p>
	<p>AERIAL BOMBLETS</p>
	<p>BOMBLETS FROM MISSILES</p>
	<p>ROCKETS</p>
	<p>VECTORS</p>
	<p>AEROSOL GENERATORS</p>
	<p>COVERT/SABOTAGE</p>

Figure 2-3. Probable enemy methods of delivering biological agents.

than normal in humid atmospheres, thereby increasing area coverage. When the amount of moisture in the air is low, these biological agent aerosols can be expected to be less effective than normal, thereby decreasing area coverage. However, a few "dry-type" biological agents can be expected to survive in low humidity.

2-24. Effects of Terrain Conditions

Biological agent aerosols tend to flow over rolling

terrain and down valleys in generally the same manner as airborne particles such as smoke. Vegetation may remove some agent particles from the air by impaction, and may slow downwind travel. Heavily wooded areas such as jungle canopy permit some agents to persist for longer periods of time than normal because of lack of sunlight. Ground contamination after a biological aerosol attack is not generally a hazard to troops crossing or occupying the terrain.

Section IV. NUCLEAR WEAPON EFFECTS

2-25. General

Nuclear weapons are used in military operations to produce casualties by three effects: blast, thermal radiation (heat and light), and nuclear radiation (fig 2-4). The extent and relative importance of the three effects will depend on the weapon type; height of burst; distance from the detonation; hardness of the target; and yield of the weapon, which is measured in kilotons (KT) or megatons (MT). Although not considered practicable, radioactive materials can be disseminated by means other than nuclear weapons, with the resulting effect restricted to nuclear radiation.

2-26. Types of Nuclear Explosions

Nuclear explosions are classified into three types according to height of burst: airbursts, surface bursts, and subsurface bursts. Field manuals of the 101-31-series contain details of the effects that height of burst, yield of weapon, and weapon type have on casualty production, materiel damage, and fallout and contingent effects.

a. Airbursts. When the fireball does not touch the surface of the earth, the nuclear explosion is called an airburst. Blast, initial nuclear radiation, and heat effects are increased in a low airburst. Fallout of radioactive material from an airburst is *not* of military significance. Neutrons from the detonation will cause induced radiation in the ground near ground zero (GZ). Except for very high airbursts, neutron-induced radiation in the area of ground zero will be of concern to both mounted and dismounted personnel who are required to go in or across the area. Radiological monitoring will be required as units pass through the area so that hazardous levels of nuclear radiation can be detected and avoided if possible.

b. Surface Bursts. When the fireball touches the surface of the earth, the nuclear explosion is called a surface burst. Blast, heat, and initial nuclear radiation effects are not as widespread as in an airburst; induced radiation is also present but is masked by residual radiation from fallout. Fallout of radioactive material from a surface burst may cover areas as large as hundreds of square kilometers, depending on the weapon yield, weapon design, and weather.

c. Subsurface Bursts. When the center of the fireball is beneath the surface of the ground (or

water), the nuclear explosion is called a subsurface burst. If the fireball of a subsurface burst breaks through the surface, fallout of radioactive material will occur. Heat will not be a significant hazard since it will be almost completely absorbed by the soil. Airblast effects are greatly reduced, and shock waves passing through the ground or water will extend for a limited distance. The range of initial nuclear radiation is considerably less than that from an airburst or a surface burst. Extremely hazardous residual radiation occurs in and around the crater, especially in the area covered by contaminated earth from the crater. If the fireball does not break through the surface so that the explosion is contained, shock waves will pass through the ground and subsidence craters may result.

2-27. Effects of a Nuclear Explosion

At the instant of a nuclear explosion, a fireball is produced that gives off a blinding flash of light, great quantities of heat, and nuclear radiation. When the fireball reaches maximum size, a blast wave is also produced. In surface bursts and in subsurface bursts in which the fireball breaks through the surface, the fireball—as it rises—creates an updraft that pulls significant amounts of material from the ground into the air, making both a radioactive stem and a radioactive cloud. The degree of hazard created by fallout from this cloud depends on the yield and type of weapon, height of burst, and weather.

a. Blast. Direct pressure from the blast can cause immediate death or injury to personnel and heavy damage to materiel. Indirect effects are caused by flying debris, overturning and dragging of objects, and collapse of structures. The shock wave has strong winds that pick up and toss through the area loose objects and materiel that may strike personnel, causing death or injury.

b. Heat. The heat from a nuclear explosion may cause injuries from either flash burns or burns from fires caused directly or indirectly by the explosion. On a moderately clear day, slight skin burns can be produced by a 20-kiloton burst at a distance up to 4 kilometers, and heat may be felt as far as 16 kilometers away. Anything that casts a shadow will afford some protection to personnel who might otherwise be burned by the direct heat rays.



Figure 2-4. Effects from a nuclear explosion.

c. Light. The flash of light produced by a nuclear explosion causes dazzle (temporary loss or reduction of vision). Dazzle from a burst during daylight hours does not persist for more than 2 minutes and is not generally an important consideration for other than aircraft crewmen. At night, personnel not facing the burst can be expected to recover from dazzle in about 3 minutes, and those facing the burst, in about 10 minutes; loss of night vision persists for longer periods. Recovery of night adaptation may be experienced within 15 minutes, depending on the level of visual thermal energy received. The flash of light produced by the nuclear explosion can also cause permanent burns within the eye, but only in those personnel who are looking at the fireball.

d. Nuclear Radiation. See paragraph 2-28.

2-28. Effects of Nuclear Radiation

The tremendous output of initial nuclear radiation accompanying a nuclear explosion is in the form of gamma rays, neutrons, and alpha and beta particles. However, since the range of the alpha and beta particles in air is limited, the gamma rays and neutrons present the only significant initial radiation hazard. Gamma rays and beta and alpha particles are emitted by the fallout materials from a nuclear explosion. The immediate vicinity around ground zero is radioactive because of induced radioactivity even though the detonation was an airburst (para 2-26a). Nuclear radiation from any source cannot be detected by the physical senses, and radiation detection devices must be used to determine its presence.

a. Physiological Response of Individuals to Nuclear Radiation (STANAG 2083). Exposure of the whole body, or of a large part of it, to a significant amount of penetrating ionizing radiation causes radiation sickness and may result in death. The effect of whole body radiation depends on several factors, including—

(1) The total dose accumulated from previous exposures.

(2) The periods over which the doses are received.

(3) The periods of recuperation between radiological exposures.

(4) The physical condition, sex, and age of the individual at the time of radiological exposure.

(5) The presence or absence of any additional injuries.

b. Gamma Rays. These are invisible rays similar to X-rays. These penetrating rays interact with the human body and cause damage to the tissues and the blood-forming cells. Probable effects from gamma radiation are listed in table 2-1.

c. Neutrons. During a nuclear explosion neutrons constitute an important part of the initial nuclear radiation. The effects of neutrons on the body resemble those of gamma radiation. Neutrons also have the ability to make other substances radioactive, particularly some elements in soil and certain metals. The intensity and extent of this radioactivity depend upon soil type, height of burst, yield, weapon type, and proximity to ground zero. For an airburst, the induced radioactivity in the underlying soil is normally the only significant residual source of radiation.

d. Alpha Particles. These are positively charged particles. Their range in air is only a few inches; therefore, emitters of alpha particles outside the body are not militarily dangerous. However, an alpha-emitting source that enters the body through wounds, the mouth, or the nose can be a long-term hazard.

e. Beta Particles. These are minute particles with a negative electrical charge. Because their range in air is limited to only a few feet, beta particles present in initial radiation from a nuclear explosion are not a military hazard. However, if radioactive material giving off beta particles is held in contact with the skin, damage to certain organs and sores and burns of the skin may result. The severity of sores and burns depends upon the length of time the source is in contact with the skin and upon the penetrating power of the particles. Beta emitters that enter the body may present a long-term hazard.

2-29. Cause of Fallout

Fallout is produced by material from the earth being drawn into the fireball, vaporized, combined with radioactive material, and then condensed to particles that fall to the earth. The larger particles fall immediately back to earth in the vicinity of ground zero. Smaller particles are carried by the upper winds until they gradually settle on the earth's surface. Rain or snow falling through a radioactive cloud will pick up radioactive particles and carry them to earth.

Table 2-1. Probable Effects of Nuclear (Gamma) Radiation on Exposed Personnel

Estimated exposure range (rad)	Initial symptoms	Onset of symptoms	Incapacitation	Hospitalization	Duration of hospitalization	Final disposition
50 to 200 -----	None to transient mild headache.	Approximately 6 hours after exposure.	None to slight decrease in ability to conduct normal duties.	Hospitalization required for less than 5 percent in upper part of exposure range.	45 to 60 days in upper part of range.	Duty. No deaths anticipated.
200 to 500 -----	Headaches, nausea, and vomiting; malaise. Symptoms not relieved by medication in upper part of exposure range.	Approximately 4 to 6 hours after exposure.	Can perform routine tasks. Sustained combat or comparable activities hampered for period of 6 to 20 hours.	Hospitalization required for 90 percent of exposed personnel in this range. Hospitalization follows latent period of 17 to 21 days' duration.	60 to 90 days -----	Some deaths anticipated; probably less than 5 percent at lower part of range, increasing toward upper end.
500 to 1,000 -----	Severe and prolonged nausea and vomiting; difficult to cure. Diarrhea and fever early in upper part of exposure range.	Approximately 1 to 4 hours after exposure.	Can perform only simple, routine tasks. Significant incapacitation in upper part of exposure range; lasts more than 24 hours.	Hospitalization required for 100 percent of exposed personnel. Latent period short, 7 to 10 days in lower range to none in upper range.	90 to 120 days for those surviving.	Approximately 50 percent deaths at lower part of range, increasing toward upper end; all deaths occurring within 45 days.
Greater than 1,000 ---	Severe vomiting, diarrhea, and prostration.	Less than 1 hour after exposure.	Progressive incapacitation, following an early intermittent task performance capability.	Hospitalization required for 100 percent of exposed personnel. No latent period.	3 to 30 days -----	100 percent deaths occurring within 30 days.

Notes. The contents of this table are in consonance with STANAG 2083 and show the expected response of personnel to radiation. The data are based on the assumptions that individuals--

1. Are healthy, rested, and well fed.
2. Have had no previous exposure.
3. Have had their whole body exposed to radiation.
4. Have received an acute dose (either initial or residual).
5. Have received no other injuries.

2-30. Extent of Contamination from Fallout

The contaminated area may be very small or may extend over many thousands of square kilometers, and the dose rate (level of radioactivity) may vary from a militarily insignificant level to an extremely dangerous one for all personnel not taking necessary defensive measures. The dose rate and area covered depend on the following factors:

- a.* Yield and type of weapon.
- b.* Height of burst.
- c.* Speed and direction of wind at all altitudes up to the top of the cloud.
- d.* Composition of the surface upon which the nuclear weapon is detonated.

PART TWO

CBR AND NUCLEAR DEFENSE GUIDANCE FOR THE INDIVIDUAL

CHAPTER 3

INDIVIDUAL CBR DEFENSE RESPONSIBILITIES

3-1. General

A unit's ability to survive a chemical, biological, or nuclear attack will depend initially on the actions taken by individuals until unit integrity is restored. *Each individual, regardless of his level of leadership or position in the unit, must know and be capable of taking immediate actions for his own survival.*

3-2. Standing Operating Procedures

Individual measures that are taken for survival in a chemical, biological, or nuclear attack or in a contaminated environment are discussed in this chapter and in chapters 4 through 6. The application, timing, local and command directives, and unit response procedures are established in the unit SOP. Each individual must know and understand where he and his leadership position fit into the overall CBR and nuclear defensive status of the unit or organization. The SOP specifies individual actions which together produce a combined unit effort toward survival. Each individual must take measures for his own protection and orient his actions according to the unit SOP.

3-3. Individual CBR Defense Standards of Proficiency

The attainment of individual CBR defense standards of proficiency demonstrates the individual's ability to correctly take the proper defensive actions; it instills confidence in his ability to survive a chemical, biological, or nuclear attack and the subsequent contamination hazards. The specific objectives of individual CBR defense standards of proficiency are listed in appendix B.

3-4. Individual Detection and Warning of CBR Hazards

The detection of chemical and biological agents and radioactive materials may require individual skills and the use of special equipment. Indi-

viduals who are assigned to operate chemical and radiological detection equipment are given instruction and training in their use and additional guidance in the unit SOP.

a. Detection. Any individual who suspects an enemy chemical or biological attack gives a local alarm (app G). The physical senses may be valuable aids to the individual. He may see the munitions delivered, hear explosive sounds, see some munition effects that are unusual, feel their effects, or taste strange flavors in food or water. When the unit is operating under the threat of an enemy chemical or biological attack, any suspicious enemy artillery or air attack is considered a *chemical* attack until the unit chemical agent detection equipment either confirms or denies the presence of a chemical agent. *It must be stressed that the physical senses are not reliable for the detection of chemical and biological agents and radioactive materials and that use of unit chemical and radiological detection equipment is the only local means of confirming a chemical attack or the presence of a radiological hazard.* However, physical senses cannot be disregarded and any suspicious or unusual feeling should be cause for alarm and appropriate immediate actions.

b. Local Alarm. The unit SOP establishes the individual local alarm procedure for personnel; it usually conforms to directives from higher headquarters. The individual will normally be in complete chemical protection under the mission-oriented protective posture (para 4-7b) after chemical agents have been employed in combat or when intelligence reports indicate that their use is imminent. If an individual is not in complete chemical protection, he should first take individual protective measures, then give the local alarm to personnel in his immediate area and inform his immediate leader or supervisor so that a unit warning can be given.

CHAPTER 4

DEFENSE AGAINST CHEMICAL ATTACK

(STANAG 2047)

Section I. INDIVIDUAL CHEMICAL PROTECTION

4-1. General

Personnel are provided with individual protection against chemical agents when operating under threat of an enemy chemical attack. Individual chemical protection is provided by the wearing of protective clothing and the chemical-biological mask and hood and the use of protective and defensive items described in paragraphs 4-2 through 4-6. Currently standardized components of a chemical protective system for the individual are:

a. Mask, field protective, chemical-biological, M17A1, with resuscitation tube and water-drinking device.

Note. Tank crewmen use the ABC-M14A2 and M25-series tank masks and aircraft crewmen use the ABC-M24 aircraft protective mask. For a description of other special-purpose protective mask, see paragraph 4-4.

b. Hood, CB protective mask, ABC-M6A2, which is an accessory of and compatible with only the M17-series protective masks.

Note. Other hoods are available for the M14A2, M25-series, M24, and other special-purpose masks.

c. Boots, combat, leather, treated with vesicant gas resistant leather dressing or boots, rubber, insulated.

d. Clothing outfit, chemical protective, consisting of—

(1) One ensemble of chemical protective overgarments or chemical protective shirt and trouser liners.

(2) One pair of socks, cushion sole, chemical protective.

(3) One pair of gloves, cotton, chemical protective.

e. Decontaminating and reimpregnating kit, individual, ABC-M13.

4-2. Chemical Protective Clothing

Different types of chemical protective clothing are available for wear in different weather conditions and for special purposes. Permeable clothing allows the passage of air and moisture through the fabric; impermeable clothing does not. Combat troops normally will be issued standard-A permeable chemical protective clothing and variations of standard-B impregnated permeable clothing described below. TM 10-277 describes and illustrates how various items of chemical protective clothing are worn.

a. Types of Permeable Protective Uniforms.

(1) *Standard-A chemical protective overgarment ensemble.* The expendable two-piece overgarment (fig 4-1) consists of one coat (shirt) and one pair of trousers with fly front; it is packaged in a sealed vapor-barrier bag. (The bag provides protection against rain, moisture, and sunlight and also has an instruction label.) Three pairs of cushion sole socks and one pair of gloves are issued separately. The shirt and trousers are made of material having an outer layer of nylon 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 normally worn over the duty uniform; however, in high temperatures, the overgarment may be worn over the underwear. The overgarment will normally be issued to troop units forward of the brigade rear, as designated by the division commander. The overgarment normally is discarded within 6 hours after being contaminated with liquid chemical agents or when it is worn or ripped too severely to be repaired with the individual issue patch accessory; it is not designed to be decontaminated and reimpregnated for reuse.

(2) *Standard-A chemical protective liner*



Figure 4-1. Chemical protective overgarment.

ensemble. This ensemble consists of one shirt liner and one trouser liner, three pairs of cushion sole socks, and one pair of cotton gloves inside a clothing bag. The shirt and trouser liners consist of clothing that has been treated (impregnated) with chemicals (XXCC3 impregnate) that give protection against vapors, aerosols, and small droplets of nerve and blister agents. They are worn under the issue trousers and shirt and over the underwear. The outer layer of clothing consists of the appropriate environmental uniform. The chemical protective liner ensemble will normally be issued to troop units to the rear of the brigade and to armor and aircraft units, as designated by the division commander. It is designed to be laundered or decontaminated and retreated.

(3) *Standard-B issue for wear under temperate conditions*. This uniform consists of impregnated cotton-sateen trousers and shirt to be worn as outer garments, with impregnated underwear to be worn as the innermost layer.

(4) *Standard-B issue for wear under cold-wet conditions*. This uniform consists of impregnated coat and trousers to be worn as outer garments over environmental clothing, with impregnated underwear to be worn as the innermost layer.

b. Maintenance of Protective Clothing. Chemical protective clothing is designed to form a barrier to protect the body against small droplets and vapors of chemical agents. Any tears, rips, holes, or worn places in the material will allow the agent to penetrate the barrier. Therefore, protective clothing must be carefully inspected to insure serviceability.

(1) *Laundering*. After being worn continuously for periods up to 1 week, protective clothing that is designed to be laundered (a(2), (3), and (4) above) will need to be laundered, whether or not it has been contaminated. Protective liners may be laundered several times without reimpregnation because they are treated with a chemical additive in the final rinse at the laundry.

(2) *Replacement guide for protective clothing*. The following general guidance may be used to determine when to decontaminate, dispose of, or replace protective clothing (also generally applies to the environmental uniform when worn as part of the chemical protective ensemble):

(a) When it is torn, is ripped, or has heavily worn areas (elbows, knees, and seat areas), exchange it for replacement clothing as soon as possible.

(b) When it has uniformly scattered pinhead-size spots of contamination at least one-fourth inch apart, continue to wear it and decontaminate with the M13 kit at any convenient time; exchange it for replacement clothing within 1 week.

Note. Although the M13 kit will overcome the "brush-off" or smear hazard of the contamination, G- and H-agent vapors will continue to be given off from the clothing for up to 6 hours, depending on the temperature; this hazard will require continuous wearing of the mask.

(c) When it has uniformly scattered spots of contamination larger than a pinhead but less than one-eighth inch in diameter at least one-fourth inch apart, continue to wear it; decontaminate it with the M13 kit as soon as possible, and exchange it for replacement clothing within 6 hours or as soon as possible. Wearing of the mask will be necessary because the clothing will give off G- and H-agent vapors.

(d) When it has large spots or moist areas of a chemical agent, continue to wear it *only* until it can be exchanged; it *must* be exchanged as soon as possible. The mask must be worn until the clothing can be exchanged.

Note. The protective qualities of protective clothing are degraded when it is wet with water, solvents, or petroleum products. Individuals need to wear ponchos and other rain gear in rain and take precautions to prevent wetting the protective clothing with solvents and petroleum products (for example, mechanics and other personnel handling these products). The protective qualities are restored when the clothing dries. When the mission permits, individuals replace clothing splashed with oil and grease that will not dry.

4-3. M17-Series Chemical-Biological Field Protective Masks

The M17-series chemical-biological field protective 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 by filter elements that fit in the cheeks of the facepiece. They filter the contaminated air but do not manufacture or produce 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 will not be able to provide air suitable for breathing. The M17-series masks also do not protect against ammonia vapors or carbon monoxide produced in tunnels and caves by burning (for example, burning smoke grenades). These masks are commonly referred to as the

“protective mask” or “mask,” as may be appropriate.

a. *M17A1 Field Protective Mask.* The M17A1 is the standard-A field protective mask (fig 4-2). It has as an accessory a resuscitation tube for giving mask-to-mouth artificial respiration by a masked individual to an individual casualty in a contaminated atmosphere in temperatures between 0° and 100° F. It has the following components: a voicemitter to facilitate communications, a device for drinking water from the canteen while masked (including a water canteen cap which is to be carried in the mask carrier), two eyelens outserts to protect the eyelenses and to improve operations in low temperatures, and a waterproofing bag in which the mask can be inclosed to protect the filter elements from damage by water (for example, during wading operations). The M17A1 mask will replace on an attrition basis the M17 mask, which is not equipped with either the water-drinking device or the resuscitation tube.



Figure 4-2. M17A1 chemical-biological field protective mask in use.

b. *Accessories.* Additional accessories for use with the M17-series masks include the items listed below; figure 4-3 illustrates these accessories. See FM 21-41 for detailed techniques of using accessories.

(1) The ABC-M6A2 CB protective mask hood is designed for semipermanent attachment to the M17-series masks to provide protection to

the head and neck from chemical agent vapors or liquid droplets.

(2) The ABC-M4 CB mask winterization kit is used under arctic conditions to prevent frost accumulation on the inlet valve caps.

c. *Filter Element Replacement Criteria.* Matched-pair filter elements (one for the right side and one for the left side of the mask) are designed for protection against normal field concentrations of all known enemy chemical agents and are considered adequate for all foreseeable field use. Both filters must be replaced carefully under the following circumstances: when directed by the division or higher headquarters, after prolonged usage, at the first opportunity after exposure to one blood agent attack, if they impose severe impedance to breathing, after immersion in water, if on visual examination they are found to be damaged or unserviceable, or if the lot numbers do not match. Instructions are contained in TM 3-4240-202-14 and TM 4240-258-14.

(1) As a field expedient against irritant agents only, filters that are wet may be removed and dried for 12 to 24 hours and reused.

(2) Filters in protective masks that are used extensively in mask confidence training exercises should be replaced before the masks are issued for field use.

(3) Filter elements normally are replaced by individuals supervised by CBR-trained personnel under unit control on the battlefield, and the contaminated filter elements are disposed of by burying them under a few inches of soil. Replacement filter elements are stocked at unit supply.

d. *CB Protective Mask Carrier.* The carrier is provided with a shoulder strap, a waist strap, and pockets. The pockets are used to carry accessories and the following additional items: the M13 decontaminating and reimpregnating kit, a book of chemical agent detector paper, and other items that may be prescribed by the commander such as amyl nitrite ampuls and atropine injection devices.

e. *Inspection, Fitting, Adjustment, and Care of the Mask.* The individual is responsible for inspecting, fitting, adjusting, and caring for his protective mask. He inspects it frequently to make certain that it is clean, free from damage or defect, and in a usable condition. TM 3-4240-202-14 for the ABC-M17 mask and TM 3-4240-



Figure 4-3. Items used with M17-series protective masks.

258-14 for the M17A1 mask contain instructions on the inspection, fitting, and cold-weather use of the mask.

(1) The hood is attached and adjusted to

the protective mask, and both are carried in the mask carrier, ready for use as a combination mask and hood.

(2) While the individual is fitting and ad-

justing his protective mask, during the mask confidence training exercise, he determines the limitations of head movements without breaking the seal of the mask. At least once a year, to refresh his memory, the individual determines the limitations of the movements that can be made while wearing his mask.

4-4. Tank, Aircraft, and Special-Purpose Protective Masks

Several different types of protective masks have been developed for special field uses, such as the M28 riot control agent mask designed specifically for protection against aerosols of irritant agents. Specially designed chemical-biological protective masks are available for individuals injured from head wounds (ABC-M18), for crewmen of aircraft (ABC-M24), for crewmen of armored vehicles (ABC-M14A2 and M25-series), and with toxicological agents protective outfit (M9-series). Criteria for replacement of canisters of the tank, aircraft, and special-purpose protective masks described below are similar to criteria for replacement of filters of the M17-series field protective masks described in paragraph 4-3c. These masks are commonly referred to as the "protective mask" or "mask," as may be appropriate.

a. Tank Chemical-Biological Protective Masks, ABC-M14A2 and M25-Series. These masks provide protection against all known enemy chemical and biological agents. When used in a tank or similar combat vehicle, the mask is coupled to the tank gas-particulate filter unit such as the M8A3 or M13A1 filter unit, which forces air to the facepiece, thus enhancing its wearability in hot weather. When the mask is worn outside the tank, the individual inhales air through the M10A1 protective mask canister. An antifogging kit is a component of the mask. See TM 3-4240-223-14 and TM 3-4240-255-14 for instructions on the care and maintenance of the two masks.

(1) A microphone assembly in the mask is used to communicate with other crew members through the vehicle communications system. The M14A2 and M25 masks are identical, except that the M14A2 has a microphone assembly for use in tanks equipped with AM radio and the M25 has a microphone assembly for use in tanks equipped with FM radio.

(2) Accessories include the ABC-M5 CB mask hood and a winterization kit. The hood is attached to the mask as described in the appropriate technical manual.

(3) The mask canister is replaced under the same conditions as described in paragraph 4-3c, except that it does not need to be changed after the stated chemical attacks until exposed several times to blood agent.

b. Aircraft Chemical-Biological Protective Mask, ABC-M24. This mask provides protection against all known enemy chemical and biological agents. The mask can be attached to the aircraft oxygen supply system by the use of an M8 adapter kit. It provides protection both in the aircraft and on the ground by the M10A1 canister. The facepiece is not force-ventilated as it is for the tank mask. A microphone element-and-bracket assembly is installed in the nosecup. An anti-fogging kit and an antiglare eyelens outsert are components of the mask. See TM 3-4240-219-14 for instructions on the care and maintenance of the mask.

(1) Accessories include the M7 aircraft protective mask hood and a winterization kit. The hood is attached to the mask as described in the technical manual.

(2) The mask canister is replaced under the same conditions as described in paragraph 4-3c, except that it does not need to be changed after the stated chemical attacks until exposed several times to blood agent.

c. Riot Control Agent Mask, M28. This mask provides protection *only* against irritant (riot control) agents. The mask is designed so that it can be folded and stowed in a carrier to form a waterproof package. It has no hood accessory. Two eyelenses allow good vision and are kept free from fogging by a nosecup and nosecup valves. However, the mask is not intended for use in below freezing temperatures because the lenses may fog and impair the wearer's vision. The mask has inlet valves and one outlet valve that allow the mask to be cleared and checked. See TM 3-4240-269-12 for instructions on use and maintenance of the M28 mask.

d. Special-Purpose Chemical-Biological Protective Masks, M9-Series and Noncombat Protective Mask, M16. These masks provide protection against all known enemy chemical agents. The M3 hood is an accessory for M9-series masks; there is no hood for the M16-type mask. The M11 canister used with these masks is replaced under the same conditions as described in *b(2)* above. See TM 3-4240-204-14 for instructions on use and maintenance of the M9-series mask.

4-5. ABC-M13 Individual Decontaminating and Reimpregnating Kit

The ABC-M13 kit is carried in the large external pocket of the carrier for the M17-series masks and in the appropriate pocket of other mask carriers. General instructions for use of the kit are attached to the container. The items in the kit must be replaced after they have been used.

a. Description. The container is a plastic can equipped with a plastic pull-handle slip-on lid (fig 4-4). It contains the following items:

(1) A small *skin pad* filled with "fuller's earth" powder.

(2) Two *cloth bags* filled with a decontaminating and reimpregnating compound (XXCC3). Each bag contains a capsule of B1 chemical agent detector dye.

(3) A single-edge cutter.

b. Purpose and Use. This kit provides the individual with a means of detecting liquid chemical contamination; and decontaminating his skin, clothing, and equipment. Detailed information and techniques on using the kit are contained in TB 3-4230-207-10.

(1) *The skin pad* is used to adsorb chemical agents from skin. The pad fits over the fingers in such a way that one side can be used to blot the contaminated skin and the other side can be used to dust and rub over the contaminated area. The most effective procedure to follow is using the skin pad to decontaminate the skin is to BLOT, TURN, SLAP (dust), and then RUB.

(2) *The cloth bags* are used to detect chemical contamination; when the dye capsule inside the bag is crushed and kneaded into the compound and the bag is subsequently rubbed over clothing and equipment, the presence of nerve agent and blister agent contamination is disclosed by red or brown color changes of the contaminated spots. Further rubbing with the cloth bags will eliminate the smear hazard of liquid contamination but will not eliminate the vapor hazard of G- and H-type agents.

(3) *The single-edge cutter* is used to cut out spots of hazardous contamination on clothing.

4-6. Chemical Defensive Items

Chemical defensive items available for issue to individuals are described below and illustrated in figure 4-5.

a. Leather Dressing, Vesicant Gas Resistant, M2. When properly applied to leather boots, this leather dressing (protective dubbing) makes the

leather resistant to penetration by chemical agents.

(1) The most effective method for applying the leather dressing to leather combat boots is the hot-dip (immersion) method. This process involves total immersion of the boots in the melted leather dressing, where both the exterior and interior surfaces of the boots are completely treated by the melted dressing. The interior of the boots must be thoroughly wiped to remove excessive dressing. Detailed procedures for applying vesicant gas resistant leather dressing are contained in TB 3-8030-200-12.

(2) When the hot-dip method cannot be used and prestocked boots (treated with vesicant gas resistant dressing) are not available, warm leather dressing can be hand rubbed into the inside and outside surfaces of clean boots. This method is not as effective as the hot-dip method and is used only as an emergency measure until properly treated boots are available.

b. Automatic Atropine Injector. Three spring-operated, automatic atropine injectors (green and yellow) normally are stored in the pocket of the protective mask carrier for use as first aid against nerve agent poisoning (para 4-15). The following directions for use are printed on the injector: "1. Remove yellow safety. 2. Place green end on thigh and push hard until injector functions." See FM 21-11 and FM 21-41 for additional directions for use. The freezing point of atropine solution is approximately 30° F, a temperature well above that at which nerve agents will produce casualties. Therefore, in cold weather (40° F or below), the atropine injectors must be removed from the carrier and placed inside the field uniform, where body temperature will prevent freezing.

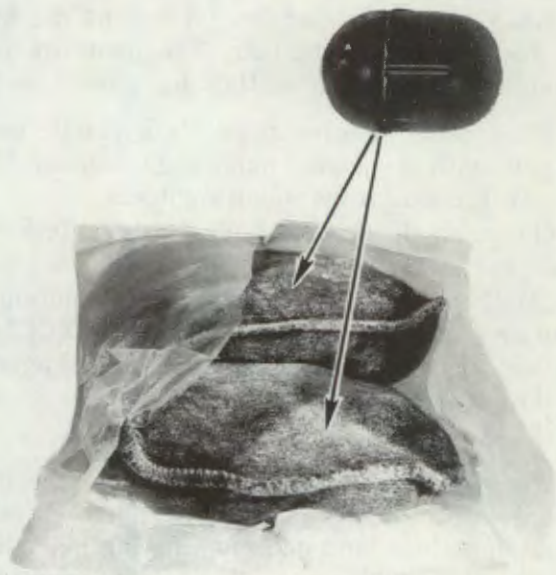
c. Amyl Nitrite Ampuls. When intelligence indicates that blood agents may be used by enemy forces, amyl nitrite ampuls (yellow) will be issued to individuals for use in first aid (para 4-17). When required, amyl nitrite will be issued on the basis of one box of 12 ampuls per individual.

d. Chemical Agent Detector Paper, ABC-M8. A booklet of 25 sheets of chemical agent detector paper may be issued to individuals for the detection of liquid nerve or blister chemical agents (para 8-17a).

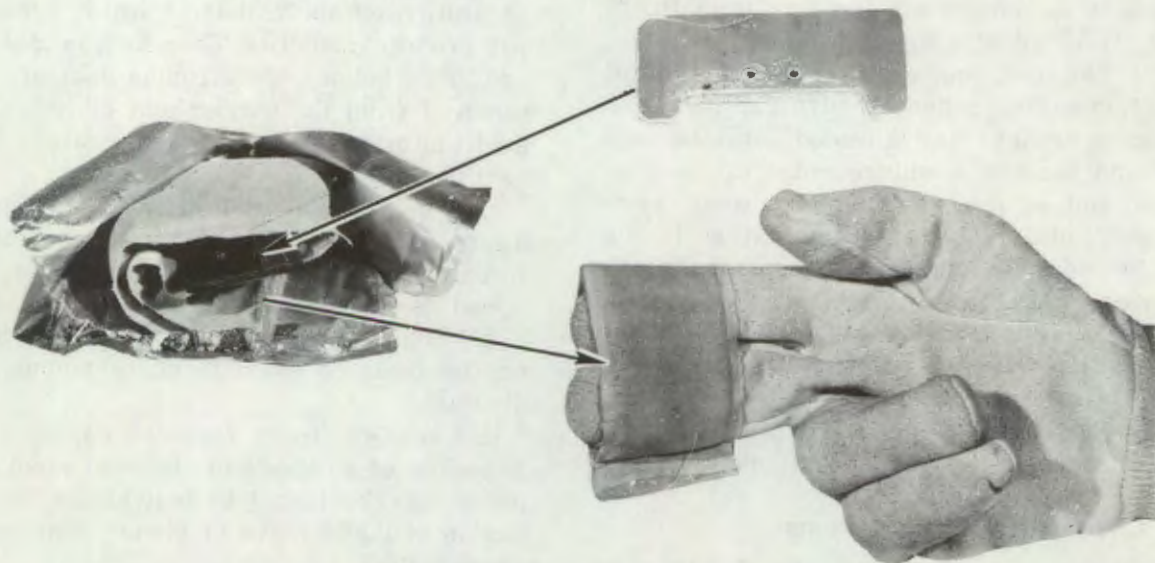
Note. An improved liquid agent detector (LAD) eventually may replace or complement M8 detector paper issued to individuals. LAD will have an adhesive backing for attaching strips on parts of the body (for example, right arm, left wrist, and ankle) to indicate liquid agent contamination.



KIT CONTAINER WITH PLASTIC LID



TWO CLOTH DECONTAMINATING BAGS WITH DYE CAPSULE INSIDE



SKIN DECONTAMINATING PAD AND CUTTER

Figure 4-4. ABC-M13 individual decontaminating and reimpregnating kit.



Figure 4-5. Chemical defensive items.

Section II. INDIVIDUAL DEFENSIVE MEASURES AGAINST A CHEMICAL ATTACK

4-7. General

The defensive measures taken by an individual against a chemical attack include the training he receives, the actions taken before and during a chemical attack, and the actions taken after the chemical attack such as recovery, first aid, and decontamination.

a. Enemy Chemical Attack Capability. Because of potential enemy chemical attack capabilities, it is probable that a massive amount of chemical agent will be delivered on units in an extremely short period of time. In this environment a dangerous amount of agent can be inhaled by or contaminate the skin of an individual before he can put on his protective mask and clothing. In

high concentrations of agent, one or two breaths may be enough to result in serious injury or death. In addition, it is possible for an individual to be contaminated with liquid agents before he could take cover, even if cover were available. To protect against this potential enemy capability, the United States forces have adopted the *mission-oriented protective posture* (MOPP), described in *b* below.

b. Mission-Oriented Protective Posture. MOPP means that individuals who are under constant threat of an enemy chemical attack will wear their protective clothing and masks at all times—unless their duties, the weather, or personal needs prevent it—and that they will remove

only that amount of protective clothing and equipment for the time required to perform their duties. The amount and degree of protection required will be determined by the unit commander. However, MOPP does not arbitrarily require an individual to wear full chemical protective clothing at all times.

4-8. Individual Defense Actions Before a Chemical Attack

Before an enemy chemical attack, the commander or unit leader decides the level of chemical protection needed and states how chemical protective clothing and equipment will be worn by personnel of his unit. He bases his decision on an analysis of the situation in which he balances his mission requirements against the protection requirements and other factors. The mission-oriented protective posture is discussed in detail in paragraphs 8-8 through 8-13.

a. Extended Wearing of Protective Clothing. The individual must adapt to requirements for wearing protective clothing and equipment for extended periods because the amount of time required to put them on during a chemical attack will usually be longer than the amount of time required to receive a deadly dose of a chemical agent.

b. Alertness. Even with MOPP, all individuals remain alert and constantly aware of the chemical threat, especially when duty requirements prevent the wearing of full chemical protective clothing and equipment. The individual needs to understand chemical alarms and signals and be proficient in attaining the maximum level of protection when alerted to a chemical attack. He also needs to attain and maintain proficiency in giving first aid.

c. Protection of Individual Equipment. The individual needs to protect his equipment and supplies against liquid chemical agent contamination by keeping his equipment organized and covered, if duty requirements permit. Hastily constructed foxhole covers, brush, ponchos, shelter halves, or any expedient material can be used to protect against liquid chemical agent contamination. Individuals wear protective clothing and equipment while sleeping and, if possible, cover themselves and their equipment before they go to sleep.

4-9. Individual Defense Actions During a Chemical Attack

An enemy chemical attack can be made directly

in the area in which individuals are located or upwind from the area.

a. General. If not already masked, individuals take the following immediate defensive actions when under chemical attack:

- (1) Stop breathing and remove headgear.
- (2) If spectacles are worn, remove and place them in a convenient place, such as in the removed headgear, in a pocket of the outer garment, or between web equipment. (After masking, place the spectacles in a safe place, such as the mask carrier.)
- (3) Mask, clear mask, and resume breathing.
- (4) Give the alarm.
- (5) Continue the mission.
- (6) Remain masked until ordered to unmask.
- (7) In addition, if—
 - (a) The situation permits, take cover.
 - (b) Symptoms of nerve agent poisoning appear, take atropine.
 - (c) The skin or eyes are contaminated, decontaminate as described in paragraph 4-14.
 - (d) Clothing and equipment are contaminated, decontaminate as soon as the situation permits.
- (8) If an unconscious unmasked individual is encountered, decontaminate his face as necessary, put a protective mask on his face if he is breathing, and give him appropriate first aid. If his breathing is difficult or stops, give him mask-to-mouth resuscitation as appropriate to the situation. If the individual is masked and in trouble, follow (7) above.

b. Chemical Attack Alarms. Any individual recognizing or suspecting a chemical attack gives the following local alarms, after first masking if not already masked (STANAG 2047, app G).

(1) *Visual alarm.* The individual extends both arms horizontally sideways with fists doubled facing up and rapidly moves the fists to the head and then back to the horizontal position, repeating as necessary. For more detailed information on visual signals, see FM 21-60.

(2) *Vocal alarm.* The individual shouts "SPRAY" for a chemical spray attack and "GAS" for a chemical attack by any other means. The vocal alarm is effective only for other individuals in the immediate vicinity because of the limitations of the protective mask voicemitter.

(3) *Sound alarm.* At some headquarters or installations, designated individuals use a device that produces an audible sound or a noise not easily confused with other sounds encountered in combat. Examples of these devices are: empty shell cases, bells, and metal triangles.

c. Individual Protection Against Aircraft Spray. When under an enemy chemical spray attack, in addition to the wearing of chemical protective clothing and masks, individuals use a protective cover such as a poncho or shelter half to further protect the body from falling liquid droplets, if the situation permits. After the spray has stopped falling, individuals throw the cover off, taking care to prevent liquid contamination of their clothing and equipment. When the situation permits, individuals decontaminate as required. Individuals do not remove their protective masks and hoods until the order to do so is given by the unit leader or commander.

d. Individual Protection Against Large-Area Chemical Attack. The individual protective measures against spray attacks (*c* above) also protect against large-area chemical attacks by artillery or aerial bombs. Individuals obtain overhead cover, if possible.

e. Individual Protection Against Chemical Agents Used by Friendly Forces. When chemical agents are used by friendly units against the enemy, the headquarters directing the mission provides the necessary troop safety information to friendly units that may be affected by the mission. Individuals take the same protective measures under these circumstances that they take against similar-type enemy chemical attack.

4-10. Conditions Requiring Automatic Masking

If an enemy chemical attack is reported to be imminent or if chemical attacks have been initiated, individuals not already masked must mask without waiting for a chemical attack alarm when—

- a.* Attacked by artillery, mortar, or rocket fire or by aircraft bomb.
- b.* Attacked by aircraft spray.
- c.* Smoke or mist of an unknown source is present.
- d.* A suspicious odor or liquid is present.
- e.* A chemical attack is suspected.
- f.* Entering an area known to be or suspected of being contaminated with a chemical agent.

g. For no obvious reason the following individual effects occur:

- (1) An unexplained runny nose.
- (2) A feeling of choking and tightness in the chest or throat.
- (3) Dimming of vision and difficulty in focusing the eyes on close objects.
- (4) Irritation of the eyes (could be caused by presence of any of several chemical agents).
- (5) Difficulty in breathing or increased rate of breathing.

4-11. Individual Defense Actions After a Chemical Attack

An enemy chemical attack can be made as a nonpersistent aerosol or vapor attack or a persistent liquid contaminating attack.

a. Immediate Individual Actions. If the attack was a vapor or an aerosol attack (no liquid chemical agent present), individuals remain masked and continue with their mission. Individuals give first aid to casualties in the immediate area, if required, and report the local casualty status to the squad or section leader, platoon leader, or company headquarters as appropriate. If the attack was a liquid chemical agent attack (liquid chemical agent present), individuals also remain masked and continue with their mission.

b. Subsequent Individual Actions. If exposed skin was contaminated, individuals decontaminate immediately, according to guidance in paragraphs 4-13 and 4-14. As time permits, individuals check skin, clothing, and equipment for possible contamination and decontaminate according to the guidance in paragraph 4-5b. Then individuals decontaminate parts of equipment that require handling to operate or function—for example, butt plate, trigger housing, and hand guard of individual weapons; and operator controls of other equipment such as telephone hand sets and microphones. Individual squad and section leaders inform the next higher command level of the status of themselves and those under their control, according to the unit SOP.

4-12. Conditions for Unmasking

When the enemy employs chemical agents, the guidance for unmasking described in *a* below applies. However, during stability operations when the enemy employs only irritant agents, the guidance for unmasking described in *b* below applies.

a. *Unmasking When Chemical Agents are Employed.* Individuals do not unmask until authorized by their immediate commander or, in the absence of command guidance, the procedures described in (1) or (2) below are followed. The procedures are followed as a safety measure on the assumption that highly lethal agents may have been employed by the enemy.

(1) *Procedure when a chemical agent detector is available.* The unit chemical agent detector kit (more sensitive than the chemical agent alarm) is used to test for the presence or absence of chemical agents. After determining the absence of chemical agents, two or three individuals unmask for 5 minutes and then remask for 10 minutes. After the individuals have been examined in a shady area for chemical agent symptoms and no symptoms appear, the remainder of the individuals in the group may then safely unmask. It should be noted that bright sunlight will cause contraction of the pupils of the eyes which could erroneously be interpreted as a nerve agent symptom. However, limited exposure to a low concentration of nerve agent not detectable by the chemical agent detector kit will cause no ill effects other than a runny nose, tightness of the chest, and sometimes pinpointing of the pupils of the eyes. These effects are usually relieved by one injection of atropine.

(2) *Procedure when no chemical agent detector is available.* As an emergency field expedient when no chemical agent detector kit can be obtained, two or three individuals are selected by the senior-in-charge to take a deep breath, hold it, break the seal of the mask, and keep their eyes wide open for about 15 seconds. They reestablish the mask seal and wait for about 10 minutes. If no symptoms develop after 10 minutes, the same individuals again break the mask seal, take three or four breaths, and then reseal the masks. After 10 minutes, if no symptoms have developed, these same individuals unmask for 5 minutes and then remask. After 10 minutes, if no symptoms appear, the remainder of the individuals in the group may then safely remove their masks. However, individuals should remain alert for the appearance of chemical agent symptoms.

b. *Unmasking When Irritant Agents are Employed.* When it has been determined that only irritant agents are employed, individuals unmask on an individual basis when the agent cloud has dispersed in their particular area. Individuals then break the seal of the mask around the face and take several breaths to make sure that the area is clear before removing their masks.

Section III. INDIVIDUAL FIRST AID

4-13. General

Individual first aid includes the immediate actions required to prevent further injury or complications from the effects of chemical agents; this includes prompt removal of agents from the eyes and prompt decontamination of the skin to avoid becoming a casualty from certain lethal liquid agents. Therefore, individual first aid includes individual decontamination, automatically and without orders when required, and the use of appropriate medication or actions to reduce the effects of the agent, such as the use of atropine for nerve agent poisoning. Each individual must receive training in both first aid and decontamination so that he can perform these actions quickly. For guidance on the detailed *techniques* of individual first aid, such as the technique of using the atropine injector, refer to FM 21-11 and FM 21-41.

4-14. First Aid and Decontamination of Unidentified Chemical Agent

In most cases the individual will not be able to

immediately identify the chemical agent used in an attack. When exposed to an enemy chemical attack while dressed in chemical protective clothing and equipment, normally he will not be concerned with immediate decontamination. However, if an individual believes that he has been contaminated by an unidentified agent, perhaps while unmasked, he follows the actions described below.

a. *Decontamination of Eyes and Face.* If the eyes or face has been contaminated (for example, from a spray attack), the individual must immediately try to obtain overhead cover before attempting to decontaminate himself. He needs this shelter to protect himself from possible additional contamination during the decontamination process. If no shelter is immediately available, he must mask and then try to obtain shelter before decontaminating himself. The individual decontaminates—

(1) His eyes by turning the face upward and using water from the canteen to repeatedly flush the eyes.

(2) His skin by using the skin pad from the M13 kit. If necessary, he decontaminates the inside of the protective mask that comes in contact with the skin.

b. Decontamination of Other Exposed Skin. If the skin other than the face has been contaminated (for example, the back of the neck), the individual decontaminates with the skin pad from the M13 decontaminating kit or soap and water. Also this procedure is followed for skin that was in contact with contaminated clothing before it could be removed.

c. First Aid Treatment. The type of chemical agent that was used in the attack normally will be identified by use of the unit's chemical agent detector kit or chemical agent detector paper. If the type of agents cannot be identified, the individual watches for possible symptoms, either from himself or from others, as described in paragraphs 2-7 through 2-13, for identification of the agent to which he may have been exposed. Based on these symptoms, the individual applies first aid, without orders, as described in paragraphs 4-15 through 4-21.

4-15. Nerve Agents

It is imperative that nerve agents in contact with the skin or eyes be neutralized or removed immediately if the individual is to avoid becoming a casualty. These agents are lethal and are rapidly absorbed by the eyes and through cuts in the skin; they are absorbed through undamaged skin somewhat slower. Clothing contaminated with nerve agents must not be allowed to remain in contact with the skin.

a. First Aid. The injection of atropine and the giving of artificial respiration or resuscitation may be the first aid measures necessary for individuals showing symptoms of nerve agent poisoning, including difficulty in breathing.

(1) *Atropine.* The individual is authorized to carry and use three atropine devices on himself at 10- to 20-minute intervals, if the symptoms do not begin to disappear. If possible after giving himself the first injection, the individual seeks someone else to check on: his symptoms, the time interval for giving himself the other two injections, and the need to give artificial respiration. The need for more than three injections of atropine is determined by a medical aid man; if medical personnel are not available, then the senior person present determines when to give an additional atropine injection.

(2) *Artificial respiration or resuscitation.* When breathing becomes extremely difficult, irregular, or stops, artificial respiration must be given. In cases of severe symptoms in individuals being evacuated for medical treatment, it may be necessary for someone to continue giving artificial respiration or resuscitation.

b. Decontamination. The skin pad from the M13 decontaminating kit (or soap and water) is used to remove liquid agents from the skin. Plain water only is used repeatedly to flush these agents from the eyes. The skin in contact with contaminated clothing is decontaminated as soon as the clothing can be removed.

4-16. Blister Agents

Blister agents in contact with the eyes or the skin must be removed or decontaminated without delay.

a. Decontamination and First Aid. Plain water only is used repeatedly to flush these agents from the eyes. The skin pad from the M13 decontaminating kit (or soap and water) is used to remove these agents from the skin.

b. Treatment. If burns or blisters should subsequently develop on the skin, the area is covered with a sterile gauze or clean cloth to prevent infection.

4-17. Blood Agents

Inhalation of a high dose of blood agent can cause an individual to become unconscious.

a. First Aid. Two crushed amyl nitrite ampuls are held close to the nose; if the individual is still in a contaminated atmosphere, the crushed ampuls are inserted inside the protective mask. If symptoms persist, this treatment of two crushed ampuls is repeated about every 4 or 5 minutes until normal breathing returns or until a total of eight ampuls is used. The individual should seek someone to give artificial respiration, when necessary, if breathing becomes difficult.

b. Decontamination. None is needed.

4-18. Choking Agents

Individuals exposed to a choking agent should continue with their mission unless breathing becomes difficult. Serious symptoms of lung injury may not appear for several hours; the critical period is during the first 48 hours after exposure. The symptoms may persist and grow worse, but

often first symptoms disappear and are followed by a latent period in which the individual feels fairly well.

a. First Aid. The individual avoids movement when symptoms become severe and keeps himself warm until evacuated for medical treatment.

b. Decontamination. None is needed.

4-19. Incapacitating Agents

The mental or physical symptoms of incapacitating agents normally are delayed.

a. First Aid. The individual moves to fresh air when possible. He should seek someone to observe him for possible onset of mental or physical symptoms. Exposure to a certain type of incapacitating agent can cause heat exhaustion or heat stroke because it may inhibit sweating. Therefore, excessive clothing may have to be removed if the temperature is above 78° F. (Some individuals may have to be restrained to prevent them from injuring themselves or others.)

b. Decontamination. Aerosol particles of these agents can be removed with soap and water if necessary.

4-20. Vomiting Agents

The symptoms of vomiting agents will usually be delayed for several minutes. Individuals must leave the protective mask on, even though the distress following exposure to vomiting agents

may increase after the mask is put on, because the enemy may use vomiting agents to conceal the presence of a lethal chemical agent. However, the mask can be pulled away from the chin (not removed) during actual vomiting. The face-piece should be cleared of agent each time the airtight seal of the mask is broken.

a. First Aid. Vigorous activity lessens the duration of effects of vomiting agents; therefore, individuals continue with their mission.

b. Decontamination. Aerosol particles of these agents can be removed with soap and water, if necessary.

4-21. Irritant Agents

The eye symptoms of irritant agents normally appear immediately and last for a short period of time. The eye effects are temporary if the eyes are not rubbed. Respiratory and skin effects appear later.

a. First Aid. Individuals move to fresh air and face into the wind for 5 to 10 minutes, when the situation permits. Individuals should not rub their eyes; tears will normally physically flush out the agent particles. Normally, coughing will eventually stop without any first aid.

b. Decontamination. The eyes, face, and other exposed skin are flushed with an abundance of water, if necessary, *after* first aid. Clothing is brushed to remove particles of the agent.

Section IV. INDIVIDUAL CHEMICAL DECONTAMINATION

4-22. General

Individual chemical decontamination is that which the individual, using materials on hand, performs on himself and on his equipment. Chemical decontamination is usually performed as soon as practicable and is usually sufficient to allow the individual to carry on his assigned mission. Protective clothing and equipment are worn during decontamination operations.

4-23. Decontaminating Materials and Methods of Decontamination

Some of the more common chemical decontaminating materials and methods of decontamination are listed below and described in appendix C.

a. ABC-M13 Decontaminating and Reimpregnating Kit. This kit contains two cloth bags

that are used for decontaminating clothing and other material and a skin pad that is used for adsorbing chemical agents from the skin.

b. DS2. This is a solution that requires no mixing and can be applied to equipment with the M11 decontaminating apparatus or with brushes and swabs.

c. STB. Supertropical bleach (STB) powder can be mixed with water to form a "slurry" and with earth to form a "dry mix." The slurry is applied with brush or swab and the dry mix with a shovel to chemically contaminated surfaces.

d. Soap and Water. Soap and water, preferably hot, can be used with other decontaminating materials or used alone for removal of chemical contamination from clothing or equipment.

e. Weathering. Exposure of chemically contaminated equipment to the sun, air, and rain will decontaminate the equipment if sufficient time is allowed.

4-24. Chemical Decontamination of Individual Equipment

General methods of decontaminating individual equipment and when to decontaminate it are described below.

a. Protective Mask. A protective mask is decontaminated as soon as practicable after contamination because the rubber facepiece absorbs liquid chemical agents. The external parts of the mask are decontaminated with the cloth bag from the M13 decontaminating kit. They are subsequently washed with soap and water. The interior surface of the mask is decontaminated with the skin pad from the M13 kit.

Caution: Water must not be allowed to enter the filter elements or the canister, as the case may be. DS2 or other solvents must not be used on the facepiece.

b. Clothing. Clothing is decontaminated as described below.

(1) *Ordinary clothing* that has been exposed to vapors of a chemical agent may be decontaminated under temperate conditions by airing in sunlight for 4 to 8 hours or overnight. The cloth bag from the M13 decontaminating kit is used to detect liquid contamination and to decontaminate clothing that has been contaminated with spots of chemical agent less than one-eighth inch in diameter. However, spots of contamination greater than one-eighth inch in diameter are hazardous because they can penetrate the fabric and should be cut out of the clothing; the clothing is removed and replaced as soon as practicable.

(2) *Chemical protective clothing* exposed to vapors of a chemical agent does not require decontamination. The cloth bag from the M13 decontaminating kit is used to detect liquid contamination and to decontaminate scattered spots less than one-eighth inch in diameter. Protective overgarments contaminated by spots greater than one-half inch in diameter and impregnated outer-clothing contaminated by several spots greater than one-eighth inch in diameter in an area the size of an M13 kit are hazardous because they can defeat the protective treatment of the fabric; the clothing is removed and replaced as soon as the situation permits. See paragraph 4-

2b(2) for guidance on decontamination of chemical protective clothing.

c. Boots. Leather boots are decontaminated by using soap and water or bleach slurry as soon as practicable after contamination; they are then treated with vesicant gas resistant leather dressing. The cloth bag from the M13 kit can be used to reduce the contamination hazard of the boots until they can be washed with soap and water.

d. Individual Metal Equipment. Individual metal equipment, such as helmets and entrenching tools, is decontaminated with DS2, soapy water, or the cloth bag from the M13 decontaminating kit, as soon as practicable after contamination. Personal items (such as mess kits and utensils, canteens and cups) must be decontaminated before use, by washing them thoroughly with soap and water, rinsing them in clear water, and then airing them. If possible, contaminated eating equipment is boiled in hot soapy water, rinsed, and aired.

e. Individual Weapons. Individual weapons and ammunition are decontaminated with the cloth bag from the M13 decontaminating kit, as soon as practicable after contamination. After decontamination, weapons are disassembled, washed, rinsed, dried, and oiled to prevent corrosion.

f. Web Equipment. Web equipment lightly contaminated (pinhead-size spots at least one-fourth inch apart) with chemical agents can be decontaminated as described in *b* above. Web equipment heavily contaminated (one-eighth inch or larger diameter) with chemical agents is destroyed and replaced.

4-25. Individual Chemical Decontamination of Unit Equipment

Unit equipment used by individuals is decontaminated by individuals, as soon after contamination as the situation permits, as described below.

a. Vehicles. Vehicles that are lightly contaminated (pinhead-size spots at least one-fourth inch apart), as determined by chemical agent detector paper, may be decontaminated by airing. Each tactical vehicle is authorized one M11 portable decontaminating apparatus that contains 1 1/3 quarts of decontaminating agent DS2. It is used to decontaminate parts of the vehicle that must be touched during vehicle operation, such as controls.

(1) If the driver of the vehicle realizes that

the vehicle is contaminated, he and other occupants mask and continue their mission until the situation permits decontamination outside the contaminated area.

(2) The vehicle is decontaminated with DS2, soapy water, solvents, or slurry. The M11 decontaminating apparatus is not intended for decontamination of the entire vehicle; one filling of DS2 is sufficient for emergency decontamination of the operator controls. The apparatus is used by tank crews and armored personnel carrier drivers to decontaminate those parts of the vehicle that will be touched by personnel during the mission; for example, areas touched when entering or leaving the vehicle. If sufficient DS2 is not available, gasoline, mud, rags, or any other expedient may be used. Contaminated wood surfaces and tires are decontaminated with slurry.

b. Crew-Served Weapons. Crew-served weapons are decontaminated by using the methods described in *a* above. If considered necessary, the bore can be decontaminated by using cleaning solvent or hot soapy water. Ammunition is decontaminated with DS2 solution, wiped with

gasoline-soaked rags, and then dried. If DS2 is not available, ammunition may be washed with cool soapy water, rinsed, and then dried thoroughly. Ammunition corroded from contamination is disposed of, particularly if the brass parts cannot be cleaned. Dry STB (bleach) must not be used on ammunition contaminated with mustard-type blister agents because when mixed they may ignite and start a fire.

c. Optical Instruments. Optical instruments are decontaminated by blotting with rags, wiping with an organic solvent (lens-cleaning solvent only is used for the lens), and then allowing them to air. If available, hot air is used to decontaminate most optical instruments.

d. Communications and Radar Equipment. Communications equipment is decontaminated by using hot air, if available. The next best method is by airing or weathering. The metal parts of field telephones and radios are decontaminated with DS2 and then wiped with rags. Electrical devices that contain tubes or other heat-producing equipment normally are decontaminated by the heat given off during operation.

Section V. INDIVIDUAL DEFENSIVE MEASURES IN A CHEMICAL ENVIRONMENT

4-26. General

The pace of activities for individuals dressed in complete chemical protective clothing and equipment generally will be slower than for those dressed in reduced chemical protection. Individuals will receive guidance from their unit commanders on all aspects of fighting or working, sleeping, eating, and attending to personal needs. However, they will need to know what to do under circumstances when they may be unable to receive this guidance. Paragraphs 4-27 through 4-30 provide this information.

4-27. Wearing of Chemical Protective Clothing and Equipment

The unit commander normally will indicate how chemical protective clothing and equipment will be worn by personnel in his unit, according to his appreciation of the chemical threat, his mission, the work rate imposed by the mission, and the temperature and humidity. His decision normally is based on seeing that his unit can accomplish its assigned mission without unnecessarily reducing individual efficiency from heat stress and other factors.

a. Types of Chemical Protective Clothing. The individual may be issued the chemical protective overgarment, the chemical protective liners, or impregnated outergarments. The protective shirt may be worn open to permit ventilation or closed to provide complete protection. See paragraph 4-2 for a description of the various protective ensembles.

b. Protective Mask and Hood. The protective mask may be worn with the hood open and rolled up to provide ventilation or closed to provide complete protection.

4-28. Drinking Water and Eating

Personnel in a chemical environment normally will drink water individually, as required, but normally will be fed under unit control.

a. Drinking Water. With training, individuals equipped with the M17A1 protective mask will run minimum risk of becoming a chemical casualty if they use the drinking device with which to drink water from their canteens (fig 4-2). See paragraphs 8-13*b* for guidance on refilling water canteens in a contaminated environment. How-

ever, personnel equipped with any other protective mask will need to use an expedient method to drink water; this method is described below.

(1) Remove the canteen from the carrier, remove the canteen cap and, if necessary, decontaminate exposed threads with water or the skin pad from the M13 decontaminating kit.

(2) Take a few breaths and hold the last one.

(3) Close the eyes, pull the protective hood up, grasp facepiece behind the outlet valve assembly of the protective mask with the free hand, and pull the facepiece out and up far enough to provide access to the mouth.

(4) Place the neck of the canteen to the closed lips and cant it, tilting the head back until the water reaches the lips, and then fill the mouth with water.

(5) Replace the facepiece, swallow the water, and then clear the mask.

(6) Rest and then repeat as necessary.

b. Eating. Personnel may be fed on a rotational basis in a chemical protective shelter, if one is available. Depending on the situation, the unit commander may authorize a small percentage of personnel in his unit to remove their masks and eat or he may remove some on a selective basis to an uncontaminated area to eat.

4-29. Sleeping, Shaving, Bathing, and Changing Clothing

When operating continuously in a contaminated chemical environment, personnel will need to make some adjustments in their normal routine.

a. Sleeping. Individuals will sleep in chemical protective clothing and under overhead cover, if

possible. If the hood is fitted properly and is worn correctly with the mask while sleeping, there will be very little, if any, leakage around the mask. Two individuals can use the "buddy" system to periodically check on each other.

b. Shaving. Individuals shave daily, if possible, to insure a good seal of the protective mask.

c. Bathing. Individuals bathe and change underclothing about every 2 or 3 days, if possible, to prevent skin rashes when wearing protective liners.

d. Changing Clothing. Expendable protective overgarments may be disposed of and new ones drawn at the unit supply as prescribed, normally weekly. Reusable protective clothing is exchanged periodically to be laundered, normally biweekly (every 14 days). The exchange of protective clothing is usually performed at a designated field bath unit, mobile bath unit, or personnel decontamination station.

4-30. Defecating and Urinating

During the removal, opening, and closing of contaminated outergarments or while squatting over the latrine in a contaminated environment, the possibility of transferring contamination to the underclothing or exposed skin requires special precautions. For this reason, individuals dust with the cloth pad of the M13 decontaminating kit the parts of the contaminated outergarments that might come in contact with the skin when the contaminated clothing is partially removed or opened. After the contaminated outergarments have been opened or partially removed, individuals remove the protective gloves before handling the undergarments or the bare skin.

CHAPTER 5

DEFENSE AGAINST BIOLOGICAL ATTACK

(STANAG 2047)

5-1. General

Although respect for biological agents is important, personnel must be free from any unreasonable fear of contracting disease from a suspected biological attack. The protective mask will protect against infection from biological agent aerosols. Sickness from a biological attack generally develops slowly and can usually be successfully treated. Unless symptoms actually develop after a suspected biological attack, individuals will not assume that they are infected and they must continue with their mission. They can protect themselves against infection by sanitation measures and such preventive measures as listed below and in table 5-1. For more detailed information on sanitation measures, see FM 21-10.

a. Keeping high standards of personal hygiene and, when possible, avoiding practices that produce a rundown condition and consequent lowering of resistance to disease.

b. Keeping the body clean and free from vermin.

Table 5-1. Defense Measures Against Antipersonnel Biological Agents

Items	Defense measures
Protective equipment	The protective mask and hood protect against biological agent aerosols; they also protect the face and neck against bites from infected insects such as mosquitoes. The duty uniform and gloves covering other exposed skin protect the remainder of the body against insect bites.
Immunization	Prescribed immunizations taken as scheduled increase body resistance to specific diseases.
Decontamination	Washing the body with soap and water removes biological agents from the body surfaces. De-lousing procedures and use of repellents reduce the chances

Items	Defense measures
Food and drink	of infection from insect bites. Washing clothing with soap and water or airing it in the sun kills most biological agents. Eating and drinking only approved food and liquids protect against possible infection from ingestion of contaminated substances. Approved treatment of water and cooking of food destroy most biological agents.
Sanitation measures	Taking sanitation measures and staying out of quarantined buildings and areas reduce possibility of infection.

5-2. Individual Protection Against a Biological Attack

The basic protection against a biological agent attack is the wearing of the protective mask with the protective hood attached.

a. *Protection Against Aerosols.* The protective mask gives complete protection against aerosols of biological agents.

(1) It is not likely that biological agents will settle out from aerosols in any meaningful quantity and remain alive in soil or on vegetation to be a major problem.

(2) Where the biological munition is specifically designed for ground contamination, marching men may stir contaminated dust into the atmosphere, thus creating a secondary aerosol of some types of "dry" biological agents. However, secondary aerosols do not normally present a hazard of military significance. In areas suspected of being contaminated, individuals wear the protective mask and hood and decontaminate the clothing that was worn while in these areas, when the situation permits.

b. *Protection Against Infected Vectors.* The duty uniform and gloves protect against bites from vectors such as mosquitoes and ticks that carry disease microorganisms. Clothing is but-

toned and trouser legs are tucked into the boots. Covering the skin reduces the possibility of the agent entering the body through cuts and scratches and also prevents disease-carrying insects from reaching the skin. Insect repellents and insecticides are effective against most disease-carrying insects.

5-3. Body Defense Against Biological Agents

The body possesses several defenses against biological agents. These are the physical barriers to entry in the body and natural immunity and acquired immunity, both of which resist infection.

a. Physical Barriers. These consist of the unbroken skin and mucous membrane. The mucous membrane produces a moist sticky substance, called mucus, which traps and holds microorganisms that come in contact with it.

b. Natural Immunity. This is present at birth and includes—

(1) *White cells* which engulf and destroy microorganisms. They are found in the bloodstream, bone marrow, and certain organs such as the liver, spleen, and lymph nodes.

(2) *Biochemical resistance factors* such as enzymes that attack microorganisms and cause them to dissolve.

c. Acquired Immunity. Active acquired immunity is obtained when the body produces antibodies, such as by prior exposure to the disease. Passive acquired immunity results from antibodies that are produced in another body and are transferred to the individual, such as by inoculation or vaccination.

5-4. Individual Defensive Measures Before a Biological Attack

Training, understanding, and individual preparedness are the best defensive measures against a biological attack. The individual needs to remain alert and have a questioning attitude toward any indication that biological agents may have been used. Normal daily sanitation is the basic defense against any kind of infection. Individuals must not repeat or exaggerate rumors of enemy biological attack. Biological attacks are difficult to detect or recognize; however, through simple defensive measures, such as wearing the protective mask, the effects of a biological attack can be held to a minimum.

5-5. Local Indications of a Biological Attack

Because units are not authorized biological agent

detection devices, individuals use their senses to detect a local biological attack by observing the types of weapon and munition used in the attack and by comparing them with the known characteristics of an enemy biological attack. For example, the most favorable time for a biological attack is during the period from about 1 or 2 hours before dusk to about 1 or 2 hours after dawn. Cloudy or foggy days may also be favorable. A biological attack may be suspected under the following circumstances:

a. Low-flying aircraft that appear to be producing a mist or spray are observed.

b. The functioning of any type of spray device is observed.

c. The functioning of a munition, such as a bomblet, that appears to have no immediate or widespread effect is observed.

d. Unusual types of bomblets are found.

e. Unusual swarms of insects are observed, such as mosquitoes suddenly appearing after aircraft have dropped containers that do not have any immediate effects.

f. Numerous unexplained ill personnel are observed.

5-6. Local Alarms

Any individual suspecting a biological attack gives the following alarms, after first masking if not already masked (STANAG 2047, app G):

a. Sound Alarm. The individual beats any metal object designated in the unit SOP that produces a loud noise.

b. Visual Alarm. The individual extends both arms horizontally sideways with fists doubled facing up and rapidly moves the fists to the head and then back to the horizontal position, repeating as necessary. For more detailed information on visual signals, see FM 21-60.

c. Vocal Alarm. The individual shouts "SPRAY" for a biological spray attack and "MASK" for a biological attack by any other means.

5-7. Individual Defensive Measures After a Biological Attack

Because units are not authorized devices to indicate when the biological hazard no longer exists, individuals continue wearing the protective mask until authorized to remove it by their

leader/supervisor or the unit commander. After a biological attack, the following actions may be necessary:

a. Decontaminate as Required. Generally, decontamination of individuals and individual equipment is not required in the field when biological agents are disseminated as an aerosol. When decontamination is required, refer to appendix C where the methods and materials available in the field for biological decontamination are described. When required, individuals decontaminate themselves by showering with soap and hot water; germicidal soaps are used if available. The nails and hairy parts of the body may require special attention. Contaminated clothing is washed in hot soapy water.

b. Report Sickness Promptly. Reporting sickness promptly serves two purposes: first, it allows early treatment of the disease and second, it enables medical personnel to identify the biological agent to which individuals were exposed. Once the disease has been identified, effective medical measures can then be taken.

c. Guard Against Contamination. Individuals avoid food and water that could be contaminated. Microorganisms are difficult to detect; therefore, if a biological attack is suspected, all exposed surfaces must be assumed to be contaminated. Food and water in sealed containers can be consumed if the containers are boiled or washed thoroughly with soap and water before the seal is broken.

CHAPTER 6

DEFENSE AGAINST NUCLEAR ATTACK AND RADIOLOGICAL HAZARDS

(STANAG 2047)

Section I. INDIVIDUAL DEFENSIVE MEASURES BEFORE AND DURING A
NUCLEAR ATTACK**6-1. General**

Individual actions for protection against the effects of a nuclear attack include the actions for protection against heat and light, blast, and radiation.

a. Thermal Effects. The heat and light given off during a nuclear explosion are called thermal radiation. To avoid eye damage from the intense light, individuals must not look at the fireball until the surrounding area is no longer illuminated. The duty uniform provides some protection against burns from the heat. Even when an individual is beyond the zone of serious danger from blast and nuclear radiation, he may still be vulnerable to heat. In these circumstances, parts of the body covered by clothing will be fairly well protected from flash burns. Loose-fitting clothing offers greater protection against flash burns than tight-fitting clothing; additional layers give better protection.

b. Blast Effects. Protection against blast consists primarily of the individual protecting himself against the wind effects and getting out of the way of flying debris.

c. Radiation Effects. Protection against radiation consists primarily of shielding against gamma radiation and neutrons; radiation from alpha and beta particles is essentially an internal or a contact hazard. Clothing will keep radioactive material from coming into actual contact with the skin.

6-2. Defense Actions Before a Nuclear Attack

The best individual defense against a nuclear attack is to dig in. Defensive positions against a nuclear attack are prepared whenever the tactical situation permits. These positions vary

from individual foxholes to improved shelters; however, certain materials and types of construction provide good shielding against initial radiation and protection against blast and heat.

a. Foxholes. Because earth is a good shielding material and the most readily available, a properly constructed foxhole provides excellent protection. The individual habitually digs a foxhole whenever occupying a position and improves it by providing overhead cover as soon as time and the situation permit. A deep foxhole affords more shielding against initial gamma radiation and neutrons than a shallow foxhole because it provides more earth between the individual and the fireball. Radiation can enter the foxhole through the earth and through the opening, but the amount that enters through the earth is reduced considerably by the shielding effect. In addition, an earth covering will reduce the radiation entering the foxhole opening and will also prevent the entrance of fallout. The foxhole and the cover are made strong enough so that they will not be collapsed by blast.

b. Shelters. Tunnels, caves, and storm drains will provide effective shelter unless there is a nearby underground burst. Culverts, drains, and ditches can be used in an emergency, although they offer only partial protection. A tank will provide excellent protection in most situations. Other vehicles made of steel will also provide some protection.

c. Protection of Equipment and Supplies. Individual equipment is placed in protected positions, either individual foxholes or separate holes, whenever possible. Objects such as ration cans, tools, and gas cans are secured to minimize the danger of flying materials when the blast wave hits. Rations and supplies remain packaged to

protect against fallout, and extra water supplies are protected by placing them in covered holes. Individual helmets, weapons, equipment, and web gear, and canteens, ammunition bandoliers, pouches, and other equipment attached to web gear are worn or, if removed, placed *in the foxhole* and not outside the foxhole.

6-3. Defense Actions During a Nuclear Attack

An enemy nuclear attack probably will come without warning. The first indication will be a very intense light, much brighter than sunlight. There will be a small amount of time available to take protective action, depending on the yield of the weapon and the distance to the burst; therefore, individual defense actions must be automatic and instinctive. Heat and radiation come with the intense light of the explosion, and blast follows within seconds. As with conventional

high explosive weapons, individuals take cover. They—

- a. Move no more than a few steps to seek cover.
- b. Drop flat on the ground or to the bottom of a foxhole.
- c. Close their eyes and do not face toward the fireball.
- d. Protect exposed skin from heat rays as much as possible (put hands and arms near or under the body and keep helmet on if possible).
- e. Remain down until after the blast has passed and debris has stopped falling.
- f. Stay calm, check for injury, check weapon and equipment for damage, and prepare to continue the mission.

Section II. INDIVIDUAL DEFENSIVE MEASURES AFTER A NUCLEAR ATTACK

6-4. General

Following a nuclear attack, the greatest potential dangers to individuals are (1) exposure to fallout of radioactive material from the nuclear cloud and (2) exposure to radiologically contaminated terrain for unsafe periods. When warned of fallout by the local alarm, individuals seek cover (para 6-2 and 6-5a).

a. *Fallout.* As explained in paragraph 2-29, fallout is produced from the earth being drawn into the fireball, vaporized, combined with radioactive material, and then condensed to particles that gradually fall to earth. The start of fallout can sometimes be determined by observing particles settling; it can always be determined by appropriate radiac instruments.

b. *Local Alarms.* Sound signals may be used (STANAG 2047, app G). The local vocal alarm for fallout is "FALLOUT."

6-5. Defense Actions after a Nuclear Attack

After a nuclear attack, individuals prepare to continue the mission, secure and organize equipment, reinforce and repair positions, and make preparations for possible fallout. The presence and degree of radiological contamination are determined by the use of radiac instruments which are operated by designated personnel. Individual responsibilities include the preparation of positions, equipment, and facilities so that the effects of fallout are held to a minimum.

a. *Defense Against Fallout.* The protective mask is not required for defense against fallout. When radioactive particles in the air make breathing difficult or cause discomfort, a handkerchief or similar cloth placed over the nose can be helpful. If it is necessary to remain in an area having fallout, individuals enter rapidly, dig in quickly, sweep the area around foxholes, and remain covered until fallout stops.

b. *Requirements for Movements.* If the radiation dose rate reaches a hazardous level after fallout is complete, individuals may be instructed to move to a less hazardous area. However, individuals will not be directed to move solely on the basis of fallout prediction, because precise locations of fallout cannot be reliably predicted.

6-6. Individual Radiological Decontamination

Since radioactive material cannot be destroyed or neutralized, radiological decontamination consists of physically removing the contaminated material. Individual radiological decontamination is confined to the individual, his clothing and equipment, his position, and his food.

a. *Contaminated Skin and Clothing.* The skin and clothing of individuals who have been exposed to fallout or who have traversed a radiologically contaminated area may be contaminated to a hazardous level (dose rate from 20 to 50 rad). If the situation temporarily prohibits individuals from decontaminating themselves by bathing and

a change of clothing, they use field expedient methods. These methods include: removal and vigorous shaking of clothing or brushing the clothing with brushes or brooms (can be improvised from shrubbery), removing dust from the hair and from under the fingernails, and wiping exposed skin with a damp cloth. Individuals take care to prevent secondary contamination of food and water supplies during and after the decontamination process. They bathe and change clothing as soon as the situation permits.

b. Contaminated Equipment. The requirement for decontamination of individual equipment, vehicles, arms, 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, if available.

c. Contaminated Individual Positions. After fallout has stopped, the radioactive fallout particles are removed from the area immediately around the individual's foxhole. Radioactive particles can be removed by any expeditious means; for example, by sweeping with a broom that has been improvised from shrubbery or by scraping with an entrenching tool. The interior of the foxhole is decontaminated by removing approximately a half inch of earth from the sides and bottom of the foxhole. The excess dirt is thrown out of the foxhole.

d. Contaminated Food and Water. Contaminated food *may* still be acceptable for consumption, especially in an emergency. Food that is

packaged or sealed is decontaminated by washing and scrubbing the outside covering before it is opened. The decision to consume any food directly exposed to contamination is a command decision; individuals must obtain permission before eating this food. Individuals drink water only from approved sources and do not attempt to decontaminate radioactive water.

e. Normal Individual Protection During Decontamination Operations. Individuals whose duties require them to enter radiologically contaminated areas or to come in contact with contaminated objects wear the following clothing:

(1) Standard military clothing or combat fatigues tightly buttoned at the neck and tied at the wrists and ankles (trouser legs may be bloused into the top of combat boots instead of being tied).

(2) Any form of gloves.

(3) Headgear, preferably tight. (A hood may be worn if available.)

6-7. Individual First Aid

The only first aid required is that normal for burns and for injuries due to blast. Individuals should assist these casualties whenever possible. Nuclear radiation sickness does not appear until some time after exposure to gamma radiation. Early symptoms of nausea and vomiting are followed by a latent period when symptoms disappear and the individual feels normal. If incapacitating symptoms follow the latent period, medical treatment will be provided.

PART THREE

CBR AND NUCLEAR DEFENSE GUIDANCE FOR THE UNIT COMMANDER

CHAPTER 7

UNIT CBR DEFENSE ORGANIZATION

(STANAG 2047 and STANAG 2103)

7-1. General

Unit commanders establish CBR and nuclear defensive measures that will enable the unit to continue operations in a chemical, biological, or radiological environment. The objective of these measures is to enable the unit to *continue its mission* with minimum losses in personnel. These measures include organization of the unit for CBR and nuclear defense (para 7-2) and instruction and training of personnel in—

a. Proper wearing of individual chemical protective clothing and masks and the use of other chemical protective equipment when operating under threat of exposure to chemical agents.

b. Work pacing and providing for rest and relief when wearing chemical protective clothing and masks for extended periods.

c. Proper use of chemical agent detection equipment and alarm devices to warn of chemical agents.

d. Proper use of radiation detection equipment to warn of radiological hazards.

e. Prompt and proper reporting of a chemical or biological attack.

f. Protective actions to take against fallout.

g. Monitoring of individuals, food, water, equipment, and terrain to detect radiological contamination.

h. Processing of the unit's radiation status records and reports to determine its radiation exposure guide for tactical missions.

i. Decontamination of radiologically and chemically contaminated individuals and, if required, equipment and terrain.

j. Prompt first aid for individuals exposed to chemical agents.

k. Replacement of filter elements of the M17-series masks in accordance with replacement criteria (para 4-3c).

7-2. Company and Comparable Unit CBR Defense Organization

The CBR defense team of the company and comparable units and, within each platoon, the platoon sergeant and squad leaders constitute the basic company CBR defense organization. In addition, the company may be required to organize, train, and equip special teams on an additional duty basis.

a. *Unit CBR Defense Team.* Commanders of companies and comparable units appoint on unit orders and train a CBR defense team according to AR 220-58 and supplementing instructions. The CBR defense team consists of TOE personnel (appointed on an additional duty basis) with TOE equipment. It is activated when required to perform designated tasks. During active chemical and nuclear operations, CBR-trained personnel may be assigned to full-time CBR defense duties.

(1) *Personnel.* The unit commander selects personnel whom he considers best qualified to supervise CBR defense activities. A company CBR defense team usually consists of a CBR defense officer to supervise CBR defense activities; two CBR defense NCO (normally from the platoons), one to supervise the chemical detection and radiological monitoring activities and one to supervise decontamination activities; chemical detection and radiological survey parties (normally from the platoons); a decontamination squad of the required number of personnel

(normally including a cadre of about six men from the platoons); and support and security personnel as required. Selected individuals of artillery and other designated units are trained to use organic angle-measuring devices and communication equipment to observe and report nuclear burst data, as described in FM 3-12.

(2) *Equipment.* Companies and comparable units are authorized chemical agent detector kits, automatic chemical agent alarms, radiological detection equipment, and other detection material. In special situations when the unit TOE does not provide sufficient equipment to meet the unit requirements, CTA 50-914 may be used as the authority to requisition the minimum essential chemical and radiological detection equipment.

b. *Special Teams.* The teams listed below may be required, on call of higher headquarters, to assist in restoring normal operations in the event of a nuclear attack or manmade or natural disaster. See FM 61-100 (app C, Standing Operating Procedures) for details of special teams.

(1) *Area damage control party.* This party may consist of one NCO or specialist and about six enlisted men with vehicles and equipment as designated in the SOP of higher headquarters.

(2) *Light rescue, labor, and decontamination squad.* This squad may consist of one NCO or specialist and about six enlisted men with vehicles and equipment as designated in the SOP of higher headquarters.

(3) *Emergency decontamination squad.* This squad may consist of one NCO or specialist and about nine enlisted men with vehicles and equipment as designated in the SOP of higher headquarters.

c. *Sentries and Guards.* During active chemical operations, sentries and guards will have additional duties of giving the chemical attack alarm and participating in other chemical defense activities. Each sentry must know the actions to be taken in sounding the alarm or using other means of alerting unit personnel to a chemical, biological, and radiological hazard. However, additional CBR defense duties should not hamper the primary mission of the sentries and, if required, additional sentries are posted.

7-3. Detection of CBR Agent/Material

Measures to detect chemical or biological agents and radioactive material are placed in effect by unit commanders regardless of the degree of the

enemy CBR threat. The detection of chemical agents and radioactive material requires special equipment and, in some instances, special skills to operate the equipment. A capability to detect chemical agents and radioactive material is maintained continuously by those units possessing the detection equipment.

a. *CBR Agent/Material Detection and Warning System.* Specialized equipment which requires full-time skilled operators is positioned to support and reinforce the capabilities of company-size units. Support teams are assigned and attached to various levels of command on the basis of the CBR threat analysis, the combat situation, and missions of the supported units; see paragraph 13-5 for details of support teams. Each individual, team, unit, and command performs a specific task in the overall operation of the CBR agent/material detection and warning system.

b. *Detection.* Detection here refers to the initial discovery of the presence of a chemical or biological agent or radioactive material. The presence may be suspected, based on the techniques used in an artillery or air attack (para 2-14, 2-15, 2-21, 2-22, 2-28). Specific detection procedures are required for chemical or biological agents and radioactive materials, as described below.

(1) *Chemical.* The M8 automatic chemical agent alarm will be the organic means of alerting a unit to the vapor or aerosol arriving from an upwind chemical attack (para 8-15). Company-size units use the M15A2A chemical agent detector kit to detect vapors or aerosols of known types of enemy chemical agents and the M8 chemical agent detector paper to detect liquid chemical agents. The physical senses (other than odor) may indicate the presence of a chemical agent (fig 2-1, para 2-6).

(2) *Biological.* Companies and comparable units are not authorized biological agent detection equipment. Normally, warnings of a biological attack will be broadcast on the division command communication channels, which are monitored by battalions and separate units; battalions will alert their companies. Units may detect a biological attack by *local indications* (para 5-5).

(3) *Nuclear.* Unlike chemical or biological attacks, a nuclear attack will be obvious because of the flash and blast of the detonation; however, detection of the resulting radiological contamination requires special detection equipment and

trained operators. The IM-174A/PD and AN/PDR-27() radiacmeters are the primary company level detection instruments (para 11-5).

7-4. Warning and Reporting

All units below division level are designated nuclear, biological, or chemical (NBC) information sources (para E-3) and are required to collect and report through the chain of command information of a nuclear, biological, or chemical attack. In addition, each commander is responsible for warning subordinate units of chemical, biological, and radiological hazards resulting from such attack. Higher headquarters usually issue a general alert that serves as a guide for subordinate commanders in establishing the unit mission-oriented protective posture (para 8-8-8-13).

a. Warning of Subordinate Units. After an alert of a nuclear, biological, or chemical attack, all subordinate, attached, and supporting units are immediately warned of the hazard. At company level and below, the chemical or biological attack warning may be through the use of a noisemaker or brevity code (GAS, SPRAY, or MASK) by voice, radio, or telephone (STANAG 2047, app G). The "all clear" normally is given vocally. The actual means are established in the unit SOP. The warning initiated at company level and above is submitted to the next higher headquarters in the appropriate NBC reporting format, using the most appropriate communications means (STANAG 2103, app E).

b. Submitting of Initial Report. The initial use of nuclear, biological, or chemical munitions by an enemy will be reported by the most expeditious means through the next higher headquarters to the theater commander. FLASH message precedence will be used throughout the command for the initial NBC report.

c. Reporting to Higher Headquarters. For all nuclear, biological, and chemical attacks, at the same time that the warning is being sent to subordinate elements, an NBC attack report is submitted to the next higher headquarters, giving available information. The initial report will not be delayed to gain additional information designated in the NBC report format. Followup NBC reports are submitted as additional information becomes available. Standardized formats are required to keep the high volume of data in a manageable form.

(1) The NBC 1 report form is used to report

a chemical, biological, or nuclear attack. The initial NBC 1 report is submitted with a FLASH message precedence; followup reports are submitted with an IMMEDIATE message precedence. See appendix E for a detailed discussion of the NBC 1 report and paragraph E-8 for examples of NBC 1 chemical report messages.

(2) The NBC 4 report is submitted to the next higher headquarters, giving radiological contamination information. The times, use, and requirements for the NBC 4 report will be established in the higher headquarters SOP. See paragraph E-12 for examples of NBC 4 report messages.

(3) These and other NBC reports that may be submitted or received by company level units are discussed in appendix E.

7-5. Unit CBR Defense Standards of Proficiency

Units develop and maintain a capability to successfully accomplish their missions while operating in a chemical, biological, or radiological environment. For guidance on defensive measures in a chemical environment, see paragraphs 8-1 through 8-7; in a biological environment, see paragraphs 9-1 through 9-7; and in a radiological environment, see paragraphs 11-1 through 11-14.

a. Specific Objectives. See appendix B for a list of specific objectives to be used as unit CBR defense standards of proficiency.

b. Attainment of Standards. The commander is responsible for the readiness of his unit to operate with maximum individual and unit effectiveness under the threat of enemy employment of chemical, biological, and nuclear weapons. Exercises and practical demonstrations of the individual and unit CBR defense standards of proficiency listed in appendix B give the commander a basis for training and command emphasis in attaining maximum combat readiness.

7-6. Standing Operating Procedures (SOP) for Defense Against Chemical, Biological, Radiological, and Nuclear Hazards

All units prepare an SOP to conform to the SOP of the next higher headquarters. This SOP includes a CBR defense annex, or a separate CB (chemical/biological) defense annex and a separate NR (nuclear/radiological) defense annex, giving instructions for defense against chemical,

biological, radiological, and nuclear hazards. Each member of the unit should know the provisions of the CBR defense annex and receive training in their application.

a. Chemical and Biological Defense Annex. Appendix D-I is an example of a CB defense

annex to a company-size unit SOP that can be used as a guide.

b. Nuclear and Radiological Defense Annex. Appendix D-II is an example of an NR defense annex to a company-size unit SOP that can be used as a guide.

CHAPTER 8

UNIT DEFENSE AGAINST CHEMICAL ATTACK

(STANAG 2002 and SOLOG 125)

Section I. UNIT DEFENSIVE MEASURES IN A CHEMICAL ENVIRONMENT

8-1. General

The defensive measures that are taken by a unit when operating in a chemical environment are governed by the nature of the chemical threat, the unit mission, the situation, and the weather. Maneuver of troops and movement of supplies are planned so that contaminated terrain can be avoided to the maximum extent consistent with the security and mission of the movement. Contaminated terrain is crossed only when required, as quickly as possible and preferably in vehicles at speeds and intervals that minimize contamination of the following vehicles. Decontaminating material is made available for use after the contaminated areas have been crossed. The movement and heavy work-rate activities of personnel dressed in chemical protective clothing and equipment are planned for the coolest part of the day, when the situation and mission will permit. When positions are occupied, the area is so organized that alternate uncontaminated positions can be occupied when required.

8-2. Tactical Defense Plans and Actions

Tactical chemical defense plans are *integrated* into the general scheme of maneuver. Unit commanders remain constantly alert to the possibility of a chemical attack by the enemy. A chemical attack may be used by an enemy under unfavorable conditions in an effort to obtain surprise or to reduce his troop safety hazard. If there is an imminent threat of enemy use of chemical agents, all artillery and air attacks are considered potential chemical attacks. Planning procedures include considerations of the chemical threat.

a. Analysis of the Situation. In addition to other matters when analyzing the situation and formulating plans, the commander considers—

(1) Capabilities of enemy weapons and chemical munitions.

(2) The enemy use and behavior of chemical agents.

(3) The weather and terrain as they affect chemical agents.

(4) Availability and serviceability of unit chemical defense equipment.

(5) The effects that the wearing of chemical protective clothing and masks will have on unit personnel and on accomplishment of the unit mission.

b. Plans for Defense Against Chemical Attack. Once chemical agents have been employed or while the threat of enemy chemical attack exists, the unit commander decides whether to keep all personnel, or only a certain number, masked and in chemical protective clothing. *Whenever possible, subordinate unit integrity is maintained.* This decision, called the mission-oriented protective posture (para 8-8—8-13), is based on the chemical threat, mission of the unit, type of activity required, and temperature; it is made at the lowest possible command echelon according to policy or guidance furnished by the next higher headquarters. Casualties from an enemy chemical attack may be minimized by the following measures:

(1) Training in immediate protection, first aid, and decontamination.

(2) Enforcing chemical defense discipline.

(3) Exposing a minimum number of personnel to chemical hazards.

(4) Exposing personnel to chemical hazards for the shortest possible time.

(5) Exposing personnel to the lowest possible concentration of the chemical hazard.

(6) Remaining constantly alert to the possibility of a chemical attack and developing prompt reaction plans.

8-3. Unit Chemical Reconnaissance

Each unit is responsible for chemical reconnaissance of its own front, flanks, routes, and alternate routes of approach. Patrols may be designated by the unit to conduct chemical reconnaissance. An immediate, quick reconnaissance to determine the best means of passage is necessary whenever a contaminated area is encountered unexpectedly. Daytime reconnaissance of contaminated areas is preferable, if possible, since night reconnaissance of these areas is difficult.

a. Chemical Agent Detection Equipment. Areas suspected of being contaminated are checked with the following unit equipment: an automatic chemical agent alarm either mounted on a vehicle or carried on a personnel backpack to detect the presence of vapor from contaminated terrain, a chemical agent detector kit to detect the type of chemical agent vapor present, and chemical agent detector paper on the tip of a stick to determine if the terrain is contaminated with liquid chemical agent. Special attention is given to shell craters, low-lying patches of woods, defiles, ravines, stream beds, areas covered with high grass or underbrush, and other spots favorable to contamination by a persistent chemical agent.

b. Contaminated Areas. Units discovering chemical contamination in an area report this fact according to their SOP. They mark the area with the chemical contamination marker ("GAS") according to STANAG 2002 (app F) if it is considered necessary to protect friendly units crossing or occupying the area. For guidance on approximate duration of hazard in contaminated terrain, see table 8-3.

c. Chemical Contamination Information. The following information, as required, is gathered by the chemical reconnaissance patrol:

(1) *For areas known to be contaminated with chemical agents.*

(a) Type of chemical agent contamination and date, if known.

(b) Location and extent of contamination.

(c) Possible routes for troops and vehicles upwind or downwind of the contaminated area, and requirement for masking.

(d) Feasibility of preparing a road or of using any established paths or roads through the contaminated area.

(e) Requirements for marking contaminated area or establishing warning of contamination.

(2) *For areas recently contaminated with chemical agents.*

(a) Limits of contaminated areas.

(b) Location of clean areas.

(c) Other information on which to base recommendations as to whether or not the area can be safely occupied or traversed, such as date of contamination, type of terrain, and weather (temperature, rain).

8-4. Maneuver

When planning maneuvers, the unit commander considers movements to place personnel and materiel in favorable positions for defense against chemical attack. Routes and positions are selected that are favorable both for accomplishment of the mission and for protection against chemical attack. In choosing routes and areas, the following considerations are important:

a. Elevation and Air Currents. Uncontaminated high ground is preferable because chemical agent vapors and aerosols tend to flow to low ground. On the other hand, air currents in corridors may tend to carry agents up slope and up valley during the day and down slope and down valley during the night.

b. Concealment and Cover. Woods offer concealment and some cover against spray; woods with good overhead cover and clear of undergrowth are preferable. However, chemical agents are likely to be more persistent in wooded areas of this type. The possible hazard from chemical attack under these conditions is weighed against the security of concealment offered by the wooded area. Before entering wooded areas, a chemical agent detection team determines if contamination is present. If heavily contaminated, low scrub and long grass may contaminate troops. Furthermore, chemical agent vapors and aerosols linger in heavy undergrowth, particularly in low areas.

c. Dispersion. Dispersion is an important protective measure. A dispersed installation or formation presents a less lucrative target to attack than a concentrated one, especially for a surprise chemical attack designed to achieve immediate casualty effect. In some cases, the retention of specific terrain may be essential to the mission and may permit only limited dispersion.

8-5. Issue of Chemical Protective Equipment

The level of issue of individual chemical protective equipment is established by major commanders, based on a threat analysis. When intelligence indicates that the enemy has the capability to employ chemical agents, chemical protective clothing and equipment are stationed as close as possible to unit personnel. If there are indications of enemy intent to employ chemical munitions, the commander directs the issuance of chemical protective clothing and equipment and establishes the mission-oriented protective posture (para 8-8-8-13).

8-6. Chemical Collective Protection

Individual chemical protective clothing and masks cannot be worn indefinitely. An enemy may be able to subject an area occupied by friendly troops to a hazardous concentration for a prolonged period. Therefore, it is necessary to provide chemical collective protection for personnel to permit them to rest and take care of their personal needs. Also, protective shelters are needed for operations of command, communications, and other important facilities. Details concerning collective protection shelters and gas-particulate filters used with the shelters are contained in FM 5-15, TM 3-221, and TM 5-311. The use and requirements for collective protection for unit activities are normally coordinated above company level (para 14-14-14-18).

8-7. Protection of Equipment and Supplies from Chemical Contamination

Because contaminated equipment and supplies present a threat to personnel, covers are used to protect equipment and supplies stored outdoors. The following guidance is appropriate for units in the field and in support of combat operations:

a. Equipment. Important items of equipment are 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 no other cover is available, dense foliage will provide some protection. The following are sample means of protection for listed items:

- (1) *Ammunition* is covered or kept in its containers as long as possible.
- (2) *Weapons* are covered or dispersed under foliage when possible.
- (3) *Instruments*, such as those used for fire

control, are kept in their containers when not being used because they are subject to corrosion by certain chemical agents.

(4) *Vans* are located to take advantage of any available natural shielding. If possible, vans are located so that the air-conditioners are opposite the prevailing wind direction. Personnel responsible for the operation of the vans should make every effort possible to reduce leakage in vans and components such as the air-conditioners.

(5) *Aircraft* are provided with covers (at least for cockpits, plastic windows, guns, and gun compartments) when not in hangars.

(6) *Vehicles* are stored in woods or under bushes or are dispersed and covered, if possible.

(7) *Communications equipment not housed in shelters* is covered. Special care is taken to protect the headsets on radios and the mouthpieces on telephones from contamination.

(8) *Field latrines* are provided with overhead cover.

b. Packaged Food Items. Vapor, aerosol, or liquid chemical agents may contaminate food. The type of food, type and amount of chemical agent, and effectiveness of protective measures influence the edibility of food. Protective measures include the packaging of food, proper storage procedures, dispersal of supplies, and maximum use of both natural and artificial shelters or other forms of overhead cover. Foods not in protective packages generally constitute the major difficulty. The current packing methods for overseas shipment substantially reduce the possibility of contamination.

c. Unpackaged Subsistence Items. Chemical agents will contaminate unpackaged food; oily and fatty foods in particular are vulnerable. Foods are protected from contamination when stored in containers such as field ice boxes and refrigerators, if the sealing gaskets are serviceable. As a rule, contaminated unpackaged food will not be eaten unless released for consumption by medical personnel.

d. Water. Engineer personnel are responsible for operations of water supply systems and for the purification (decontamination) of water from these sources. Medical personnel are responsible for recommendations on the potability of water (SOLOG 125). Water that is not in sealed containers may become contaminated. Water suspected of contamination is not consumed until tested and declared safe.

Section II. MISSION-ORIENTED PROTECTIVE POSTURE (MOPP)

8-8. General

The potential enemy weapons array for delivery of massive volumes of chemical agent capable of producing rapid and complete coverage of friendly areas in extremely short periods will require personnel to be in continuous individual protection. This enemy capability can produce casualties by causing individuals to be unable to put their protective clothing and masks on in time to be effective. However, military situations, unit missions, duty requirements, and basic human needs will not permit personnel to remain totally protected against chemical agents at all times. Adoption of the *mission-oriented protective posture* allows the commander options and compromises to assure the accomplishment of the unit mission with minimum risk of casualties.

a. Mission-Oriented Protective Posture Defined. The mission-oriented protective posture is a flexible system of chemical protection for operations in a toxic chemical environment. This posture requires personnel to wear individual chemical protective clothing and equipment consistent with the chemical threat, work rate imposed by their mission, temperature, and humidity without unacceptably degrading their efficiency from the effects of heat stress, psychological stress, and other factors affecting the senses. Personnel are directed to assume the mission-oriented protective posture when intelligence indicates that the enemy may initiate the employment of chemical agents or once chemical agents have been employed. The extended wearing of chemical protective clothing and equipment is required by the continuing immediate threat of chemical attack or hazard resulting from the known capability of the enemy to produce an unacceptable casualty rate among unprotected personnel.

b. Operational and Environmental Effects. Individuals in the mission-oriented protective posture can be expected to function generally as described below under the stated conditions:

(1) *Under cool temperatures* (50°-70° WBGT*), unless involved in heavy work, individuals should be able to continue to function with-

*The WBGT (Wet Bulb Globe Temperature), normally provided by the division surgeon, is described in TB MED 175. The specific temperatures quoted in parentheses are temperatures at which the effects were studied in field tests. The WBGT does not differ significantly from ordinary temperature (° F) at a relative humidity of approximately 75 percent.

out significant degradation from heat buildup for extended periods while wearing chemical protective clothing, mask and hood, and gloves. Psychological factors, however, may require individuals to have brief respites by removing the mask and hood for 5 to 10 minutes an hour to minimize longer range cumulative adverse effects. For acclimated individuals, the relief periods may be less frequent. As the work rate increases, individuals should be able to continue their mission if they are permitted progressively to modify their chemical protection by opening the hood of the protective mask and protective clothing for ventilation and subsequently removing the protective mask and hood, and gloves. Further, personnel may remove layer or layers of underclothing and still be in the mission-oriented protective posture.

(2) *Under warm temperatures* (70°-85° WBGT), when involved in moderate work and *not* in a contaminated environment, individuals should be able to continue their mission for extended periods if they are permitted to modify their chemical protection by opening the protective clothing and removing the protective mask and hood, and gloves. However, when involved in heavy work under the same conditions, individuals must be permitted to reduce their chemical protection *early* by removing the protective mask and hood, gloves, and some of the duty uniform or protective clothing, as appropriate.

(3) *Under hot temperatures* (85°-100° WBGT) and high relative humidity, especially when involved in moderate or heavy work and when *not* in a contaminated environment, individuals can be expected to continue their mission only if they are permitted to reduce their chemical protection as early as possible by removing the protective mask and hood, gloves, and some of the duty uniform and/or chemical protective clothing, as appropriate.

8-9. The Wearing of Individual Chemical Protective Clothing and Equipment

The two currently standard-A chemical protective clothing ensembles are described in paragraph 4-2. The ensemble consisting of an expendable two-piece protective overgarment will be worn over the duty uniform with protective gloves, socks, and mask and hood (figs 4-1 and 4-2); it will normally be issued to units forward of brigade rear, as designated by the division

commander. The ensemble consisting of impregnated shirt and trouser liners will be worn under the duty uniform with protective gloves, socks, and mask and hood; it will normally be issued to units to the rear of brigade and to armor and aircraft units, as designated by the division commander. Some units may be issued variations of the standard-B impregnated uniform with impregnated underwear, protective gloves, socks, and mask and hood. The flexibility of MOPP in providing for varying levels of individual protection is based on the limitations described below.

a. Heat Exhaustion. Individuals operating at heavy work rates while in chemical protection may experience heat exhaustion (dizziness and faintness) at any time, especially during periods of high temperatures and humidity.

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

c. Senses. Individuals who are required to perform duties involving the senses or related functions such as manual dexterity, visual acuity, and voice communication will operate at varying decreased levels of efficiency while in full chemical protective clothing and equipment, depending on training and proficiency.

d. Personal Needs. Individuals cannot be in full chemical protection for indefinite periods and still attend to certain personal needs such as eating, receiving medication, caring for wounds, shaving, and elimination of body wastes.

8-10. Commander's Guidance for the Mission-Oriented Protective Posture

The commander's guidance for the wearing of individual chemical protective clothing and equipment is stated in the unit SOP. Any deviation from the SOP is published in the coordinating instructions for operation plans or orders. The commander must have the flexibility to vary individual and unit chemical protection to provide the best chemical protection to personnel while minimizing interference with the unit's mission. The evaluation of the unit's capability to accomplish its mission may require a determination

of trade off among mission accomplishment, protection, and variations of acceptable casualties from different weapons and temporary incapacitation from heat exhaustion. In making his decision, the unit commander considers the following:

a. The amount of time needed to perform most tasks will be increased when troops are required to wear full chemical protective clothing and equipment. Commanders must accept this fact and plan accordingly.

b. Personnel who are required to remove parts of their chemical protective clothing will be more vulnerable to chemical agents than those who wear full chemical protective clothing. The commander must accept the risk of casualties if personnel in reduced chemical protection are subjected to a chemical attack. The number and severity of casualties will depend on the alertness of personnel, the elapsed time between the attack and subsequent decontamination of personnel, the immediacy of the warning system, and the giving of first aid.

c. Reduced chemical protection of personnel should not be permitted unnecessarily because the risk of heat stress or even heat exhaustion involves only a brief illness, whereas chemical casualties may be much more serious. It should be realized that most cases of heat *exhaustion* will recover within a relatively short period (measured in hours), whereas some heat *stroke* and chemical casualties will *not* recover or will be incapacitated for longer periods. For example, heat *stroke* has a 50 percent mortality rate; however, it accounts for only a small percentage of heat casualties. Heat exhaustion can be considerably reduced by command emphasis in making certain that all personnel drink enough water and take salt tablets according to TB MED 175 during unmasked rest breaks or while in a collective protection shelter.

Note. Heat *exhaustion* results from excessive loss of water and salt from the body; symptoms are dizziness and faintness. Heat *stroke* is characterized by very high body temperatures and unconsciousness; symptoms may include stoppage of sweating and hot dry skin.

8-11. Commander's Analysis of the Situation

The commander makes an analysis of the situation before the start of a mission to determine what chemical protection the personnel of his unit will require. He also considers related requirements.

a. In his analysis, the commander considers the following:

(1) The type mission and its relative importance to the overall mission. For example, if the commander must conduct a dismounted assault under threat of a chemical attack, he could consider directing—

(a) All subordinate units to be in full chemical protection and risk failing to complete the mission or taking a longer time than desired to complete the mission because of possible casualties from heat exhaustion or fatigue, *or*

(b) All subordinate units to be in reduced chemical protection and accept the risk of increased chemical casualties in the event of a chemical attack, *or*

(c) Subordinate units making the assault to be in reduced chemical protection and troops of subordinate units in reserve to be in full chemical protection, or vice versa.

(2) The effects of estimated time and duration of the mission, temperature, terrain, and enemy situation and the support required to minimize casualties from enemy fire, chemical attack, and illness from heat buildup.

b. The commander also considers the following related requirements:

(1) Provision for relief of personnel so that they can shave daily (to insure a close seal of the protective mask) and bathe and change underclothing about every 2 or 3 days (to prevent skin rash from the chemical protective clothing in contact with the skin) when operating continuously in a contaminated environment.

(2) Provision for small decontaminated areas where personnel can remove their clothing to relieve themselves.

(3) Provision for periodic (about weekly) exchange of chemical protective clothing.

8-12. Commander's Options Under the Mission-Oriented Protective Posture

Based upon his analysis of the situation, the unit commander determines from the options available what chemical protection is required so that his unit can accomplish its mission in a chemical environment. Whenever possible, the commander specifies the chemical protection individuals will have *before* the start of the mission. He may subsequently direct this chemical protection to be modified, reduced, or varied within his unit according to his appreciation of the situation and the operational limitations. He considers that as the temperature, humidity, and work rate increase, he has to reduce the amount of chemical

protection of individuals or take certain pacing options to minimize the probability of degradation of unit effectiveness from heat stress and other factors.

a. *Commander's Options of Reduced Chemical Protection.* Several examples of many possible variations of the mission-oriented protective posture are described in table 8-1.

b. *Commander's Options Contingent Upon Contamination Hazards.* The incidence of heat stress and heat exhaustion, especially under conditions of high temperatures and humidity, can be reduced as follows:

(1) *In a contaminated area.* The unit commander may—

(a) Rotate heavy work among subordinate units or individuals.

(b) Authorize more frequent rest periods. See table 8-2 for guidance on suggested maximum safe unit work time and rest periods for personnel dressed in chemical protective clothing.

(c) Use vehicles for transportation whenever possible.

(d) Provide an adequate water supply so that personnel can increase their water intake by frequent drinking of small amounts, especially when taking salt tablets.

(2) *When there is no immediate hazard from chemical agents.* Table 8-3 provides guidance on approximate duration of hazard in contaminated terrain. A unit commander may rotate personnel to various combinations of reduced chemical protection to provide relief from the buildup of body heat or to permit them to attend to body requirements. In addition to permitting personnel to reduce their chemical protection, a unit commander may permit a small percentage of them to be out of their chemical protective clothing at one time.

(a) The number of personnel in reduced chemical protection is determined by the unit commander according to his appreciation of the local situation.

(b) Reduced chemical protection also is permitted on a selective basis for personnel performing certain tasks involving manual dexterity, visual acuity, and voice communication.

(c) Reduced chemical protection may also be required after considering long-term psychological and physiological effects on personnel in full chemical protective clothing for extended periods.

(d) When there is no danger from chemi-

Table 8-1. Example Variations of the Mission-Oriented Protective Posture

WORK RATE ¹ (para 8-8b)	TEMPERATURE RANGE		
	Cool (50°-70° WBGT) ²	Warm (70°-85° WBGT) ²	Hot (85°-100° WBGT) ²
Low	Wear full protective clothing and equipment.	Progressively open mask hood and clothing.	Remove and carry mask and hood, and gloves. Remove some protective clothing or duty uniform.
Moderate	Wear full protective clothing and equipment.	Remove and carry mask and hood, and gloves. Open protective clothing and duty uniform.	Remove and carry mask and hood, and gloves. Remove some protective clothing or duty uniform.
Heavy	Remove and carry mask and hood, and gloves. Progressively open and/or remove some protective clothing or duty uniform.	Remove and carry mask and hood, and gloves. Remove some protective clothing or duty uniform.	Remove and carry mask and hood, and gloves. Remove protective clothing or duty uniform.

¹ Examples:

Low: Motorized movement or administrative work.

Moderate: Improvement of defensive position or reserve position activity.

Heavy: Infantry dismounted assault or forced march.

² See footnote in paragraph 8-8b.Table 8-2. Work Pacing Guidance for Personnel Dressed in Chemical Protective Clothing¹**Warning:** This table is intended as a guide only and should be used with table 8-1.

WORK RATE (para 8-8b)	SUGGESTED MAXIMUM SAFE UNIT WORK TIME TO MINIMIZE MODERATE RISK OF HEAT ILLNESS ^{2,3}					
	Temperature Range ⁴					
	Cool ⁵ (50°-70° F)		Warm (70°-85° F)		Hot (85°-100° F)	
	Open Suit ⁶	Closed Suit ⁷	Open Suit ⁶	Closed Suit ⁷	Open Suit ⁶	Closed Suit ⁷
Low	60 up ⁸	40-60 ⁸	45-60 ⁸	25-40	30-45	15-25
Moderate	45-60 ⁸	30-45	30-45	20-30	20-30	15-20
Heavy	20-30	15-20	15-20	10-15	10-15	5-10

¹ This applies to personnel dressed in standard-A chemical protective clothing or standard-B impregnated clothing (para 4-2).² Time is in minutes (derived empirically by extrapolation of laboratory and troop test data and by evaluation of psychological factors for trained troops).³ Rest periods are primarily temperature dependent. Required rest breaks to dissipate heat build-up will range from normal breaks at cool temperatures to indefinitely long breaks at hot temperatures. (Little or no heat load can be dissipated at hot temperatures.) In the warm temperature range, troops should be able to repeat similar work effort for the same periods after resting approximately twice as long as they have worked.⁴ The specific temperatures in parentheses at a relative humidity of approximately 75 percent do not differ significantly from the WBGT described in paragraph 8-8b.⁵ In temperatures below 50° F. normal work pacing will be sufficient if adequate environmental clothing is removed.⁶ Open Suit refers to protective clothing and duty uniform worn open, and carrying mask and hood, and gloves.⁷ Closed Suit refers to protective clothing and duty uniform worn closed, and wearing mask and hood, and gloves.⁸ Sixty minutes is intended to indicate the time for a normal break period. The 60-minute break period may be exceeded if in the judgment of the unit commander there will be no hazard to personnel.

cal contamination and personnel are required to operate at moderate to heavy work rates, a unit commander may authorize reduced chemical protection by authorizing personnel to progressively—

1. Open the zipper of the hood (and possibly roll it back) for ventilation.

2. Remove the protective mask and hood.

3. Open the duty uniform and the chemical protective clothing for ventilation.

4. Remove the chemical protective gloves.

5. Remove some of the duty uniform or the protective clothing, as appropriate.

8-13. Unit Personnel Needs in a Chemical Environment

Before a mission, the unit commander considers the normal body functions of personnel and provides them with opportunities for relief from wearing the protective mask and hood and for

Table 8-3. Approximate Duration of Hazard in Contaminated Terrain

Warning: This table is intended as a guide only. Chemical agent detectors must be used to determine the extent of actual contamination and vapor hazards.

TASK	TERRAIN	APPROXIMATE TIME AFTER CONTAMINATION THAT PRESCRIBED TASKS MAY BE PERFORMED WITH NEGLIGIBLE RISK ¹ (Not wearing protective clothing) ²			
		Blister agent (mustard)		Nerve agent (V- or G-)	
		Temperature ³		Uniform ⁴	
		Warm (70°-85° F)	Hot (85°-100° F)	Summer	Winter
TRAVERSAL ⁵ (Walking across area, 2 hr or less)	Bare soil or low vegetation. ⁶	Wearing masks			
	High vegetation, including jungle and heavy woods.	36 hr	36 hr	5 hr	2 hr
OCCUPATION (Without hitting ground, 24 hr)	Bare soil or low vegetation. ⁶	4 days	3 days	32 days	13 days
	High vegetation, including jungle and heavy woods.	4 days	3 days	32 days	13 days
OCCUPATION (Involving advance under fire, 24 hr)	Bare soil or low vegetation. ⁶	4 days	3 days	32 days	13 days
	High vegetation, including jungle and heavy woods.	6 days	4 days	50 days	18 days

¹ These times are safe-sided for troop safety.

² Leather combat boots treated with protective dubbing or rubber combat boots are worn.

³ Effects of blister agent vary significantly with temperature. Mustard freezes in temperatures below 60° F. and can present a hazard when the temperature rises.

⁴ Protection from V-agent and thickened G-agent varies significantly with layers of clothing worn.

⁵ For personnel walking for 2 hours in an area contaminated by blister agents, the limiting factor is the vapor hazard. If only a few minutes are required for traversal of the area, the task can be initiated at earlier times than those given.

⁶ Times shown are not applicable to sand, which will hold chemical agents for longer periods of time than those given.

⁷ The data refer to approximate times at which personnel could occupy contaminated areas without having to wear protective masks for protection against vapor hazard.

periods of rest. The pace of activities for personnel dressed in chemical protective clothing and operating in a chemical environment will normally be slower than for personnel operating in a clean environment. Individuals will be given instruction and practice in wearing chemical protective clothing and equipment and be trained in proper procedures and precautions when eating, drinking, sleeping, defecating, urinating, bathing, and changing clothing in a chemical environment. See table 8-3 for guidance on contaminated terrain.

a. *Feeding.* The feeding of personnel in a chemical environment depends on the type and extent of the chemical environment and the situation. The commander has the following options:

(1) *Feeding in a contaminated area where there is also a vapor hazard.* A protective shelter, such as the XM51 positive pressure collective protection shelter, can be used. If the XM51 collective protection shelter is used, the unit commander

has the following choices, since the shelter has a capacity of about 10 individuals:

(a) Feed one squad at a time and rotate the squads.

(b) Feed two or more individuals simultaneously from each squad.

(2) *Feeding in a contaminated area where there is no detectable vapor hazard.* Groups of personnel can be fed on a rotational basis, with about 25 percent of them removing their masks at one time. This is also the method used when there is a chemical attack threat.

(3) *Withdrawing personnel from a heavily contaminated area when there is a dangerous vapor hazard.* It may be necessary to withdraw personnel to a nearby safe area or to the rear area for feeding. This method is highly dependent on the situation, the distances involved, and the availability of a clear area or of collective protection shelters.

b. *Drinking Water.* Individuals equipped with the M17A1 protective masks use the drinking

device (fig 4-2) while in a contaminated environment. Normally, drinking from and refilling the canteen in an area contaminated with a chemical agent that does not present a vapor hazard can be performed with only minor decontamination of the canteen cap and water spigot areas. In other more hazardous situations, the unit commander makes arrangements for delivery of filled canteens with caps on, in exchange for empty ones with caps on that are collected in the contaminated areas. These empty canteens are then decontaminated and filled with fresh water. Individuals equipped with other type protective masks are instructed to drink water by an expedient method (para 4-28a).

c. Sleeping. Personnel should sleep in full chemical protection and under cover, if possible.

d. Identifying Personnel. The wearing of chemical protective clothing and the protective mask and hood make normal identification of personnel impossible. Each unit should devise an expedient method of identifying personnel; one such method, the wearing of color coded tape for

personnel of each platoon of a company, is described in the unit SOP (app D-I). Any other practical method is also acceptable. However, if wax crayons are used, markings must *not* be placed on the charcoal treated layer of the protective overgarment.

e. Defecating and Urinating. A decontaminated area is provided, when practicable, for personnel to take care of their personal needs. Personnel are instructed in removal, opening, and closing of contaminated outer garments to prevent contamination of underclothing or uncontaminated skin (para 4-30).

f. Shaving, Bathing, and Changing Clothing. Personnel are provided with a means of shaving, bathing, and changing clothing when operating continuously in a contaminated environment (para 4-29).

g. Training. Personnel are given instructions and practice in wearing chemical protective clothing and equipment and living in a contaminated chemical environment.

Section III. UNIT CHEMICAL AGENT DETECTION

8-14. General

Chemical agents are detected by the use of detection equipment and materials described in paragraphs 8-15 through 8-17. Personnel must be instructed *not* to rely on odors to detect chemical agents because some enemy agents are odorless and lethal, and produce rapid effects.

8-15. Automatic Chemical Agent Alarm

The M8 automatic chemical agent alarm will be the primary means of detecting chemical agents arriving from an upwind chemical attack. It is capable of detecting chemical agents primarily in vapor and inhalable aerosol form by an automatic low-level audible alarm and visual signal. It is issued to platoons, companies, and similar units. See TM 3-6665-225-12 for technical details on the M8 automatic chemical agent alarm.

a. Principal Components (fig 8-1).

(1) The detector unit of the automatic chemical agent alarm continuously monitors the air at its location and indicates the presence of nerve (G- and V-) agents, choking (phosgene) agents, and blood (soluble cyanide) agents by a low-level audible signal. It weighs about 14

pounds and is designed to operate unattended for 12 hours between servicings.

(2) The M42 alarm unit is a remote terminal that provides visible and audible warnings when the detector unit is positioned upwind of the using organization.

b. Auxiliary Equipment. Auxiliary equipment includes low-profile and high-profile mounting kits that are used for vehicular operations and a power supply transformer/rectifier that allows the use of AC power in units with access to generators.

c. Alarm System. A typical organization of an automatic chemical agent alarm system for the company in defense is illustrated in figure 8-2. If the prevailing wind changes, the detectors must be moved accordingly. The detector can be mounted on a vehicle or carried by a soldier on a backpack when the unit is on the move.

(1) *Portable detectors.* The detectors are normally positioned about 150 meters upwind of the forward platoons, about 300 meters apart. They are connected by telephone wire to the M42 alarm sounding units located at the platoon command post. Where the terrain or the situation



DETECTOR UNIT

M42 ALARM UNIT



Figure 8-1. Principal components of the M8 automatic chemical agent alarm.

do not permit placing the detector 150 meters upwind, the unit's chemical protection may need to be increased to compensate for the decreased warning time.

(2) *M42 alarm.* The remote terminals for the detectors are normally positioned near radio/telephone communications at the platoon headquarters. To insure the ability of the radio/telephone operators to respond promptly and safely

in relaying warnings, they should remain masked while on duty.

8-16. Chemical Agent Detector Kit

The AN-M15A2A VGH chemical agent detector kit is an expendable kit that is issued to platoons, companies, and similar units, as required (fig 8-3). It is normally used by CBR trained personnel to detect dangerous vapor concentrations

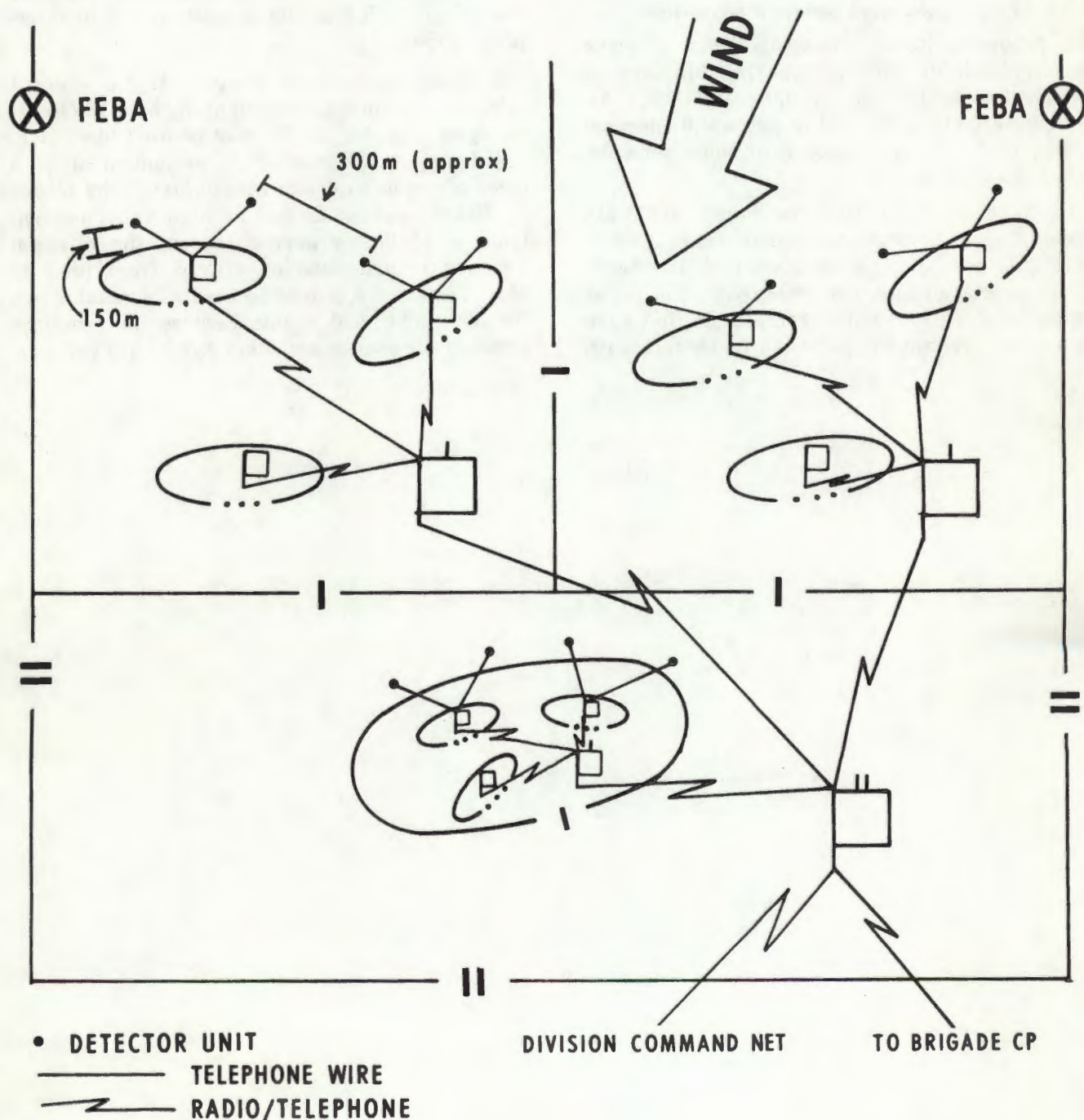


Figure 8-2. Typical organization of an automatic chemical agent alarm system for the company in defense.

of known nerve, blister, and blood agents by color changes in detector tubes or enzyme tickets. Detailed operating instructions are contained in the kit. The kit is used when the unit is under chemical attack, when a chemical attack is reported to be imminent, or when the presence of a chemical agent is suspected. See TM 3-6665-253-12 for technical details on the M15 detector kit.

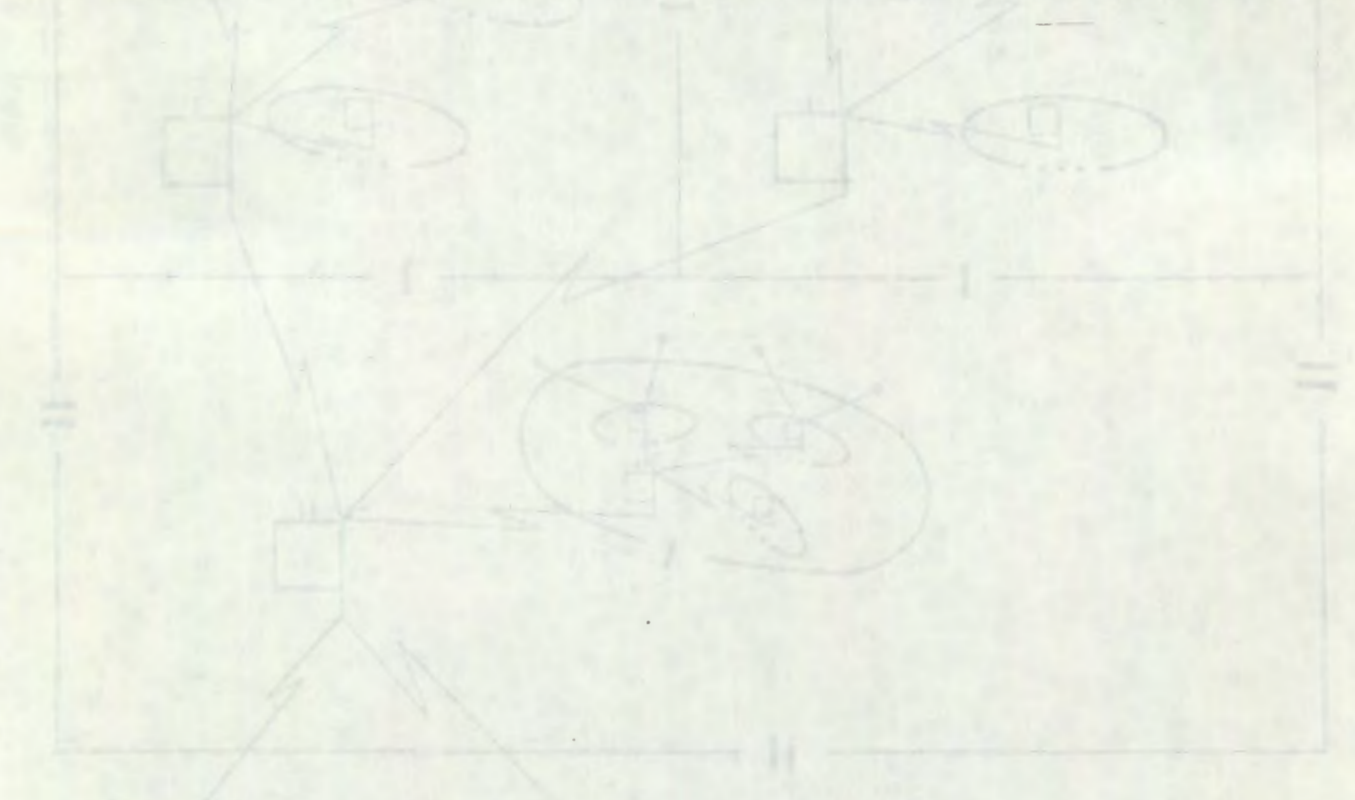
8-17. Chemical Agent Detector Materials

The following items are components of some chemical agent detector kits and, in addition, may be issued to individuals or units (fig 8-3). Although these materials will detect liquid chemical agents, they will also react with some solvents, as indicated below.

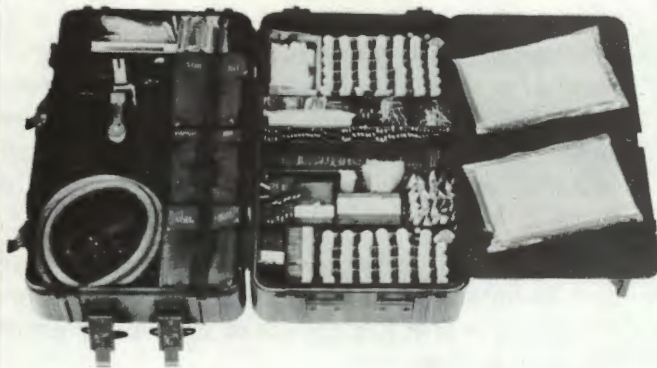
a. Chemical Agent Detector Paper. ABC-M8 chemical agent detector paper is issued in a booklet of 25 sheets and is a component of the chemical agent detector kits. The sheets consist of paper impregnated with chemical compounds that turn dark green, yellow, or red when in contact with

V- or G-type nerve agents or blister (mustard) agents, respectively, in liquid form. This paper *must touch* the liquid agent to insure a positive test; it does not detect vapor. It is best suited for use on nonporous material; the test is not always reliable on porous material, which absorbs the liquid agent. Because some solvents cause a change in the color of the paper, it is unreliable for determining the completeness of decontamination by the use of solvents. A color chart is included in the booklet to aid in interpreting the tests.

b. Vesicant Detector Crayon. M7A1 vesicant detector crayon is a component of the M18 chemical agent detector kit. It may be used like blackboard crayon and rubbed on equipment or on a piece of paper to detect contamination by blister (mustard) agents. Liquid or high vapor concentrations of blister agents (except the nitrogen mustards) turn detector crayon from pink to blue. The crayon cannot be used as a reliable test for other chemical agents because the reactions between the crayon and other agents are variable.



DETECTOR UNIT
 TELEPHONE WIRE
 RADIO TELEPHONE



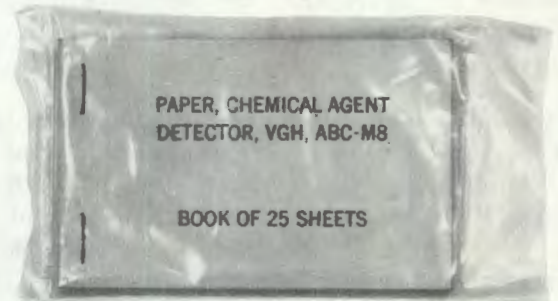
ABC-M19 CBR AGENT SAMPLING AND ANALYZING KIT (para 14-4)



ABC-M18A2 CHEMICAL AGENT DETECTOR KIT (para 13-2)



AN-M15A2A CHEMICAL AGENT DETECTOR KIT (para 8-16)



ABC-M8 CHEMICAL AGENT DETECTOR PAPER



M7A1 VESICANT DETECTOR CRAYON

Figure 8-3. Chemical agent detection equipment and materials.

Section IV. UNIT CHEMICAL DECONTAMINATION

8-18. General

Unit decontamination is an organized effort performed by personnel of the unit under supervision of trained individuals with equipment available to the unit.

a. Decontamination Procedures. Chemical contamination that creates an obstacle to the accomplishment of the unit mission may be decontaminated by neutralizing, covering, removal, or weathering. The method selected depends on the extent of contamination, agent, means available, and time involved. Generally, terrain contamination that does not present an obstacle to the accomplishment of the unit mission is marked and bypassed. Equipment decontamination will initially consist of only that amount of decontamination necessary to safely use or operate the equipment; that is, operator controls, vehicle interiors, and other areas that come in contact with personnel. Extensive equipment decontamination may be conducted as the situation permits. When decontamination is required, a system of correct procedures, supervision, and checks is followed to assure that the decontamination is complete. TM 3-220 gives specific decontamination procedures.

b. Commander's Guidance. In unit decontamination, the commander makes certain that his subordinate commanders, assisted by CBR defense NCO, determine when unit equipment will be decontaminated and that decontamination is properly supervised. In some situations, it may be necessary for the unit commander to designate decontamination priorities so as to enable his unit to continue with its mission. Decontaminating personnel are required to wear protective clothing and equipment suitable for the tasks in order to avoid contaminating themselves. It may be necessary to provide guidance on disposing of materials that were used for decontamination so that they do not constitute a hazard.

8-19. Decontamination of Terrain, Buildings, and Food and Water

Decontamination of vital areas of terrain beyond the capability of the unit may be performed by specialized decontamination units, using specialized equipment such as power-driven decontaminating apparatus (PDDA).

a. Terrain. Contaminated terrain presents a

hazard that varies from hours to days, depending on the nature of the terrain and the contaminant, the type of munitions used to disseminate the chemical agent, and the local climate conditions. See table 8-3 for guidance on approximate duration of hazard in contaminated terrain. Decontamination of terrain by methods other than weathering will, of necessity, be confined to small areas critically needed for immediate operations. In these instances, units use any practical means available for removal or covering of the contaminants, such as turning the contaminated earth with spades or bulldozers.

(1) Hard surfaces, roads, and runways are best decontaminated by weathering. If time is not available for weathering, use of PDDA is the most practical method.

(2) Grass or low vegetation is best decontaminated by burning. Gasoline, fuel oil, or firebombs may be used to start the fire; however, toxic smoke from this fire may create downwind hazards. Spreading dry bleach over the burned area will reduce the hazard from any residual contamination.

b. Buildings. Buildings, particularly wooden ones, are difficult to decontaminate. Buildings may be decontaminated by scrubbing or swabbing with STB slurry; washing with hot, soapy water; washing or spraying with washing soda solution; or airing.

c. Food and Water. Packaged rations are easily decontaminated with soap and water or with DS2. Food must be decontaminated by personnel familiar with decontamination procedures; qualified medical personnel must inspect and approve the food before it can be eaten. Decontamination of water requires the use of chemicals and equipment not regularly issued to troop units; transportation of uncontaminated water is generally more satisfactory. Water in closed containers is safe for drinking after decontamination of the outside of the containers with STB slurry or DS2.

8-20. Decontamination of Equipment

When the situation permits, unit equipment is decontaminated under the supervision of the unit officers and NCO. Lightly contaminated equipment may be decontaminated by airing. See paragraph 4-25 for guidance on decontamination of vehicles, weapons, and equipment.

8-21. Decontamination of Personnel

Personnel field decontamination stations are established and operated by the commander having direct jurisdiction over the area, normally at division level. A clothing exchange and a first-aid and monitoring facility are normally operated in conjunction with the personnel decontamination station (para 14-21).

a. Field Bath Units. Field bath units provide a means for large scale decontamination of personnel. In situations where field bath units are not available or cannot be readily reached or water is not available, mobile personnel decon-

tamination stations may be established, using PDDA.

b. Field Expedient Personnel Decontamination Station (para 14-22). In an emergency, it may be necessary for a company-size unit to improvise a personnel decontamination station when a bath unit or a mobile decontaminating unit is not available. Any clean material, water supply, and cover available can be used with improvised water heaters and shower heads. Fresh clothing and equipment and a means for disposing of contaminated clothing, equipment, and water should be provided.

CHAPTER 9

UNIT DEFENSE AGAINST BIOLOGICAL ATTACK

(STANAG 2002 and STANAG 2047)

9-1. General

Unit defensive measures against a biological threat include training and immunization of personnel and requiring the wearing of protective masks. If the threat is *biological only*, the protective measures described in this chapter are adequate; however, if the threat is *both biological and chemical*, then commanders apply the mission-oriented protective posture (para 8-8-8-13). Training and plans for the prevention of disease are the beginning of the defensive measures.

a. Troop Indoctrination. Training for defense against biological attacks stresses the necessity for an alert and a questioning attitude toward any indication that biological agents may have been employed. Although respect for biological agents is important, there must be no unreasonable fear of disease from a suspected biological attack. Personnel are instructed not to repeat or exaggerate rumors and are informed that a biological attack—

(1) Is normally difficult to recognize or detect. However, it can be detected by alert troops and intelligence sources of major commands.

(2) May be used to supplement other types of attack or may be used with other types of attack.

(3) May be used to cause either death or long-term incapacitation for strategic purposes, or may be used to cause early casualties (possibly within 3 days) for tactical purposes.

b. Preventive Measures. Casualties from a biological attack can be reduced by such preventive measures as immunization, quarantine of contaminated structures and areas, rodent and pest control, and instruction in the proper care of any cuts or wounds and in using only approved sources for food and drink. If possible, personnel are immunized against those diseases produced

by biological agents that intelligence indicates the enemy could use. High standards of personal hygiene and, when practicable, avoidance of practices that produce a rundown condition will assist personnel in fighting an infection. The importance of good protective mask discipline and proper field sanitation measures is emphasized. See FM 21-10 for detailed information on field hygiene and sanitation.

9-2. Detection and Warning of a Biological Attack

Most units will have to be alert to the detection of *local* biological attack; for large-area biological attacks, they will depend on the division and higher level organizations for biological attack warnings. Biological attack warnings will normally be disseminated over the division command communication channels through battalion and comparable units to company level units.

9-3. Alarms and Warnings

When alerted to a biological attack, the unit alerts its personnel, including any attached and supporting units, with a FLASH precedence brevity code; "SPRAY" is used for a biological spray attack and "MASK" is used for a biological attack by any other means. If the biological attack warning originates in the unit, it submits an NBC 1 biological attack report to the battalion or next higher headquarters. See appendix E for guidance on NBC 1 reports. The local alarm for a biological attack consists of sound, visual, or vocal signals described in paragraph 5-6. See appendix G for a discussion of local alarms and "all clear" signals (STANAG 2047).

9-4. Marking of Contaminated Areas

Biologically contaminated areas are marked with "BIO" signs that are in consonance with STANAG 2002; see appendix F for details.

9-5. Biological Decontamination

Generally, decontamination of personnel and equipment is not a matter of immediate urgency in the field when biological agents are disseminated as an aerosol. Under some conditions, unit decontamination of personnel is carried out when time and resources permit; the methods and materials available in the field for decontamination of personnel, terrain, and materiel contaminated with biological agents are described in appendix C and discussed below. For detailed information on large-scale decontamination operations, refer to TM 3-220.

a. Personnel Decontamination. Personnel can decontaminate themselves by showering with soap and hot water; germicidal soaps are used if available. Contaminated clothing is washed in hot soapy water if it cannot be sent to field service laundries for decontamination. Cotton items may be boiled.

b. Outdoor Areas. Sunlight kills most microorganisms and will usually decontaminate unshaded outdoor areas. However, shaded areas, especially at low temperatures, may remain hazardous for several hours to days. Decontamination of large areas is not feasible, but critical

areas suspected of being contaminated may be decontaminated by the use of DS2, BPL, or caustic soda solution (app C).

c. Indoor Areas. Personnel in a shelter or building that is suspected of being contaminated with biological agents wear protective masks until they are evacuated or the building is decontaminated. BPL, the standard biological decontaminant for the interior of buildings, is *toxic* to man, and extreme caution must be taken when using it. Medical personnel advise on and decontamination unit personnel provide the support required for interior decontamination of buildings.

9-6. Treatment of Biological Casualties

Personnel who become ill because of a biological attack will be treated in the same way that patients are treated for illnesses resulting from normally transmitted diseases. The patients are reported to an aid station by medical aidmen or are evacuated to a hospital.

9-7. Operations in a Biological Environment

The guidance in paragraphs 4-28 and 4-29 applies for eating, drinking, sleeping, and shaving in a biological environment.

CHAPTER 10

UNIT DEFENSE AGAINST NUCLEAR ATTACK

10-1. General

On a nuclear battlefield, units normally will be dispersed to the extent permitted by the situation and mission. Dispersed units present a less lucrative target and hence provide greater protection. Major adjustments in positioning, movement, and missions of units will normally be made by the commander of major commands to minimize the effects of nuclear detonations while maintaining the ability to continue combat operations. Although the complexity of modern warfare and its associated equipment requires some massing of troops, the frequency of troop and equipment concentrations is usually minimized. Despite this dispersion, it is probable that many personnel of those units subjected to a nuclear attack will become casualties in a nuclear war.

10-2. Defense Against Enemy Target Acquisition

The importance of defense against enemy target acquisition is emphasized in nuclear warfare. A target must be acquired before it can be destroyed; therefore, the first defense against nuclear weapons is to prevent the enemy from locating friendly units.

a. Enemy Target Acquisition Techniques. The enemy will use any or all of the following techniques to locate targets: visual observation; radar, infrared, direction-finding, sound-ranging, and flash-spotting equipment; long-range patrols; and enemy agents and collaborators. Unit signatures that lead to target acquisition by the enemy should be recognized and eliminated or disguised, if practical. The techniques used to detect a unit will depend on the unit location relative to the forward edge of the battle area (FEBA) and the type of unit. In all cases, radio communications traffic should be held to a minimum to make communications direction-finding as difficult as possible.

b. Battle Area Zones. The battle area under friendly control can be divided into two zones:

Zone A—zero to 2 kilometers from the FEBA; and Zone B—more than 2 kilometers from the FEBA. (FEBA does not connote linear positions.)

(1) *Zone A.* Units in this zone are most vulnerable to acquisition by visual, infrared, radar, and direction-finding means. The enemy will locate most of his target acquisition equipment as close to the FEBA as possible, to make maximum use of its range. In addition, enemy units near the FEBA will be constantly searching for friendly activity. Any movement in Zone A invites detection; therefore, units and individuals do not move unnecessarily. Communications traffic is held to a minimum, and wherever possible the communications equipment is located as far from the troop position as practical.

(2) *Zone B.* Units in this zone are most likely to be detected by aerial reconnaissance; patrols; enemy sympathizers; and direction-finding, sound-ranging, and flash-spotting equipment. Zone B units must use communications equipment to operate effectively and to perform their missions. The location of units by detection of signatures from communications equipment is more time consuming than other target acquisition methods. This delay and the communications delay in forwarding the intelligence to the enemy firing unit will enable units to escape destruction by moving. Generally, units in Zone B may be required to move at least once every 12 hours. In this zone civilian movement is restricted and unit security is emphasized to prevent enemy collaborators and agents from locating friendly units.

10-3. Preparation for Defense Against a Nuclear Attack

Unit defenses against a nuclear attack are prepared whenever the situation permits and troops have the time and opportunity. These defenses vary from foxholes to unit shelters. Certain common materials and types of construction mentioned below provide good shielding against

gamma radiation and neutrons, and also provide protection against the blast and heat of a nuclear explosion.

a. *Field Shelters*. Protection against nuclear radiation is primarily a problem of shielding against gamma radiation and neutrons; radiation from alpha and beta particles is essentially an internal or a contact hazard. Foxholes, bunkers, and other protective shelters are used to the greatest extent possible, consistent with the unit mission. Further details may be found in FM 3-12. Individual protective measures are discussed in paragraphs 6-1 through 6-3.

b. *Static Protective Shelters*. See TM 5-311 for details.

(1) *Shelters* are constructed with special consideration being given to two factors: access and air supply. Each shelter should have at least two exits in case one caves in or is blocked by debris. The entrance passages or ramps should be located at right angles to the shelter proper so as to avoid direct exposure to blast, thermal radiation, and nuclear radiation. Two exits also help to prevent blockage of air passages to the shelter. In special cases it may be possible to provide forced air systems in shelters. Although inhalation of radioactive dust is not an acute hazard, for comfort and ease of breathing, filter elements can be used to remove dust particles.

(2) *Buildings* usually are not strong enough to provide effective shelter from a nuclear explosion. However, the lowest floor or basement of a reinforced concrete or steel-framed building will offer excellent protection from all effects except the higher overpressures of blast, if personnel are not in front of a window facing ground zero. Personnel in front of a window facing ground zero will receive significant exposure to initial radiation and heat and will be subjected to indirect blast damage, especially from flying glass and other missiles carried by the wind.

10-4. Protection of Supplies

Unit supplies, particularly explosives and flammables, should be dispersed. Debris is kept to a minimum and is not allowed to collect to the point where a fire hazard would be created. Objects such as radios, stoves, generators, tools, and gas cans are always secured to minimize the danger of casualties from flying debris when the shock wave hits. Supplies remain packaged to provide protection against radioactive dust. Food and water are further protected by covered storage.

10-5. Problems Related to Specific Units

Some types of units pose special problems on a nuclear battlefield because of the nature of their operations.

a. *Artillery Units*. Because of the nuclear capability of field artillery units, their location will have a high priority in nuclear warfare. These units can be located by the volume and type of radio communications and flash-spotting and sound-ranging equipment. There is some delay when these means are used because of the time required to compile communications data and to process and transmit the intelligence to the firing units. This delay will allow firing elements of field artillery units to deploy to another location after completing their fire mission before the enemy fires a nuclear round at them.

b. *Communication Units and Command Posts*. These units can be detected by the volume and type of their radio traffic. If possible, the communications equipment should be located 5 to 10 kilometers from the command post areas of major commands. Moving the equipment frequently will hinder the enemy in locating the units and decrease considerably the possibility of a nuclear attack directed at them. Dummy traffic by similar equipment will further hinder the enemy in locating the units.

10-6. Cover

Natural cover may be improved to provide protection against nuclear attack. For complete information on cover, refer to TM 5-311 and FM 5-15. Units take full advantage of natural cover in an area and improve the protection as described in the above references.

10-7. Unit Defense During a Nuclear Attack

During a nuclear attack, unit defense consists primarily of taking cover. Unit activities are suspended for a short period because all personnel take protective actions. As soon as the immediate danger has passed, the unit commander makes an analysis of the situation and takes appropriate actions.

10-8. Unit Actions Immediately After a Nuclear Burst

Specified units are designated to make observations of nuclear bursts which are used for detailed fallout predictions, and any unit may perform simplified fallout predictions.

a. Specified Units. Designated personnel of specified units (normally headquarters of field artillery and air defense battalions and other units having optical instruments) make observations to determine nuclear cloud parameters. See FM 3-12 for techniques and procedures. See appendix E for a description of the type of data required for the NBC 1 nuclear attack report that is transmitted to higher headquarters.

b. Other Units. Units within sight of the nuclear burst may be able to obtain enough preliminary data to aid the commander in his analysis of the situation. Data and guidance on yield estimation are contained in FM 3-12. Upper air wind data are available through the next higher headquarters from the tactical operations center of the major command. These data, plus location of ground zero obtained by observation or deduced by unit personnel, can be used with the M5A1 radiological fallout area predictor for a simplified fallout prediction. However, these data are not reported to higher headquarters unless specifically requested. If enough preliminary data can be obtained to make a simplified fallout prediction, the unit commander will not have to wait for an NBC 2 or NBC 3 report from higher headquarters to begin his planning.

10-9. Unit Commander's Analysis of the Situation

When the immediate danger from thermal radiation, blast, and initial nuclear radiation has passed, the unit commander makes an analysis of the situation to determine his courses of action.

a. The Analysis. The unit commander determines—

- (1) The number and severity of casualties.
- (2) The extent of damage.
- (3) The ability of the unit to continue its mission.
- (4) The degree and extent of the radiological hazard.
- (5) A rough fix on the location of ground zero and what impact, if any, it has on executing the assigned mission.

(6) When personnel may leave foxholes or shelters.

(7) The information for an NBC 1 report (app E).

b. Considerations. The unit commander considers the following in his analysis:

(1) After an airburst, determination of neutron-induced radioactivity is made as soon as possible in connection with *a*(4) above. This is normally part of the mission of the elements first approaching ground zero.

(2) In the case of a surface or subsurface burst, levels of residual nuclear radioactivity are determined in connection with *a*(4) above.

(3) The ability of the unit to continue its mission will depend on the number of casualties, extent of damage to equipment and supplies, unit radiation exposure history, and radiological contamination hazard.

c. Reports. When the analysis of the situation has been made, the unit commander submits a report by the fastest means to the next higher headquarters and informs them of the data determined and of the courses of actions taken.

10-10. Unit First Aid and Treatment of Casualties

The principal casualty-producing effects of a nuclear explosion are thermal radiation, blast, and nuclear radiation. In nuclear radiation sickness, early symptoms (nausea and vomiting) are followed by a latent period when symptoms disappear. Thermal radiation may produce heat burns or temporary blindness. Blast may produce physical injuries from flying debris.

a. First Aid. When symptoms appear, medical treatment is provided. See FM 21-11 for first aid treatment of burns and of injuries due to blast.

b. Evacuation of Casualties. The evacuation of casualties from blast, heat, and/or nuclear radiation is carried out according to medical doctrine. The Medical Commander/Surgeon is responsible for determining the evacuation procedure.

CHAPTER 11

UNIT DEFENSE AGAINST RADIOLOGICAL HAZARDS

(STANAG 2002, STANAG 2047, and SOLOG 125)

11-1. General

Following a nuclear attack, the greatest potential danger to unit personnel is exposure to radiological contamination from fallout of radioactive material. The presence and degree of radiological contamination are determined by radiac instruments described in paragraph 11-5. The radiological contamination data are used by the unit commander to determine the degree and extent of the radiological hazards in planning his operations so as to minimize casualties from exposure to these hazards.

a. Casualty-Producing Factors. The casualty-producing potential of radioactive material is based on the following factors:

(1) Dose rate during unit occupation of the contaminated area.

(2) Degree of shielding of unit personnel in the area.

(3) Time spent by the unit in the area after arrival of fallout.

(4) Previous radiological exposure history of unit personnel.

b. Determination of Radiologically Contaminated Areas. The degree and extent of radiological contamination from a nuclear detonation can be *estimated* by fallout prediction (para 11-4) and *measured* by radiological monitoring (para 11-4) and radiological survey (para 14-23).

c. Defense Against Fallout. When in a potential fallout area, the unit commander directs personnel to take protective measures *before* fallout arrives (para 11-2).

d. Defense Against Exposure to Hazardous Radiation. The unit commander checks the radiation exposure records of personnel so as to be aware of their radiation status (para 14-32 and 14-33). The use of radiation status informa-

tion will enable the commander to minimize casualties from additional hazardous exposure to radioactivity. He can minimize the effects of radiological hazards by requiring personnel to take defensive measures (para 11-4), by rotating subordinate elements out of the contaminated area before a critical dose is received, and by moving the entire unit out of heavily contaminated areas.

11-2. Unit Protective Measures Against Fallout

When a unit is in a predicted fallout area, the greatest danger to personnel from fallout of radioactive material can be avoided by using proper precautions during the early hours following the arrival of fallout. This is because fallout decays rapidly immediately after its formation in a nuclear burst. For example, if fallout arrives at H + 2 hours, half of the total 4-day dose will be received in about 8 hours after fallout occurs.

a. Personnel Actions. Personnel actions that will minimize the effects of radioactive material are discussed below.

(1) Dismounted personnel in the field protect themselves whenever possible in a foxhole with cover, or in any other underground shelters. It may be necessary to direct personnel in some areas to stay in shelters for extended periods. For armored units, the tank provides excellent protection and has the added advantage of mobility. The unit SOP should include provisions for minimizing the effects of exposure of personnel to radioactive material during operations in a fallout area and for dissemination of fallout information to other units. In all cases the prescribed actions should interfere as little as possible with the immediate mission of each unit.

(2) The actions that will minimize the effects of exposure to radioactive material are influenced primarily by the time of arrival of fallout, the rate at which fallout is deposited, and the availability of shelter. In a situation where

the radiation dose rate does not reach a peak until 6 to 8 hours after the fallout begins, it is possible to construct shelters that can reduce the fallout hazard by a factor of 10 to 100; whereas, if the peak is reached rapidly, personnel can use only existing cover. In the absence of time to construct shelters, the alternatives are to instruct personnel to stay in place, cover with any available material, and accept the exposure to radiation, or to direct movement to a less contaminated area.

(3) Movement to a less contaminated area may be authorized after consideration of the situation. Personnel will *not* be moved solely on the basis of fallout prediction because precise locations of fallout cannot be reliably predicted.

(4) Whenever shelter from fallout is available, personnel are instructed to use the shelter rather than to move to escape fallout.

(5) When practicable, rear-area shelters are constructed with earthmoving equipment to shorten construction times. For example, large diameter pipe (culvert) sections lowered into trenches and covered with earth offer good protection if the ends are barricaded and provided with an entrance and exit.

b. Unit Actions. When consistent with the unit mission and the situation, the unit commander insures that the following actions are taken:

(1) The beginning time and dose rate of fallout are reported to higher headquarters, as outlined in the SOP.

(2) Personnel are kept under cover until fallout stops.

(3) If it is necessary to cross a radioactive area, it is crossed fast—in vehicles if possible. Floors of the vehicles are sandbagged for greater protection, when practicable.

(4) If it is necessary to remain in a radioactive area, personnel are directed to enter quickly, dig in quickly, sweep the area around foxholes, camouflage, and remain covered. Tank crews are directed to stay in their tanks as much as possible or dig foxholes if staying in tanks is impracticable.

(5) Personnel are monitored frequently to make certain that they are not contaminated. If contaminated, personnel are directed to at least partially decontaminate themselves (para 6-6).

11-3. Fallout Prediction

Fallout prediction is a method used to determine

probable areas of radiological contamination that could result from a nuclear burst before the actual arrival and detection of fallout. A detailed fallout prediction is normally prepared at headquarters of major commands, based on information contained in NBC 1 or NBC 2 reports or on target analysis information and upper air wind data (FM 3-12 and TM 3-210). Fallout predictions can be used by the unit commander to—

a. Warn or alert subordinate units and personnel to expect radiological contamination.

b. Aid in tactical planning.

c. Form a basis for radiological survey planning.

11-4. Radiological Monitoring

Since nuclear radiation cannot be detected by the senses, special devices are needed for detection of radioactivity. Radiological monitoring is the act of detecting radiation and measuring the dose rate with radiac instruments. (See para 14-23 through 14-30 for a discussion of radiological surveys.) The instruments used in monitoring include dose-rate meters and dosimeters, described in paragraph 11-5. Radiological monitoring alerts the commander to a hazard that could otherwise go undetected or unmeasured. A single radiation measurement usually has limited operational significance (except to the unit in the immediate area), since it gives information at the point of reading only. However, a number of individual measurements considered together can give a picture of the radiation pattern over the area involved. A number of readings made at the same point over a period of time are required for determining fallout decay rate. Several different points for taking readings may be required in variable terrain.

a. Responsibilities. Monitoring is included in normal reconnaissance and intelligence activities of all units. Radiological monitoring at all levels is a command responsibility and is initiated upon order of the commander, upon orders of higher headquarters, or pursuant to SOP or other standing instructions. Units discovering radiological contamination in an area report this fact according to their SOP, and they mark the area with a radiological contamination marker ("ATOM") according to STANAG 2002 (app F). Radiation dose rates and time of measurement are reported to higher headquarters.

b. Company-Size Units. Units must monitor

to detect radiation in their area of operations. As a rule, company-size units maintain a minimum of two trained monitors per unit dose-rate meter. Monitoring techniques, correlation factor data, and recording data forms are described in FM 3-12. Monitoring may be *periodic* or *continuous* as described below.

(1) *Periodic monitoring* is routinely conducted during nuclear warfare. All units routinely monitor a designated point in their area a minimum of once each hour. The NR defense annex of the SOP should give detailed guidance on monitoring procedures. Units authorized several instruments need use only one for this purpose. However, instruments are alternated to conserve batteries. Dosimeters must also be read when a periodic check of the unit area is made.

(2) *Continuous monitoring* is initiated by all units when a fallout warning is received; when on an administrative or tactical move; when a nuclear burst is reported, seen, or heard; when radiation above 1 rad/hr is detected by periodic monitoring; and on order of the commanding officer. Continuous monitoring stops on instructions from higher headquarters or when the dose rate falls below 1 rad/hr (except for units on the move).

11-5. Radiac Instruments

Radiac instruments used to detect and measure radioactivity are illustrated in figure 11-1.

a. Dose-Rate Meters. Dose-rate meters are electronic devices designed to indicate the level of radioactivity in a contaminated area. Ion-chamber type dose-rate meters are used for radiological monitoring and surveys.

(1) The standard ion-chamber gamma survey meter is the radiacmeter IM-174A/PD. It is a high-range dose-rate meter; gamma radiation readings are indicated in units from 1 to 500 rad/hr. It is normally issued on the basis of one per platoon-size unit. TM 11-6665-232-12 contains information on the radiacmeter IM-174A/PD.

(2) The radiac set AN/PDR-27(*) is a low-range dose-rate Geiger-Mueller (G-M) type radiacmeter. It is issued on the basis of one per divisional company-size combat and combat support unit and as required for medical, maintenance, and bath units and water supply points; it is used for monitoring personnel, food, and equipment. See TM 11-6665-209-15 and TM 11-

6665-230-15 for details on the radiac sets AN/PDR-27().

b. Dosimeters. Dosimeters are devices used to measure the total nuclear radiation (gamma) dose received by an individual. They must be recharged after not more than 2 or 3 days of use (preferably each day). It is mandatory that the dosimeters be recharged when the total dose reads more than 500 rad. Recharging times are normally designated in the unit SOP.

(1) The IM-93(*)/UD tactical dosimeter, the standard type, is a self-indicating (direct reading) pocket dosimeter. Normally it is issued on the basis of two per platoon-size unit (and two spares in the company headquarters). If elements of a platoon-size unit operate separately under conditions to warrant it, a more widespread issue of dosimeters may be made. TM 11-6665-214-10 contains information on the IM-93()/UD dosimeter.

(2) The radiac detector chargers PP-1578/PD and PP-1578A/PD are used to charge the IM-93()/UD dosimeter. They are issued on the basis of one per four dosimeters, no more than five nor less than two per company-size unit. TB SIG 226-8 contains information on the PP-1578/PD and PP-1578A/PD radiac detector chargers.

11-6. Unit Tactical Dosimetry

It may be necessary for units to carry out assigned tasks in a radiologically contaminated area. The commander ordering units into a radiologically contaminated area takes into consideration the unit's radiation exposure history and the probable effects of additional radiation exposure in determining the probable future effectiveness of the units. He determines which operations must be conducted in the contaminated area and establishes an operation exposure guide (para 14-34) for the units ordered into the contaminated area. Use of the operation exposure guide concept will assist the commander in making effective use of his units in a contaminated area. Although the immediate combat effectiveness of previously unexposed personnel who receive a dose of 50 rad or less will not be reduced, some casualties may result among personnel who receive larger doses. See FM 3-12 for details of determining the time of entry, time of stay, and use of the operation exposure guide.

a. Company Level Actions. The following guidance is given for handling tactical dosimeter

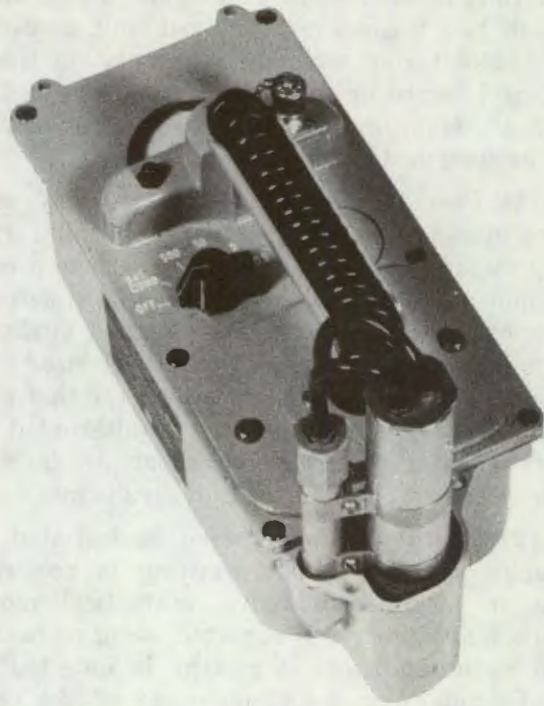
*Indicates all models of the series.

*Indicates all models of the series.



ACTUAL LENGTH 4 - 1/2 INCHES

IM-93()/UD DOSIMETER



G-M TYPE RADIACMETER OF AN/PDR-27 () RADIAC SET



(FRONT)



(TOP)

IM-174A/PD RADIACMETER

Figure 11-1. Radiac instruments.

readings in an infantry company (similar guidance would also be applicable to other units):

(1) The tactical dosimeters are read daily or more often if the situation dictates.

(2) The difference between the previous reading and the current reading is obtained for each of the two dosimeters in the platoon. These two values are averaged, rounded off to the nearest 10 rad, and reported to the company. If there is reason to believe that the reading from one dosimeter is not representative of the platoon (for example, if the person carrying the dosimeter was shielded or operating away from the platoon), then only the reading from the one representative dosimeter is reported. An alternate unit dosimeter wearer is assigned for each instrument so that a dosimeter remains within the unit when the primary wearer leaves the platoon area. The platoon reports to the company only the "net" reading, or the amount accumulated since the last reading. This means that the instrument reader records each reading of the dosimeter; however, following the initial reading, only the difference between the present and the previous reading is reported; no permanent record is necessary. Dosimeters are also read and readings reported before recharging the instruments. If a unit dosimeter wearer is evacuated or transferred to another unit, the dosimeter remains with the platoon.

(3) The platoon readings are reported by runner, message, radio, or telephone daily to the company and by the company to the S3 at battalion or comparable unit. This is part of an established operational situation report, required by the unit SOP, except when units are exposed to relatively high doses (that is, established operation exposure guide has been exceeded). In the latter case, reports are processed without delay. The NR defense annex of the SOP will specify the routine times and methods for reading and transmitting this information to the next higher headquarters.

b. Battalion Level Action. At battalion or comparable levels, a chart is kept that depicts the radiation status of each platoon and company organic or attached to the battalion. The dosimetry actions of battalion and higher headquarters are covered in paragraphs 14-32 and 14-33.

11-7. Monitoring of Food, Water, Equipment, and Personnel

Following a nuclear attack, food, water, equipment, and personnel may be radiologically con-

taminated and should be monitored. A G-M type dose-rate meter, such as the AN/PDR-27(), is used for this monitoring as it measures radiation at a lower range than does the ion-chamber type dose-rate meter, such as the IM-174A/PD. See FM 3-12 for detailed procedures.

11-8. Unit Radiological Decontamination

Radiological decontamination consists of physically removing radioactive material from contaminated surfaces. Unit radiological decontamination is normally concentrated on unit equipment and food stocks. Decontamination of large areas is usually not feasible without earthmoving equipment.

a. Contaminated Equipment. The subsequent efforts in decontamination of vehicles, arms, and ammunition can be reduced if, before arrival of fallout, they are covered with materials such as tarpaulins, shelter halves, or ponchos. Equipment requiring decontamination may be washed as may the outside of sealed food containers. Decontamination is conducted at a site with good drainage. Contaminated water should flow into a sump, if possible; if it flows into a river or stream, units downstream are so informed. For details of radiological decontamination, see TM 3-220.

b. Special Individual Protection During Decontamination Operations. For certain decontamination operations such as hosing down contaminated buildings, it is desirable for personnel to wear foul weather gear or impermeable protective clothing, if available, to prevent radioactive material from coming in contact with the body.

11-9. Unit Decontamination of Personnel

Personnel who have been exposed to fallout or who have traversed a radiologically contaminated area are routinely monitored, and, if necessary, decontaminated.

a. Monitoring for Contamination. Personnel are monitored for radiological contamination in a clean area or shelter. If contamination is noted on personnel, they are decontaminated as soon as practicable.

b. Field Expedient Decontamination. If the situation temporarily prohibits decontamination of personnel by bathing and changing of clothing, field expedient methods are used (para 6-6).

11-10. Unit Decontamination of Food and Water

An appreciable amount of radioactivity may be detected in food and water after a nuclear attack.

a. Food. The decision to eat radiologically contaminated food is a command decision (aided by the recommendation of a medical officer).

b. Water. Units do not attempt radiological decontamination of water. Engineer units are responsible for reconnaissance to select water sources and for the purification of water from these sources. The surgeon is responsible for recommendations on the potability of water (SOLOG 125). If the external radiation hazard of a water point permits occupancy of the area, the water is considered suitable for consumption during occupancy for a 1-week period (TM 5-700).

11-11. Evacuation From a Fallout-Contaminated Area

Shelters, such as field emplacements, will provide the best protective measures against nuclear radiation for personnel in the field. If the shelter provides any appreciable amount of protection, it will generally be more advantageous to remain in the shelter and improve it than to attempt to evacuate to an uncontaminated area. In order to arrive at a decision as to the optimum time to begin evacuation, certain information is required, such as: time of the nuclear burst, location of a clean area, transmission factors of shelters, transmission factor during movement out of the contaminated area, time required to move, routes to use, and location of new areas. By evacuating the contaminated area at the optimum time, the radiation dose will be kept to a minimum. See FM 3-12 for details of computing optimum time for exit from fallout-contaminated areas.

11-12. Neutron-Induced Radiation

When compared with other effects of nuclear

weapons, induced radiation does not pose a threat of major military significance. Induced radiation normally is found in a circular pattern around ground zero. There is usually no requirement to enter and stay in this area because of the great destruction. If the unit must occupy this area, it is monitored to make certain that the allowable total doses are not exceeded. Digging in is not recommended in this area. The boundary of the significant area of induced activity is considered the distance to which a 2-rad/hour dose-rate contour will extend 1 hour after the nuclear burst. The *maximum* horizontal radius of this dose-rate contour for yields of 1 MT, or less, is about 1,400 meters; it is usually substantially less, depending on the yield, height of burst of the weapon, and composition of the soil.

11-13. Identification of Unknown Radioactive Material

When radioactive material from an unknown nuclear weapon or unknown source is encountered, the unit alerts its next higher headquarters. The nearest military intelligence company, technical intelligence, or CBR agent sampling and analysis team collects samples of the material and forwards them to the general chemical laboratory for analysis (para 14-4).

11-14. Alarms and Warnings

When alerted to a fallout hazard, the unit alerts its subordinate, attached, and supporting units with the brevity code "FALLOUT." If appropriate, the unit submits to its higher headquarters an NBC 3 radiological hazard report (app E) or an NBC 4 radiation dose-rate report (app E). See appendix G for a discussion of local alarms and "all clear" signals (STANAG 2047).

a. The local sound alarm is made by beating metal objects.

b. The local vocal alarm for fallout is "FALLOUT."

c. The "all clear" is normally given vocally.

PART FOUR

CBR AND NUCLEAR DEFENSE GUIDANCE FOR THE COMMANDER AND STAFF

CHAPTER 12

COMMAND AND STAFF RESPONSIBILITIES FOR CBR AND NUCLEAR DEFENSE

12-1. General

Each echelon of command has the same general responsibilities for preparation and implementation of CBR defensive measures necessary to assure that subordinate units are able to continue operations in a chemical, biological, and radiological environment. All commanders assure that subordinate units are trained for defense against chemical, biological, and nuclear attack and that plans and procedures are established to assure that supplies and equipment are either issued or available for issue, based on the CBR threat. The training and planning for operations in a chemical, biological, and radiological environment must take place regardless of the degree of enemy threat. Based on the commander's estimate and directives from higher headquarters, plans for CBR and nuclear defense are implemented to the degree necessary to counter the CBR threat. See FM 21-48 for guidance on training in CBR and nuclear defense.

12-2. CBR Intelligence

An essential element for successful CBR defense is intelligence of the enemy's capability and intent to use chemical, biological, and nuclear weapons. Intelligence of the enemy's CBR defense capability is important in the analysis of his ability and intent to use chemical, biological, and nuclear weapons. On the basis of this CBR intelligence and other indicators, the CBR defense planner makes an estimate of the threat and determines the degree of preparedness to meet the CBR threat.

a. CBR Essential Elements of Information (EEI). Appendix D-III contains a list of questions suitable for the intelligence annex to a division SOP; it includes specific questions of enemy chemical, biological, and radiological capabilities. The list of questions is not intended to

be all-inclusive but is intended to serve as a guide for staff chemical officers in their staff functions. The questions are used by specialized intelligence-gathering units who have the mission of collecting all intelligence information about the enemy.

b. Sources of CBR Intelligence. Since all units are responsible for the collection of information about the enemy, unit personnel are an important source of CBR information about the enemy, his equipment, and activities. Other sources of information for CBR intelligence purposes are described below.

(1) *Prisoners of war* can be a valuable source of information by their answers to questions such as—

(a) What chemical protective equipment has been issued to enemy troops?

(b) Does the enemy have chemical protective shelters and decontamination stations?

(c) Do enemy troops have chemical and biological munitions on hand?

(2) *Local civilians, civilian agencies, and informers* who have been within enemy controlled areas may be valuable sources of information.

(3) *Recovered military personnel* are sources of information on the area of operation, enemy protective devices, and activities.

(4) *Captured enemy materials* may provide chemical technical intelligence for determination of enemy capabilities and vulnerabilities.

12-3. Operational Considerations in a CBR Environment

Commanders must recognize that the implementation of CBR defensive measures will diminish the operational capabilities of units to varying degrees. Operations in a chemical, biological, or radiological environment will require individuals

and units to take certain protective actions; for example, personnel operating in a chemical environment will be required to wear protective clothing and equipment. These protective actions will influence the ability of individuals and units to perform assigned tasks. Unit capabilities will be subjected to various degrees of reduction in combat effectiveness; however, realistic training and practice in the use of individual protective clothing and equipment can minimize this reduction of combat effectiveness. Guidelines for commanders to establish the degree of chemical protection needed to counter the chemical threat and accomplish the mission are discussed in the mission-oriented protective posture (MOPP) in paragraphs 8-8 through 8-13. The commander, with the recommendation of his staff, attempts to maintain a balance between a maximum combat effectiveness and a maximum chemical defensive posture within the MOPP concept of defense. This balance is considered regardless of the echelon of command.

12-4. CBR Defensive Equipment Required

CBR defense planners of major organizations determine the types and amounts of CBR defensive equipment that will be required to support subordinate units in combat operations. See AR 700-62 for guidance on authorized CBR defensive equipment. Defense planners must be aware of the impact of enemy employment of chemical, biological, and nuclear weapons on logistic support functions and must anticipate an additional load on the combat service support system. They must also be aware of the availability of automatic data processing systems, such as TOS (tactical operations system), which may be available for providing critical data on chemically and radiologically contaminated areas. CBR defense planning includes consideration of many factors involving the civil population and indigenous labor used in support of military installations. See FM 101-40 and FM 3-1 for guidance on CBR defense service support.

a. General or Limited War. If intelligence indicates that the enemy has the capability to employ chemical and biological agents, individual protective masks and chemical protective clothing and equipment are made available for immediate issue. Decontamination equipment and supplies and collective protection equipment are also made available for issue.

(1) If the enemy has the capability to em-

ploy chemical and biological agents but intelligence indicates that this is not probable, the minimum issue of individual chemical defensive equipment to personnel or retained in unit supply is listed below.

(a) Field protective mask, M17-series, or tank or aircraft protective mask.

(b) Waterproofing bag, M1 (issued with M17-series masks).

(c) Resuscitation tube, M1 (accessory of M17A1 mask).

(d) Water canteen cap, M1 (issued with M17A1 mask).

(e) Protective mask hood (compatible with the issue protective mask).

(f) Decontaminating and reimpregnating kit, ABC-M13.

(g) Winterization kit, when required (compatible with the issue protective mask).

(h) Automatic atropine injectors and amyl nitrite ampuls, in amounts authorized by the theater commander.

(i) Vesicant gas resistant leather dressing, M2.

(j) Mask spectacles, when required.

(k) Chemical protective clothing in chemical protective bags for issue by unit supply.

(2) If the enemy has the capability to employ chemical agents and intelligence indicates that he may do so, then in addition to the actions taken in (1) above:

(a) Chemical protective clothing in chemical protective bags is issued to personnel.

(b) Chemical protective items in unit supply are issued to personnel as required.

(3) If intelligence indicates that enemy employment of chemical agents is imminent, then units are directed to replace the filter elements of individual field protective masks with new filter elements.

b. Stability Operations. If intelligence indicates that the enemy has the capability to employ only irritant agents, the minimum issue of individual chemical defensive equipment to personnel or retained in unit supply is listed below.

(1) Riot control agent protective mask or chemical-biological field, tank, or aircraft protective mask.

(2) Waterproofing bag, M1 (when not issued with the mask).

(3) Mask spectacles, when required.

(4) Winterization kit, when required.

CHAPTER 13

ORGANIZATION FOR CBR AND NUCLEAR DEFENSE ABOVE COMPANY LEVEL

13-1. General

The normal command and staff structure at all levels of command is used for CBR defense operations and training according to AR 220-58. The staff sections at each command level function in those phases of CBR operation, training, and logistics within their areas. In addition, specific individuals, staff sections, and teams are available to assist, guide, direct, and conduct the CBR and nuclear defense activities within the command. See FM 31-85 for guidance on rear area protection (RAP) operations.

13-2. Battalion and Comparable Unit CBR Defense Organization

Battalions and comparable units are authorized an NCO with a chemical MOS who is normally assigned to the S2/S3 section. A school-trained CBR defense officer is designated to perform duties in the S2/S3 section. During active nuclear and chemical warfare, additional CBR-trained personnel are required to meet battalion headquarters company requirements.

a. Teams. SOP will designate CBR defense teams required, their organization, equipment, and functions (para 7-2).

b. Equipment. The CBR defensive equipment in the headquarters and headquarters company is the same as that at company level (para 8-14-8-17), except that the AN-M15A2A chemical agent detector kit is replaced with the ABC-M18A2 chemical agent detector kit (fig 8-3). The ABC-M18A2 detector kit will detect dangerous vapor concentrations of all known nerve, blister, blood, and choking agents. It can also detect residual surface contamination. This kit is normally used by the assigned chemical NCO. See TM 3-6665-254-12 for additional information on the ABC-M18A2 detector kit.

13-3. Brigade and Comparable Unit CBR Defense Organization

Brigade and comparable units are authorized a

chemical officer who advises the commander and staff. A school-trained CBR defense NCO is designated normally to perform CBR defense duties in the tactical operations center (TOC). During active nuclear and chemical warfare, additional CBR-trained personnel are required to meet brigade headquarters company requirements.

a. Teams. SOP will designate CBR defense teams required, their organization, equipment, and functions.

b. Equipment. The CBR defensive equipment in the headquarters and headquarters company of brigade is normally the same as that at battalion level.

13-4. Separate Brigade, Division, Corps, and Army CBR Defense Organizations

Separate brigades and higher headquarters have assigned and/or attached chemical personnel or chemical staff sections and are authorized CBR positions required to staff a CBR center or comparable CBR element of a TOC. The CBR defensive equipment at separate brigades and higher headquarters is normally the same as that at battalion level, with the addition of an M34 CBR agent sampling kit which is described in TM 3-6665-268-10. The M34 sampling kit is an expendable replacement for the soil sampling component of the ABC-M19 CBR agent sampling and analyzing kit; it is used to take soil samples of unknown chemical agents, biological agents, and radioactive materials. These samples are forwarded to the CBR agent sampling and analysis team or military intelligence company, technical intelligence, for subsequent processing/evacuation (para 14-4) or to the general chemical laboratory or the medical laboratory for identification.

13-5. Specialized Units Supporting CBR Defense Activities

Various specialized units are organized and equipped to meet CBR defense needs throughout the Army.

a. *Specialized CBR Defense Units.* The following units are organized specifically to support CBR defense activities and are described in detail in FM 3-1:

(1) *CBR agent sampling and analysis team* (TOE 3-500). CBR agent sampling and analysis teams are allocated on the basis of one or more per division and/or equivalent and higher headquarters, as required. See paragraph 14-4 for a discussion of missions and functions.

(2) *CBR reconnaissance teams* (TOE 3-500). CBR reconnaissance teams are allocated on the basis of one or more per armored cavalry regiment or equivalent or larger size unit. The team is organized and equipped to determine the effects produced by enemy employment of chemical, biological, and nuclear munitions; make surveys; mark contaminated areas; and take and analyze samples of chemical agents. It forwards samples of chemical agents and radioactive materials that are beyond the capabilities of its equipment through channels to the general chemical laboratory for analysis and forwards samples of biological agents to the medical laboratory. The teams normally receive instructions from and report to the CBR element of a TOC.

(3) *Decontamination service units.* Decontamination is performed normally by the decontamination platoon of the field service general support company, forward, which is authorized on the basis of one per supply and service general support battalion, forward, or six per type field army; by the field service general support company, army or communications zone, which is authorized on the basis of one per supply and service general support battalion, army, or two per type field army and as required in the communications zone; by team FA, TOE 3-500 which is authorized on the basis of one per armored cavalry regiment, separate brigade, or equivalent size unit; and by team FB, TOE 3-500 which is authorized on the basis of one per division or

equivalent size unit. These units perform critical decontamination that is beyond the capabilities of the supported unit, to include decontamination of critical installations, terrain, and materiel, and personnel at personnel decontamination stations.

(4) *Chemical, biological, and radiological center* (TOE 3-500). CBR center teams are assigned or attached to major commands to staff a CBR center or to augment the organic CBR element of the TOC. They are concerned primarily with CBR defense operations, in addition to other activities.

(5) *General chemical laboratory* (TOE 3-97). The general chemical laboratory is allocated on the basis of one or more per theater as required and one per corps support command of an independent corps size force. See paragraph 14-6 for a discussion of missions and functions.

b. *Other Units.* The following units provide secondary CBR defense support in addition to their primary missions:

(1) *Military intelligence company, technical intelligence* (TOE 30-34 and 30-48). The military intelligence company, which is allocated on the basis of one per field army and one per theater, has a technical intelligence section which processes and evaluates captured and recovered enemy munitions, weapons, and equipment (para 14-4).

(2) *Explosive ordnance disposal (EOD) detachment* (TOE 9-520). EOD detachments, which are allocated on the basis of one per 30,000 troops, locate and process unexploded munitions (para 14-5).

(3) *Medical laboratory* (TOE 8-650). The medical laboratory, which is allocated on the basis of one per field army and one per 30,000 fixed beds required in the communications zone, analyzes and identifies pathogenic germs (para 14-7).

CHAPTER 14

OPERATIONS IN A CBR AND NUCLEAR ENVIRONMENT
(STANAG 2002, STANAG 2079, STANAG 2103, and STANAG 2112)

**Section I. DETECTION AND IDENTIFICATION OF CBR AGENTS/
 MATERIALS**

14-1. General

The detection of chemical and biological agents and radioactive material requires special equipment and, in some instances, special skills to operate the equipment. A capability to detect known chemical agents and radioactive material is maintained by those units possessing detection equipment. However, a theater-wide organization is required for the identification of new or unknown enemy chemical agents, biological agents, and radioactive material from an unknown nuclear burst or other sources.

a. Organization. A schematic organization of a CBR agent/material detection and identification system within a theater of operations is shown in figure 14-1 and is described in the footnotes (fig 14-1) and paragraphs 14-2 through 14-7. This organization is designed to detect *known* enemy chemical agents and radioactive material from known sources at unit level; and to identify new or unknown enemy chemical agents, biological agents, and radioactive material from unknown sources through samples taken by specialized units for processing by designated laboratories at field army and theater levels. This system is based on the current capabilities of standardized chemical, biological, and radiological agent/material detection, identification, and alarm equipment and on the current basis of issue of this equipment to TOE units.

b. Sampling and Reporting Channels. *Unidentified* chemical and biological agent and radioactive material samples are forwarded for analysis and identification outside command channels directly to the units as shown in figure 14-1. Reports are submitted through command or intelligence channels according to the SOP of the command. When samples are forwarded outside

command channels, intervening command headquarters are notified of the action taken.

14-2. Battalions and Comparable Units

Battalions and comparable units are authorized chemical and radiological detection items of equipment, which are used as described below.

a. Chemical Agents. The M8 automatic chemical agent alarm will be the primary means of detecting chemical agents arriving from an upwind chemical attack. When alerted to a chemical attack, the battalion and comparable units equipped with the ABC-M18A2 chemical agent detector kit use it to detect certain types of *known* enemy chemical agents (and to determine the absence of these chemical agents). If an *unidentified* chemical agent was used in the attack (that is, if no positive tests are obtained with the kit and casualties still occur), CBR-trained personnel take samples of the unidentified chemical agent in white-band sampling tubes provided in the M18 detector kit for this purpose. The samples are forwarded directly (and expeditiously) to the nearest CBR agent sampling and analysis team or to the general chemical laboratory for analysis and identification, according to the SOP or operation order.

b. Radioactive Material. Headquarters and headquarters companies of battalions are issued the same radiac equipment that is issued to component companies, and the equipment is used as described in paragraph 11-5. If radiation from an unknown source is detected, the battalion alerts the nearest CBR agent sampling and analysis team or the general chemical laboratory to take samples for analysis.

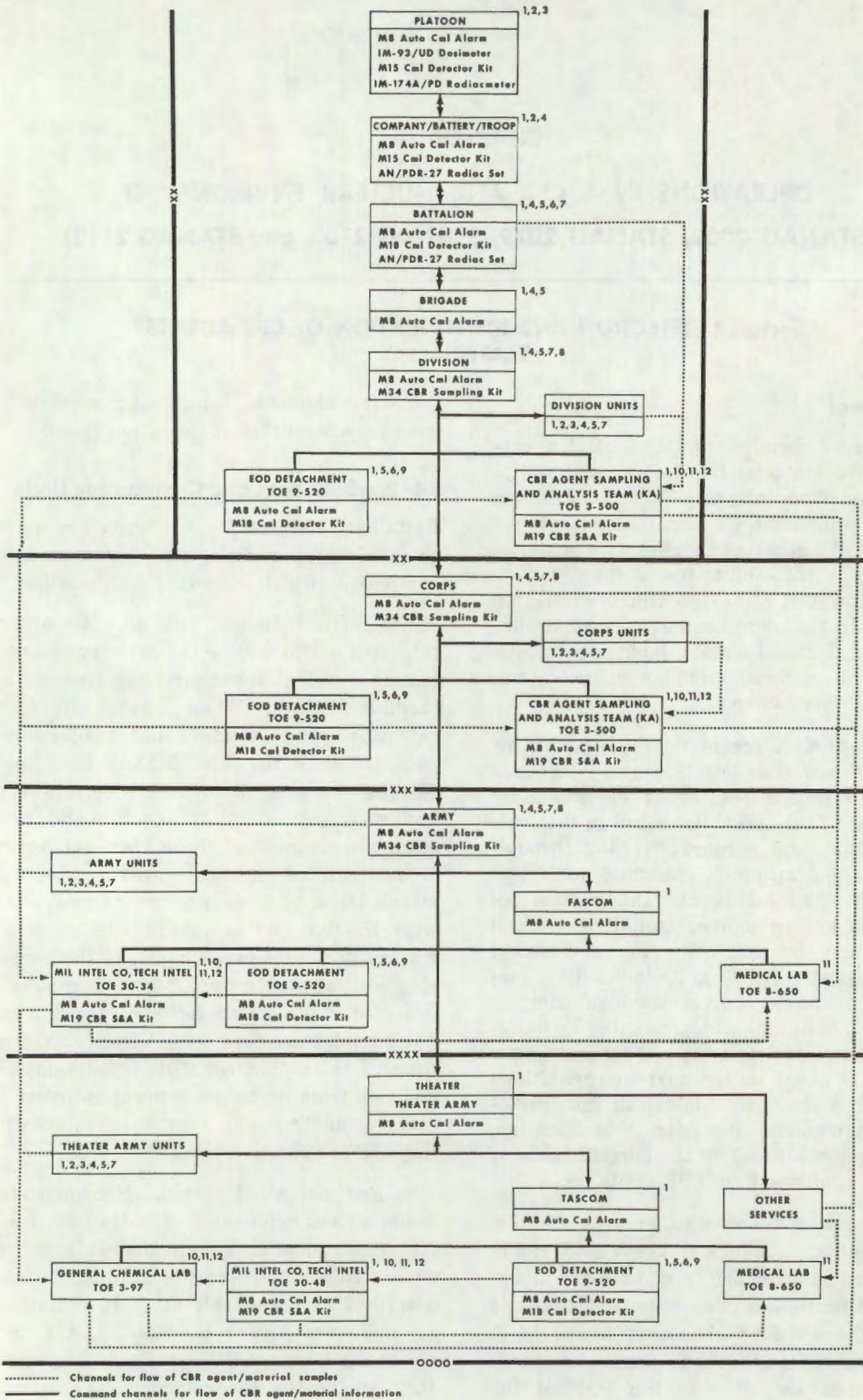


Figure 14-1(1). Schematic organization of a CBR agent/material detection and identification system.

¹M8 automatic chemical agent alarm is issued to platoon, company, battalion, brigade, division, corps, army, and theater units. See also figure 8-2.

²AN-M15-series chemical agent detector kit is issued to platoon and company as required for use by CBR-trained personnel.

³IM-93()/UD tactical dosimeter is issued on the basis of two per platoon-size unit and one per unit headquarters. IM-174A/PD radiacmeter is issued on the basis of one per platoon-size unit and one per unit headquarters.

⁴AN/PDR-27() radiac set is issued on the basis of one per divisional company-size combat and combat support unit and as required for medical, maintenance, and bath units and water supply point.

⁵ABC-M18-series chemical agent detector kit is issued to a unit that has both a mission to detect chemical agents and personnel trained to operate the kit.

⁶When the company is separated from its parent organization, it alerts the nearest unit equipped with the ABC-M18-series chemical agent detector kit, as designated in the SOP.

⁷Intervening headquarters are notified through command or intelligence channels when chemical agent samples are forwarded directly to the military intelligence company, technical intelligence, or to the CBR agent sampling and analysis team.

⁸M34 CBR agent sampling kit is authorized for issue to headquarters of division, corps, army, and separate brigade.

⁹EOD detachment is equipped with M8 automatic chemical agent alarm and ABC-M18-series chemical agent detector kit.

¹⁰ABC-M19 CBR agent sampling and analyzing kit is issued to the military intelligence company, technical intelligence; the general chemical laboratory; and the TOE 3-500 teams, such as the CBR agent sampling and analysis team KA.

¹¹Samples of suspected biological agent (taken by CBR-trained, technically qualified personnel) are sent directly to the medical laboratory for identification.

¹²Samples of all unidentified chemical agents and radioactive material from an unknown source are sent to the general chemical laboratory for analysis. Intact, defuzed, suspected biological munitions are sent to the general chemical laboratory for removal of the suspected biological agents as samples, which are then sent to the medical laboratory for identification.

Figure 14-1(2)—Continued.

14-3. Headquarters of Separate Brigades, Divisions, Corps, and Armies

Headquarters of separate brigades, divisions, corps, and armies are authorized the M8 automatic chemical agent alarm and the M34 CBR agent sampling kit. When alerted that an unidentified chemical agent, a biological agent, or radioactive material from an unknown source has been located, personnel equipped with the M34 kit take soil samples and process them according to the SOP of the command, as follows:

a. Separate Brigades, Divisions, and Corps. These organizations send chemical and biological agent and radioactive material samples to the nearest CBR agent sampling and analysis team.

b. Army. The Army sends chemical agent and radioactive material samples to the military intelligence company, technical intelligence, and the biological agent samples to the medical laboratory specified in the theater SOP.

14-4. Military Intelligence Company, Technical Intelligence, and CBR Agent Sampling and Analysis Team

The military intelligence company, technical intelligence, has a mission of processing and evaluating captured and recovered, rendered-safe enemy munitions and weapons, including chemical, biological, and nuclear munitions. The mission of the CBR agent sampling and analysis team is to analyze chemical agent samples and to take samples of unknown chemical agents for processing by the general chemical laboratory, biological agent samples for processing by the medical laboratory, and radioactive material samples from unknown nuclear detonations for processing by the general chemical laboratory. Both units are authorized the M8 automatic chemical agent alarm (para 8-15) and the ABC-M19 CBR agent sampling and analyzing kit; the kit (fig 8-3) is used as described below. TM 3-6665-205-10/1 and TM 3-6665-205-10/2 cover

information on the M19 CBR agent sampling and analyzing kit.

a. Chemical Agents. When alerted to a chemical attack by any means, chemical personnel use the M19 CBR kit to detect and identify types of *known* enemy chemical agents in vapor, aerosol, liquid, or solid form. They also use the M19 kit to analyze and identify samples of chemical agents forwarded to them in the white-band sampling tubes from the M18 kit. *The M19 kit will normally be able to identify any type of known enemy chemical agent.* However, if the enemy uses an entirely new type of chemical agent that cannot be identified by this kit, chemical personnel in the unit must take *fresh* vapor or aerosol samples of the unidentified chemical agent at the earliest opportunity. Samples (soil, water, aerosol, or vapor) are forwarded directly to the general chemical laboratory for analysis and identification. Vapor samples taken in white-band sampling tubes from the M19 kit must be forwarded expeditiously because of the short life of the chemical agent in the sampling tubes.

b. Biological Agents. Biological agent samples taken with the M19 kit are sent directly to the medical laboratory specified in the theater SOP for identification. Close coordination is required with the medical laboratory for correct sampling procedures and transportation of samples.

c. Radioactive Material. Samples of radioactive material from unknown nuclear detonations or unknown sources taken with the M19 kit are sent to the general chemical laboratory for analysis.

d. Chemical and Biological Munitions. Intact, defuzed, and rendered-safe chemical and biological munitions received by the military intelligence company, technical intelligence, from explosive ordnance disposal detachments are forwarded to the general chemical laboratory for processing after they have served their intelligence purpose.

14-5. Explosive Ordnance Disposal (EOD) Detachment

The EOD detachment has a mission of detecting, rendering-safe, recovering, evaluating, reporting, evacuating, and disposing of unexploded explosive munitions, including chemical, biological, and nuclear munitions. The detachment is authorized radiation detection equipment, the M8 automatic chemical agent alarm, and the ABC-

M18A2 chemical agent detector kit; the kit is used as described in *a* below.

a. Chemical Agents. When alerted to a chemical attack in their area, CBR-trained personnel in the detachment use the M18 kit to detect certain types of *known* enemy chemical agents. If they cannot detect the type of agent used, CBR-trained personnel take samples of the agent in white-band sampling tubes provided in the kit for this purpose and forward them directly (and expeditiously) to the military intelligence company, technical intelligence, or to the nearest CBR agent sampling and analysis team for analysis and identification.

b. Biological Agents. The detachment alerts the military intelligence company or the nearest CBR agent sampling and analysis team to any suspected source of biological agent for sampling.

c. Chemical or Biological Munitions. The detachment defuzes and renders safe intact, unexploded chemical and biological munitions and forwards them through the military intelligence company to the general chemical laboratory for processing.

14-6. General Chemical Laboratory

The general chemical laboratory is equipped with the M2A1 base chemical laboratory to provide a theater-wide broad chemical capability, including the analysis of all samples of unidentified chemical agents and radioactive material from unknown sources. It sends, through command or intelligence channels, reports of the analysis with appropriate recommendations to the theater chemical officer and to the commander of the organization in whose area the sample originated, or as may be otherwise prescribed in the CBR defense annex of the theater SOP. The laboratory—

a. Receives defuzed and rendered-safe enemy captured or recovered chemical and biological munitions for processing. It taps samples of agent from the biological munitions and forwards the agent samples directly to the medical laboratory for identification. It also taps samples of agent from the chemical munitions and forwards samples of *new* chemical agents to CONUS laboratories for development of proper treatment of casualties.

b. Provides chemical laboratory support to the other U.S. Services (Air Force, Navy, and Marine Corps) according to AR 1-35.

c. Uses the ABC-M19 CBR agent sampling and analyzing kit to provide a capability, within the theater army support command (TASCOM), for the identification of chemical agents and sampling of chemical and biological agents and radioactive material.

14-7. Medical Laboratory

The medical laboratory analyzes biological agent

samples received from the field, identifies the pathogenic agent(s) and their sensitivity to various drugs, and recommends drugs and doses to be prescribed in the treatment of casualties. It prescribes correct sampling procedures and transportation of samples to keep the agents viable.

Section II. REPORTING OF NBC ATTACKS AND WARNINGS OF CBR HAZARDS

14-8. General

United States forces use the standardized NBC attack warning and reporting procedures prescribed in STANAG 2103, which is described in appendix E. The NBC report formats provide a rapid means for disseminating information, but do not possess any inherent security. Speed is more essential than security in reporting enemy attacks; however, if rapid and secure means of transmitting reports are available, the major commander concerned may prescribe that they be used. A schematic organization within a theater of operations for reporting enemy NBC attacks and warnings of CBR hazard areas is illustrated in figure 14-2 and is described in the following paragraphs:

a. *NBC Information Source.* Units below the division, nondivisional units, and other units shown in figure 14-2 are designated NBC information sources. An NBC information source may be a unit under attack or a unit observing an attack.

b. *NBC Collection Center.* The division is designated the NBC collection center within its designated NBC observation zone (e below).

c. *NBC Control Center.* The field army or independent corps is designated the NBC control center within its designated NBC observation zone (e below).

d. *NBC Observation Zone.* This is a geographical area that defines the responsibility for collecting and reporting information on enemy or unidentified nuclear detonations, biological or chemical attacks, and resultant contamination. Boundaries of NBC observation zones are determined by the field army or independent corps.

e. *Tactical Operations Center.* The tactical operations centers of division, corps, and army

and, when required, the operations center of brigades maintain, consolidate, and evaluate reports of nuclear, biological, and chemical attacks and resultant contamination within the designated NBC observation zone of the command; predict or estimate chemical, biological, and radiological hazard areas; and warn units and organizations in the hazard areas to take defensive actions.

f. *Communications.* Normal intelligence, command, and artillery fire direction nets and area communications systems are used to report enemy nuclear, biological, and chemical attacks and warnings of chemical, biological, and radiological hazard areas. The division uses command communication channels for warning subordinate units.

g. *INITIAL Enemy Nuclear, Biological, or Chemical Attack.* The INITIAL use of nuclear, biological, and chemical weapons by enemy forces will be reported immediately to the theater commander with a FLASH message precedence and the fastest means through the next higher headquarters.

14-9. Companies and Comparable Units

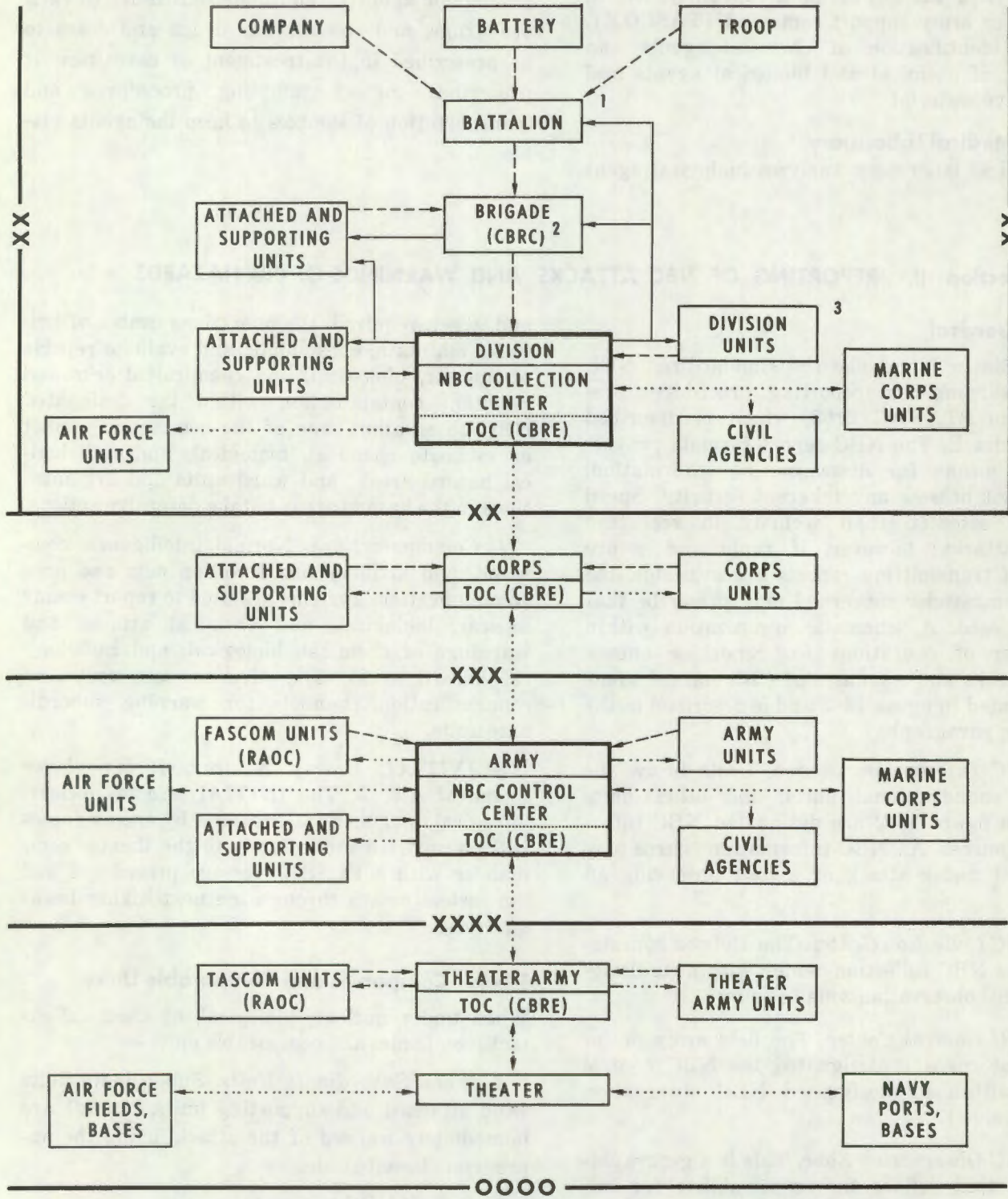
When under nuclear, biological, or chemical attack, companies and comparable units—

a. *Warn Subordinate Units.* Subordinate units (and attached and supporting units, if any) are immediately warned of the attack, using the appropriate brevity code.

b. *Submit NBC 1 Reports.*

(1) An *initial* NBC 1 report is promptly submitted to the battalion, giving basic data. See appendix E for guidance on NBC 1 reports.

(a) For a *chemical* attack, this report is normally submitted to the battalion for both "on-target" and "off-target" attacks. See paragraph



- - - - NBC 1 and 4 reports
- NBC 2, 3, and 5 reports on division net
- NBC 2, 3, and 5 reports as appropriate
- 1 See also figure 8-2
- 2 When authorized per AR 310-31
- 3 Artillery and air defense units report on artillery net

Figure 14-2. Schematic organization for reporting enemy NBC attacks and warnings of CBR hazard areas.

E-8 for examples of company NBC 1 chemical attack report messages.

(b) For a *nuclear* attack, this report is normally submitted to the division TOC, primarily by headquarters units of field artillery and air defense battalions and other designated units having such optical instruments as aiming circles, BC scopes, and theodolites. See appendix D of FM 3-12 for a listing of other designated units. See chapter 2 of FM 3-12 and appendix E for detailed guidance on and examples of NBC 1 nuclear attack report messages.

(2) *Subsequent* NBC 1 reports are submitted to the next higher headquarters, giving followup data.

c. *Submit NBC 4 Reports.* NBC 4 reports are submitted to the next higher headquarters, giving radiological contamination information. See paragraph E-11 for guidance on and paragraph E-12 for an example of an NBC 4 report message.

14-10. Battalions and Comparable Units

When under nuclear, biological, or chemical attack, battalions and comparable units—

a. *Warn Subordinate Units.* Subordinate, attached, and supporting units are immediately warned of the attack, using the appropriate brevity code.

b. *Submit NBC 1 Reports.*

(1) An *initial* NBC 1 report is promptly submitted to the next higher headquarters, giving basic data of the attack.

(a) For a *chemical* attack, this report is normally submitted to the brigade. See appendix E for examples of battalion NBC 1 chemical attack report messages.

(b) For a *nuclear* attack, see paragraph 14-9b(1)(b).

(2) *Subsequent* NBC 1 reports are submitted to the next higher headquarters, giving followup data.

c. *Alert Subordinate Units.* Subordinate, attached, and supporting units are alerted to *expected* chemical, biological, or radiological hazards from the attack. For guidance on predicting—

(1) *Chemical* hazards, see appendix H.

(2) *Biological* hazards, see appendix H.

(3) *Radiological* hazards, see FM 3-12 and TM 3-210.

d. *Submit NBC 4 Reports.* NBC 4 reports are submitted to the next higher headquarters, giving

radiological contamination information received from subordinate units.

14-11. Brigades and Comparable Commands

When under nuclear, biological, or chemical attack, brigades, groups, and comparable commands function as follows:

a. If the command is operating subordinate to the division, it performs those functions listed for the battalion in paragraph 14-10.

b. If the command is operating separately, then it performs those functions listed for the division in paragraph 14-12.

14-12. Divisions

When under nuclear, biological, or chemical attack, divisions perform the functions of an NBC collection center as listed below. See FM 61-100 for guidance on division NBC reports. Headquarters of divisions—

a. Consolidate and evaluate NBC 1 reports of the same attack submitted by subordinate units and NBC reports forwarded by adjacent Army, Air Force, and Marine Corps commands and civil agencies. Transmit an NBC 2 report to the field army or independent corps, to subordinate commands, and, when appropriate, to adjacent units.

b. Make basic computations for prediction of hazard areas resulting from a nuclear, biological, or chemical attack within its NBC observation zone.

c. Promptly warn subordinate, attached, and supporting units of predicted or actually contaminated areas within the division NBC observation zone by means of NBC 3 and 5 reports. When appropriate, transmit the NBC reports to the corps headquarters and to adjacent Army, Air Force, and Marine Corps commands and civil agencies.

d. Direct chemical reconnaissance and radiological survey necessary to determine and define areas of contamination within the division zone.

e. Provide procedures, where applicable, so that radiologically and chemically contaminated areas are marked according to STANAG 2002 (app F).

f. Exchange chemical, biological, and radiological hazard information with appropriate local civil authorities as directed by higher headquarters.

14-13. Field Army or Independent Corps

When under nuclear, biological, or chemical attack, the field army or independent corps performs the functions of an NBC control center, as listed below. When required, corps and theater army may also perform the functions of an NBC control center. Headquarters of the field army—

a. Consolidates and evaluates NBC 2 reports of the same attack submitted by subordinate commands and NBC reports transmitted by adjacent Army, Air Force, and Marine Corps commands and civil agencies.

b. Submits NBC reports to higher headquarters, adjacent commands, and national agencies as may be required.

c. Directs chemical reconnaissance and radiological survey necessary to plot data of chemically or radiologically contaminated areas of tactical importance within its NBC observation zone.

d. Provides arrangements for prompt transmission of evaluated chemical, biological, and radiological contamination data to appropriate adjacent areas when contaminated or hazardous areas are predicted to extend beyond its own area.

Section III. CBR COLLECTIVE PROTECTION

14-14. General

Individual protection against chemical, biological, and radiological hazards is discussed in Parts Two and Three. For chemical and biological hazards, this consists essentially of wearing protective clothing and masks. However, protective clothing and masks cannot be worn indefinitely; an enemy may be able to subject an area occupied by friendly personnel to a hazardous concentration of chemical agent for a prolonged period. Therefore, it is necessary to be able to provide some means of collective protection against chemical hazards to permit personnel to take care of their personal needs and to continue their various field activities.

a. *Collective Protection Shelters.* Collective protection shelters that exclude chemical agents are needed for rest and relief of personnel who must hold specific limited areas of critical terrain and for operations of command, communications, and other important facilities. Details concerning collective protection shelters and gas-particulate filters used with the shelters are contained in FM 5-15, TM 3-221, and TM 5-311.

b. *Collective Protection Equipment for Combat Vehicles.* Various combat vehicles are authorized gas-particulate filter units to provide purified air to the protective masks of a limited number of personnel. Because of the requirements for intratank communications, armor personnel will normally wear the M14A2 or M25 tank protective mask while inside the tank operating in a chemical environment. These masks are equipped with individual canisters, in addition to connections to the central filter unit, to provide protection to the wearer while he is away from the vehicle.

Because armor personnel will normally be required to leave and reenter the tank for various reasons while operating in a chemical environment, the doctrine for the wearing of chemical protective clothing discussed in paragraphs 8-8 through 8-13 applies, subject to modifications based on the judgment of the tank unit commander. The following gas-particulate filter units may be used in armored vehicles:

(1) The ABC-M8-series units permit the attachment of up to four protective masks.

(2) The M13-series units allow the attachment of five protective masks.

(3) The M14 armored ambulance filter unit will accommodate six individuals.

c. *Collective Protection Equipment for Hospitals.* The M7-series gas-particulate filter units are authorized for use in hospitals that are not equipped with filter units. They provide purified air to six protective headpieces.

d. *Collective Protection Equipment for Vans and Vehicles.* The XM14 collective protection equipment is to be used in M291A2/M292 expandable van trucks, and the XM15 collective protection equipment is to be used in M577 command post carriers.

14-15. Gas-Particulate Filters

Gas-particulate filter units consist of power units and blowers to provide an airflow, a gas filter to remove chemical agents in vapor form, and a particulate filter to remove chemical and biological agents and radioactive material in particulate form from contaminated air. See TM 3-221 for details.

a. *Gas Filters.* The gas filter uses charcoal to filter chemical-agent vapor out of contaminated air. Gas filters can be used in fixed installations and shelters and in field shelters, van shelters, and vehicles.

b. *Particulate Filters.* The particulate filter uses a mechanical process to filter micron-size particles of chemical and biological agents and radioactive material out of contaminated air. Under normal usage, the particulate filter does not wear out; however, the collection of dust and pollen tends to clog it after prolonged usage. The particulate filter should be replaced when there is a reduced air output.

c. *Replacement Criteria for Gas Filters.* The gas filter is replaced in the field by CBR-trained

personnel if it is physically damaged, is immersed in water, or offers a high resistance to airflow, and after the number of hours of operation shown in table 14-1. It is also changed as soon as possible after each chemical attack with identified blood agent, except for the M6-series filters which are changed after 1,500 hours of operation in a blood-agent contaminated atmosphere. Except for the M6-series filter units, hours of operation are continuously registered by a timer attached to either the filter unit or the vehicle. For the M6-series filter units, a log of operations is normally kept for determining the time of maintenance for the gasoline or electric motor. TM 3-4240-266-34 contains information on the M6A2 filter unit.

Table 14-1. Gas Filter Replacement Criteria for Mobile Collective Protection Equipment

	FIELD SHELTERS		VANS	VEHICLES
	M6 M6A1 M6A2	M18	M15 XM47	M8 M13 XM51 M14 M13A1
Filter Units				
Gas Filters	M10	M23	C46 XM34	
Hours of Operation, Wartime, No Chemical Agents Used	15,000	10,000	10,000	10,000
Hours of Operation, Wartime, Chemical Agents Used	2,500 (^a)	1,500 (^b)	1,500 (^b)	1,500 (^b)
After Each Attack with Blood Agent	(^c)	X	X	X
At Beginning of Combat and When the use of Blood Agent is Expected	X	X	X	X

(^a) Normally in operation for 5 months.
 (^b) Normally in operation for 2 months, 24 hours a day.
 (^c) After 1,500 hours of operation.

d. *Disposal of Contaminated Filters.* Contaminated filters are disposed of by burying them under several inches of soil.

14-16. Types of Collective Protection Shelters

Collective protection shelters are basically classified as ventilated or unventilated, either of which can be permanent or improvised. Portable collective protection shelter systems are used for command, control, communications, and other important functions.

a. *General.*

(1) *Permanent shelters* are constructed by or with the assistance of engineer personnel according to prescribed standards, usually for specially designated installations in areas where conditions are comparatively static.

(2) *Improvised shelters* are constructed by

the using unit from available material. Assistance may be obtained from engineer units.

(3) *Portable collective protection shelter systems* include the XM15 collective protection equipment to be used in the M577 command post carrier, XM14 collective protection equipment to be used in the M291A2/M292 expansible van trucks, and the XM51 positive pressure collective protection shelter. The XM51 shelter (fig 14-3) includes a protective entrance that allows contamination-free entrance and exit; it is collapsible to permit stowing. To maintain light discipline while dressing or undressing, additional tentage is required for 24-hour operation.

b. *Ventilated Collective Protection Shelter.* This type of shelter is equipped with gas-particulate filter units and airlock entrances and exits. A filter unit pumps filtered air into the shelter, providing agent-free air and building up a posi-



Figure 14-3. XM51 chemical-biological collective protection shelter.

tive pressure within the shelter. This type of shelter can be provided by using bunkers, pill-boxes, armored personnel carriers, or various types of portable collective protection shelters.

c. Unventilated Collective Protection Shelter.

This type of shelter is based on the concept of trapping uncontaminated air within the inclosure before the atmosphere becomes contaminated. The shelter must be airtight, and all openings must be sealed and remain sealed during the period that the chemical hazard exists. Calculated stay time for shelter occupants before the air becomes stagnant varies with several factors; see TM 3-221 for a method of calculating stay time.

14-17. Location and Design of Collective Protection Shelters

Considerations for the location and design of collective protection shelters are discussed below. Refer to TM 3-221 for technical details.

a. Location. Collective protection shelters are located, if possible,—

(1) So that they are readily accessible to personnel who may be required to use them in order that personnel can reach the shelter quickly.

(2) So that they provide protection against high explosives as well as chemical and biological agents.

(3) Where high concentrations of chemical agents cannot accumulate.

(4) On well-drained firm soil.

(5) Underground and well camouflaged.

b. Design. Shelters are designed—

(1) To eliminate drafts and prevent seepage of chemical agents.

(2) So that they are covered with at least 1 meter of earth or sandbags, if underground. If the shelter is above ground, all joints and cracks should be sealed and floors should be made airtight.

(3) With openings around piping, conduits, ventilators, or chimneys stopped up or altered so that they can be closed.

(4) So that the structure also offers maximum resistance to HE blast and missile penetration.

(5) With an entrance airlock and an emergency exit.

(6) With space provided for lights, water, first aid kit or equipment, shaving facilities, and latrine (or outside latrine).

(7) With provision for communications to the outside.

(8) So that they are airtight to maintain a positive pressure in the shelter.

(9) So that personnel can decontaminate themselves, if necessary, before entering the shelter proper.

14-18. Operation of Collective Protection Shelters

Details of operation of a collective protection shelter, including the duties of occupants, are prescribed in the SOP for the shelter. The capacity of each shelter is posted on the wall of the shelter. A trained sentry is stationed outside and equipped with detection equipment to advise occupants of the status of contamination outside the shelter, control entry inside, and ascertain when the shelter can be vacated safely. The SOP should also contain guidance on the following:

a. Preparation of a Clean Area Around the Shelter Entrance. If the area has been subjected to a liquid chemical attack, the area around the entrance is—

(1) Decontaminated by turning over the soil (or removing snow), by adding a clean layer of soil or sand, or by using a decontaminating agent such as STB.

(2) Provided with a protective cover having adequate ventilation underneath, using a poncho or similar material held upright on stakes or a tent where protective clothing and other equipment can be stored.

b. Entry-Exit Procedures. Specific safe entry-exit procedures must be followed for each of the

types of collective protection shelters, such as: collective-protected M577 command post carriers, M291A2/M292 expansible van trucks, and XM51 positive pressure collective protection shelters to permit these facilities to be used with the least

risk of contamination to personnel inside and the least interference with operations. The procedures must be simple and easily followed in the field under chemical hazardous conditions. See TM 3-221 for a sample SOP.

Section IV. LARGE-SCALE DECONTAMINATION

14-19. General

Decontamination can be accomplished by a variety of ways, depending on the nature of the contaminant. Chemical decontamination involves removal, neutralization, absorption, or weathering of the chemical agent; biological decontamination involves destruction or exposure to sunlight of the biological agent; and radiological decontamination involves physical removal of the radioactive material.

a. Commander's Guidance. Commanders and staff coordinate priorities for large-scale decontamination operations. They insure that provision is made for proper disposal of material that has been used for decontamination so that it does not constitute a hazard to either military or civilian personnel. TM 3-220 provides guidance on large-scale decontamination operations.

b. Levels of Decontamination.

(1) *Individual decontamination* is performed by the individual, with material at hand, on himself and on equipment he uses. It is performed as soon as practicable and is usually sufficient to allow the individual to carry on his assigned mission.

(2) *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 supervision of trained individuals. All officers, NCO, and qualified CBR specialists should be prepared to act as supervisors of decontamination teams, when required.

(3) *Support decontamination*, that decontamination which is beyond the capabilities of the using unit, is performed by specialized units equipped with M9 or M12A1 power-driven decontaminating apparatus (PDDA) and is confined to vital installations, equipment, and areas. In some cases the specialized units may provide technical assistance and supervision to the unit responsible for the area. See TM 3-4230-209-12 for details on the M12A1 PDDA.

14-20. Equipment Decontamination Stations

Equipment decontamination stations are located as far forward as possible. A typical layout for an equipment decontamination station is described in TM 3-220. Collapsible water tanks may be used to store water. Standard decontaminating equipment and materials are used if available. Brooms, mops, and pails may be used if standard decontaminating equipment is not available. Contaminated wash water is disposed of in such a way that it is not a hazard (a sump pit is one means of disposing of contaminated wash water).

14-21. Personnel Decontamination Stations

Personnel decontamination stations and procedures for operating them are described in TM 3-220. Field bath units provide a means for large-scale decontamination of personnel. In situations where field bath units are not available or cannot be readily reached or water is not available, mobile personnel decontamination stations can be established, using M9 or M12A1 PDDA.

a. Operation. Personnel decontamination stations are established and operated by the commander having direct jurisdiction over the area, normally at division level. A clothing exchange facility and a first-aid and monitoring facility are normally operated in conjunction with the personnel decontamination station.

b. Location. Personnel decontamination stations are located as far forward as the situation permits and near a medical aid station if feasible. The area is located to provide concealment from air and ground observation and where contaminated water can be disposed of safely.

14-22. Field Expedient Personnel Decontamination Station

In an emergency, it may be necessary to establish an expedient personnel decontamination station, when a bath unit or a mobile decontaminating unit is not available, to decontaminate personnel of units that cannot be withdrawn from combat.

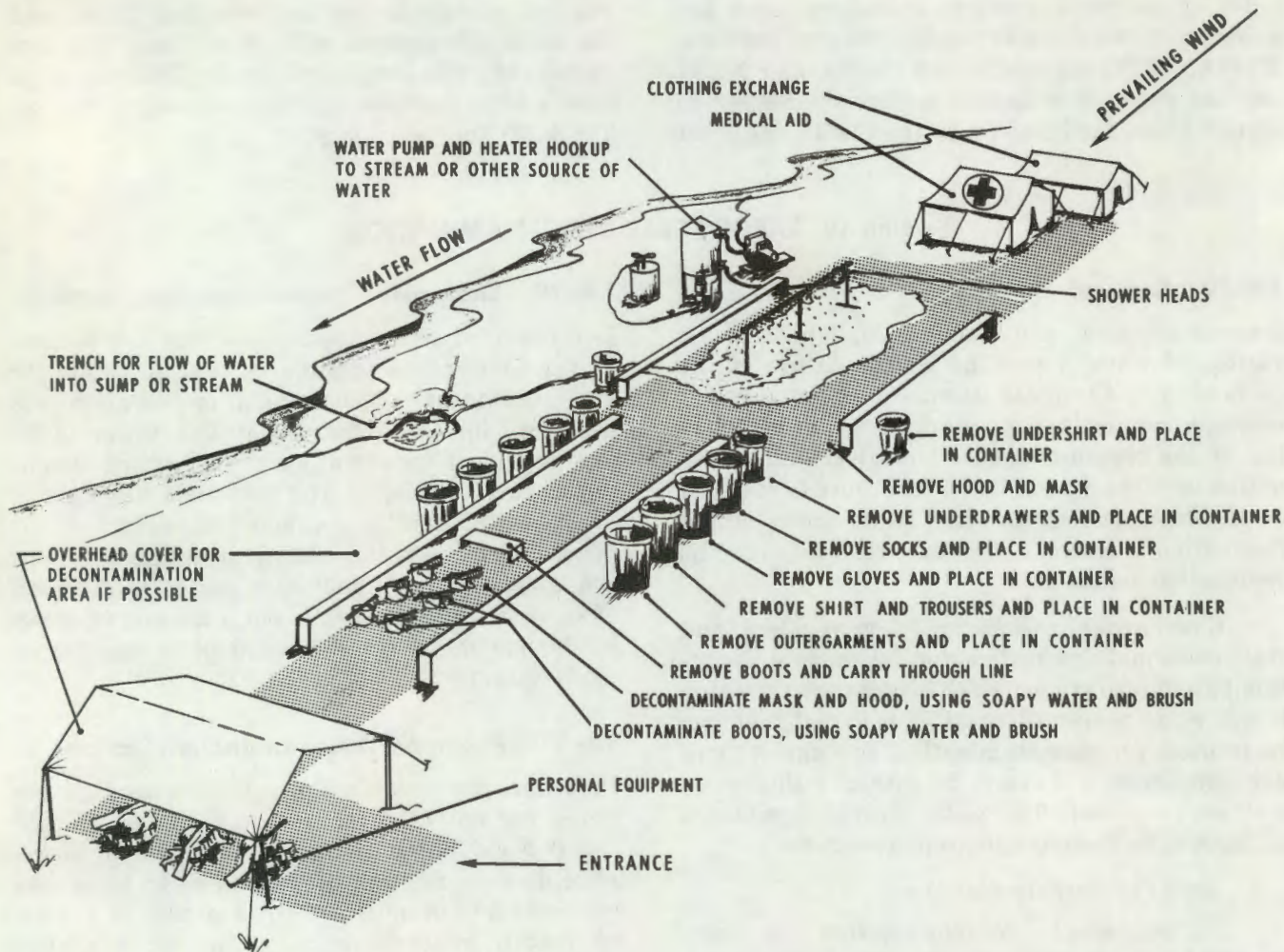


Figure 14-4. Schematic improvised personnel decontamination station.

The facility will need to provide fresh clothing and equipment and a means for disposing of contaminated clothing, equipment, and water. Figure 14-4 illustrates an improvised personnel decontamination station that can be set up by a battalion in a temperate climate.

a. General. An uncontaminated area near a source of water (such as a stream, well, or water storage facility) is selected, if possible. If the area is contaminated, it is decontaminated by turning or removing a top layer of soil, by adding a clean layer of soil or sand, or by using available decontaminating agents. If possible, the area selected should have overhead cover, or overhead cover is provided to give protection against chemical attacks.

b. Description. The following material and equipment can be used:

- (1) Containers (such as GI cans or equiva-

lent, cardboard boxes, or plastic bags) for clothing as it is removed.

- (2) Water pump and hose (if a PDPA is not available).

- (3) Water heater, improvised (if the M1 or M2 water heater is not available).

- (4) An overhead pipe with shower heads (ordinary pipe or rubber hose with holes can be used).

- (5) Lumber and nails for benches and walks.

- (6) Pails of soapy water and clear water with brushes for decontaminating boots.

- (7) Tarpaulin or any other overhead cover.

- (8) Medical tent or substitute.

- (9) Clothing exchange tent or substitute.

c. Operating Personnel. Assistants are required for the various stations to supervise and assist personnel going through the line.

d. Undressing Procedure. See TM 3-220 for details of a recommended undressing procedure. However, the undressing procedure should be modified according to the facilities and conditions at the improvised decontamination station.

e. SOP. The SOP should include a personnel decontamination station annex giving guidance on the following:

- (1) Organization of the decontamination line.
- (2) Personnel required at stations of the decontamination line and their duties.
- (3) Supplies required.

(4) Description of boot cleaning buckets and instructions for use, how often the contents should be renewed, disposal of contaminated waste, and how buckets are replenished.

(5) Undressing procedure, including a practical unmasking procedure, for personnel going through the decontamination line.

(6) Procedures for decontamination of individual equipment and reissue before departure from the decontamination station.

(7) Coordination for disposal of contaminated clothing (laundering) and, where necessary, reimpregnation of clothing.

Section V. RADIOLOGICAL SURVEYS

14-23. General

Radiological survey is the *directed* effort to determine the degree and extent of nuclear radiation. Commanders of all echelons are responsible for training radiological survey personnel and performing radiological surveys (and resurveys) when directed. STANAG 2112 prescribes the standard terms associated with radiological survey, the details required to be included in requests for survey, and the essential information that should be obtained and recorded by the survey party. This agreement also includes examples of a radiological survey briefing and report form for ground and air. FM 3-12 provides detailed guidance for radiological survey.

14-24. Organization of Surveys

Surveys are performed by one or more radiological survey parties and a control party. A ground survey party includes a monitor, who operates a dose-rate meter and records all survey data, and an assistant, who may be a driver or radio operator or both. Additional personnel may be included in a survey party for security or other reasons. An aerial survey party consists of a monitor, whose duties are similar to those of the ground monitor, and a pilot. The control party directs the survey, collects the data reported, and assembles the data into a usable form. The control party organization varies, depending on the level of command that it serves. The control party and survey parties are usually organized and equipped with unit resources.

14-25. Survey Requirements

Commanders become aware of radiological con-

tamination in their own areas through monitoring. However, at higher echelons, monitoring reports from lower units may not provide sufficient information for the determination of the contamination pattern. A radiological survey may be directed to evaluate the degree and extent of contamination when monitoring reports are insufficient to provide information. Radiologically contaminated areas are marked with "ATOM" signs that are in consonance with STANAG 2002; see appendix F for details.

14-26. Survey Control

There are two methods of controlling surveys, as described below. Radiological surveys can be performed from the air or on the ground. An aerial survey normally is conducted under centralized control; the control of a ground survey may be centralized or decentralized, depending on requirements, span of control, and communications capabilities.

a. Centralized Control. This is the primary method of operation in which the authority ordering the survey, normally the division, provides the control party and the radiological data are reported directly to the control party.

b. Decentralized Control. This is the alternate method in which the operation is directed through command channels and controlled by a control party of the subordinate command. The data are furnished to the authority ordering the survey.

14-27. Briefing Guidance for Survey Parties

Survey parties will be briefed, normally to provide guidance in the following areas:

a. Purpose. This will be to determine the presence and the level of fallout activity or induced radioactivity near ground zero, in a specified area, along a route, or at a specified location, or any combination of these.

b. Start Time and Completion Time. The times during which survey is to be conducted will be given.

c. Conduct of the Survey. The data on surveys may be summarized as an overlay or a marked map by the control party.

(1) *For ground surveys,* the route to be followed and the locations at which readings will be taken or the distance between readings will be given.

(2) *For aerial surveys,* the flight altitude, expressed as a height above either sea level or ground level, will be indicated. In certain areas, the locations at which the readings will be made will be decided by the aircraft commander. Instructions pertaining to the air-ground correlation factor (AGCF) will be given. As a minimum, this will include how many times AGCF will be checked, and may include locations at which it will be checked. The following information is obtained from the Army aviator: capability of aircraft at low speeds, nap of the earth flying (ability of the aircraft to follow the contour of the earth), and prohibited areas for aircraft.

d. Safety Precautions Concerning Nuclear Radiation Exposure. See FM 3-12 for detailed guidance, in addition to the following:

(1) The maximum nuclear radiation to which the survey party may be exposed during a given period or survey mission will be stated.

(2) The maximum dose rate beyond which the survey party will not proceed to avoid undue hazard will be stated.

e. Recording Limitations. The minimum dose rate below which no record is to be kept will be stated.

f. Method of Communications. The method by which the survey data are to be communicated to the control agency can vary. Data may be reported either at the time of recording or in the form of a summary table or record. In addition, the reporting method and destination to which the uncorrected results of the survey are to be sent will be given.

g. Special Instructions. Special instructions on conducting the survey may include—

(1) The method in which certain dose-rate readings are made, which depart from the normal procedures (for example, the determination of correlation factors). For aerial survey, in addition to altitude, the course and spacings of legs and the time interval between readings on the various legs are also indicated.

(2) Marking of contaminated areas, if required (app F).

14-28. Company-Size Units

As a rule, company-size units organize and train at least two survey parties (primary and alternate) for each dose-rate survey meter; only one party will be equipped with a survey meter. Survey parties are organized to use organic vehicles that provide maximum protection against nuclear radiation; for example, armored vehicles for armored units and aircraft for aviation units. Survey techniques for ground and air surveys, air-ground correlation factors, and correlation factors for vehicles and structures are given in FM 3-12.

14-29. Battalions and Brigades

Commanders of battalions, brigades, and comparable units are responsible for training, equipping, and organizing a control party capable of planning and directing decentralized survey operations. The officer in charge or the NCO in charge of the control party will brief survey parties according to the guidance in paragraph 14-27.

14-30. Tactical Operations Centers

The chemical, biological, and radiological element (CBRE), which in a CBR environment normally would be part of the division tactical operations center (TOC) and comparable operations centers, plans radiological surveys and processes and evaluates survey data.

a. When data are received, *if necessary,* corrections are made as follows:

(1) Conversions of the dose rate to that existing at a reference time ($H + 1$ for all readings taken between $H + 1$ and $H + 48$ hours or $H + 48$ for all readings taken after $H + 48$ hours).

(2) A correction (vehicle shielding) factor for the shielding effect of the vehicle or the aircraft used in the survey.

(3) An air-ground correlation factor to be

applied to aerial survey data to obtain the dose rate at 1 meter above ground level.

b. When data are obtained from an area covered by overlapping fallout zones or where the time of burst is unknown, the normal procedures for conversion of dose rates to a reference time ($a(1)$ above) will *not* apply. To predict the behavior of the dose rate in these areas, further

readings will be necessary. The readings are processed as described in FM 3-12.

c. Survey data that have been corrected and converted to a reference time will be plotted on a map overlay as isodose-rate lines if sufficient information is available; otherwise they will be plotted as dose rates at points of particular interest (STANAG 2103).

Section VI. TACTICAL DOSIMETRY

14-31. General

To reduce overexposure of personnel to harmful radiation, commanders control the operations of subordinate units in radiologically contaminated terrain. The primary control measure employed is the operation exposure guide established by division and at subordinate commands and units. This operation exposure guide is based on previous exposures as reported by subordinate units (radiation status reports) and known sources of radiation to be encountered in subsequent operations.

14-32. Radiation Status Reports

Radiation status reports are based on tactical dosimetry readings of the platoons of a company that are forwarded to the battalion (para 11-6). The battalion and separate units attached to the brigade forward dosimetry information daily (or after each operation) through brigade to division as a part of the periodic operations report. The radiation status of the battalions and attached units is forwarded to the division TOC. Normally, only the radiation status of the battalions is of interest to the brigade or division commander. Since the determination of this status is the result of several averaging processes and thus subject to error inherent in these processes, the commander may desire more specific information. This is obtained from the battalion at the commander's request. The division commander establishes an SOP outlining the radiation exposure information that he desires from the battalions. Typical flow of unit dosimetry information within the division is illustrated in figure 14-5.

a. *Attachment of Units.* When elements of one unit are attached to another unit, the radiation status of these elements is kept by the unit to which they are attached. When elements return to their parent unit, it is informed of their radia-

tion exposure status. If the parent unit desires to know the radiation status of its detached elements, it contacts the headquarters of the unit to which they are attached.

b. *Divisional Units.* The dosimetry information concerning divisional units is not forwarded higher than division unless specifically requested. Instead, the general radiation status is made a part of overall reports of the division's combat effectiveness.

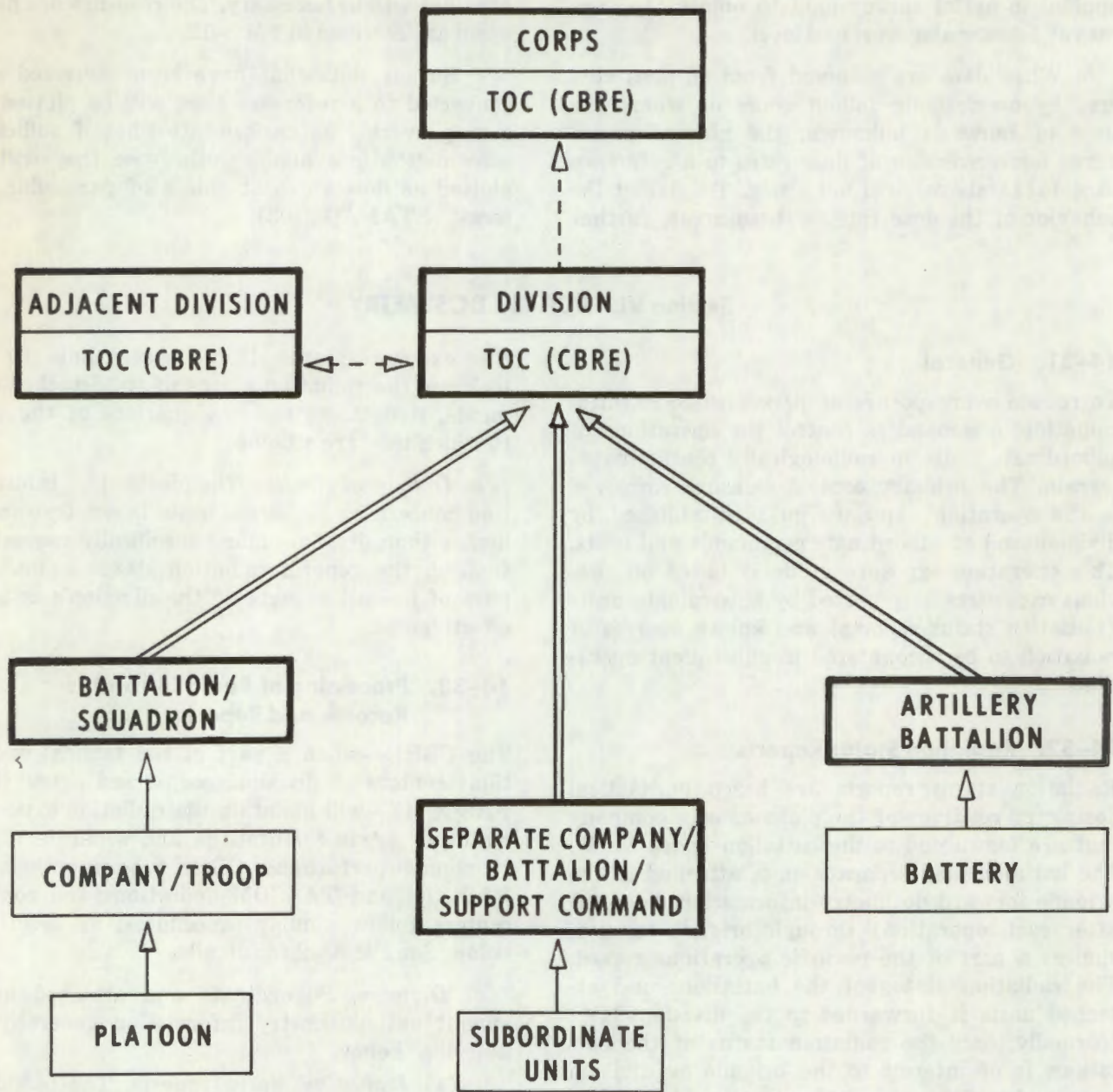
14-33. Processing of Radiation Status Records and Reports

The CBRE—when a part of the tactical operations centers at division, corps, and army (less FASCOM)—will maintain the radiation exposure status of organic battalions and separate units. Personnel performing CBRE-type functions in FASCOM and TASCOM operations and control centers follow similar procedures, as described below. See FM 3-12 for details.

a. *Division.* Subordinate and attached units submit unit dosimetry information generally as described below.

(1) *Radiation status reports.* The battalion radiation status, based on the radiation status of organic and attached companies, is forwarded to division *through* brigade as specified by the commander or the SOP. This procedure makes certain that the brigade S3 is informed of the radiation status of the battalions and attached units so that he, in turn, can advise the brigade commander. The S3 can designate the brigade chemical officer to monitor this information since the chemical officer, in conjunction with the surgeon, usually advises the commander and staff on radiation matters. The brigade headquarters is not required to maintain any records of radiation exposures.

(2) *Radiation status records.* Unit dosimeter information is needed for operational purposes



----- Processed data on request only

==== Processed data through intervening headquarters (for example, brigade, division artillery, and division support command)

—— Basic unit data

Bold blocks indicate units that keep radiation dose status charts.

Figure 14-5. Typical flow of unit dosimetry information within the division.

and is kept in the division TOC. Since the radiation status information of the battalions is retained in the CBRE of the division TOC, the

required information is readily available for G2 and G3 operations. The CBRE also keeps information of other radiological activities, such as

fallout predictions and fallout plots. The division commander normally relies on the chemical officer (who has staff responsibility for the CBRE) for information of the radiological situation. The radiation status records must be readily available to the division surgeon who uses this information as a factor in advising the division commander on the operation exposure guide for a particular mission.

b. Corps and Field Army (less FASCOM). The radiation status of corps and field army units (less FASCOM) is processed similar to that for the division.

c. Field Army Support Command (FASCOM). FASCOM battalions and separate units located in the area of a support group of the army support brigade forward their radiation status reports to the rear area operations center (RAOC) (STANAG 2079) which is attached to the support group. FASCOM units and separate units located in the corps rear area send their radiation status reports to the headquarters designated for rear area protection.

d. Communications Zone (COMMZ). Each unit (battalion, separate company, separate detachment) organic to the area support group, as well as other units in the area serviced by the area support group, forwards its radiation status reports to the RAOC of the appropriate area support group headquarters. Battalions and other units in the area support command (ASCOM) forward their radiation status reports to the area damage control center (ADCOC) of ASCOM.

14-34. Operation Exposure Guide

Data from radiation status charts are factors in establishing the operation exposure guide. The operation exposure guide is established for all levels of command. The division establishes the operation exposure guide and expresses it as the degree of acceptable risk for the particular operation (*negligible, moderate, or emergency*); the brigade follows the same procedure. On the other hand, the battalion normally expresses the operation exposure guide as a numerical value (maxi-

mum amount of predictable nuclear radiation, residual as well as initial, to which personnel may be exposed in performing the mission) for each of its units according to its past exposure history, the current operation plans or orders, and the situation. Under some conditions, the division and brigade commanders may establish a numerical operation exposure guide.

a. Establishment of Operation Exposure Guide. FM 3-12 gives the risk criteria that are used in establishing the operation exposure guide. The operation exposure guide is generally established by the commander for units in the four radiation status categories, using the following safe-sided risk criteria:

(1) *Radiation status 1* (total past cumulative dose of less than 75 rad). For units in this status, exposure to additional 5 rad for a single operation is considered a negligible risk; 5 rad through 20 rad, a moderate risk; and 20 rad through 50 rad, an emergency risk.

(2) *Radiation status 2* (total past cumulative dose from 75 to 150 rad). For units in this status, exposure to additional 5 rad for a single operation is considered a moderate risk and 5 rad through 20 rad, an emergency risk.

(3) *Radiation status 3* (total past cumulative dose greater than 150 rad). For units in this status, all further exposure is considered an emergency risk.

b. Time of Entry—Time of Stay in a Contaminated Area. It may be necessary for units to carry out tasks in a radiologically contaminated area. The commander ordering units into such an area takes into consideration the unit's radiation exposure history and the probable effects of additional exposure. He determines which operations must be conducted in the contaminated area and establishes an operation exposure guide for the units ordered into the area. Use of the operation exposure guide concept will assist the commander in making effective use of his units in a contaminated area. See FM 3-12 for details of determining the time of entry, time of stay, and use of the operation exposure guide.

APPENDIX A

REFERENCES

A-1. Army Regulations (AR)

1-35	Basic Policies and Principles for Interservice and Interdepartmental Logistic Support.
220-58	Organization and Training for Chemical, Biological, and Radiological (CBR) Operations.
310-25	Dictionary of United States Army Terms.
310-31	Management System for Tables of Organization and Equipment (The TOE System).
310-50	Authorized Abbreviations and Brevity Codes.
700-62	Chemical Protective Clothing Policy and Utilization of Certain Chemical Corps Units and Equipment in Combat Areas.

A-2. Field Manuals (FM)

3-1	Chemical, Biological, and Radiological (CBR) Support.
3-10	Employment of Chemical Agents.
3-12	Operational Aspects of Radiological Defense.
5-15	Field Fortifications.
7-30	The Infantry Brigades.
9-14	Explosive Ordnance Disposal Service.
21-10	Field Hygiene and Sanitation.
21-11	First Aid for Soldiers.
21-41	Soldier's Handbook for Defense Against Chemical and Biological Operations and Nuclear Warfare.
21-48	Chemical, Biological, and Radiological (CBR), and Nuclear Defense Training Exercises.
21-60	Visual Signals.
31-85	Rear Area Protection (RAP) Operations.
61-100	The Division.
101-5	Staff Officers' Field Manual: Staff Organization and Procedure.
101-10-1	Staff Officers' Field Manual: Organizational, Technical, and Logistical Data—Unclassified Data.
101-31-series	Staff Officers' Field Manual: Nuclear Weapons Employment.
101-40	Armed Forces Doctrine for Chemical and Biological Weapons Employment and Defense.

A-3. Technical Manuals (TM)

3-210	Fallout Prediction.
3-215	Military Chemistry and Chemical Agents.
3-216	Technical Aspects of Biological Defense.
3-220	Chemical, Biological, and Radiological (CBR) Decontamination.
3-221	Field CBR Collective Protection.
3-240	Field Behavior of Chemical, Biological, and Radiological Agents.
3-4230-209-12	Operator and Organizational Maintenance Manual: Decontaminating

- Apparatus, Power-Driven, Skid-Mounted, Multipurpose, Nonintegral, 500-gallon, M12A1.
- 3-4240-202-14 Operator, Organizational, Direct Support, and General Support Maintenance Manual: Mask, CBR: Field, ABC-M17 and Accessories.
- 3-4240-204-14 Operator's, Organizational, Direct Support, and General Support Maintenance Manual: Mask, Chemical-Biological: Special Purpose, M9A1; Mask, Chemical-Biological: Special Purpose, M9; and Accessories.
- 3-4240-219-14 Operator's, Organizational, Direct Support, and General Support Maintenance Manual (Including Repair Parts and Special Tools List): Mask, Chemical-Biological: Aircraft, ABC-M24 and Accessories.
- 3-4240-223-14 Operator's, Organizational, DS and GS Maintenance Manual: Mask, Chemical-Biological: Tank, ABC-M14A2 and Mask, Chemical-Biological: Tank M25 and Accessories.
- 3-4240-255-14 Operator's Organizational, Direct Support, and General Support Maintenance Manual (Including Repair Parts and Special Tool Lists): Mask, Chemical-Biological Tank, M25A1 and Accessories.
- 3-4240-258-14 Operator's, Organizational, DS, and GS Maintenance Manual: Mask, Chemical-Biological: Field, M17A1, and Accessories.
- 3-4240-266-34 Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List): Filter Unit, Gas-Particulate, EMD, 300 CFM, M6A2.
- 3-4240-269-12 Operator and Organizational Maintenance Manual (Including Repair Parts and Special Tools List): Mask, Riot Control Agent, XM28E4.
- 3-6665-205-10/1 Operator's Manual: Sampling and Analyzing Kit, CBR Agent, M19.
- (C) 3-6665-205-10/2 Operator's Manual: Sampling and Analyzing Procedures, Sampling and Analyzing Kit, CBR Agent, M19 (U).
- 3-6665-225-12 Operator's and Organizational Maintenance Manual: Alarm, Chemical Agent, Automatic: Portable, M8.
- 3-6665-253-12 Operator and Organizational Maintenance Manual: Detector Kits, Chemical Agent, VGH, AN-M15A2A and AN-M15A2N.
- 3-6665-254-12 Operator and Organizational Maintenance Manual: Detector Kit, Chemical Agent, ABC-M18A2.
- 3-6665-268-10 Operator's Manual: Sampling Kit, CBR Agent: M34.
- 5-311 Military Protective Construction (Nuclear Warfare and Chemical and Biological Operations).
- 5-700 Field Water Supply.
- 10-277 Protective Clothing—Chemical Operations.
- 11-6665-209-15 Operator, Organizational, DS, GS, and Depot Maintenance Manual, Including Repair Parts and Special Tool Lists: Radiac Sets AN/PDR-27J, AN/PDR-27L, and AN/PDR-27Q.
- 11-6665-214-10 Operator's Manual: Radiacmeters IM-9E/PD, IM-93/UD, IM-93A/UD, and IM-147/PD.
- 11-6665-230-15 Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual (Including Repair Parts and Special Tools List): Radiac Set AN/PDR-27R.
- 11-6665-232-12 Operator and Organizational Maintenance Manual (Including Repair Parts and Special Tools List): Radiacmeter IM-174A/PD.

A-4. Department of the Army Pamphlets (DA PAM)

- 310-1 Index of Administrative Publications.
- 310-3 Index of Doctrinal, Training, and Organizational Publications.
- 310-4 Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.

A-5. Tables of Organization and Equipment (TOE)

3-97	General Chemical Laboratory.
3-500	Chemical Service Organization.
8-650	Medical Laboratory.
9-520	Explosive Ordnance Disposal Detachments.
30-34	Military Intelligence Company, Technical Intelligence.
30-48	Military Intelligence Company, Technical Intelligence—Production.

A-6. Miscellaneous

CTA 50-914	Individual Safety and Protective Clothing and Equipment.
TB MED 175	The Etiology, Prevention, Diagnosis, and Treatment of Adverse Effects of Heat.
TB SIG 226-8	Chargers, Radiac Detector PP-1578/PD and PP-1578A/PD.
TB 3-4230-207-10	Decontaminating and Reimpregnating Kit, Individual, M13.
TB 3-8030-200-12	Leather Dressing, Vesicant Gas-Resistant, M2.

APPENDIX B

CBR DEFENSE STANDARDS OF PROFICIENCY

Section I. INDIVIDUAL CBR DEFENSE STANDARDS

B-1. General Objectives

The general objectives of these individual CBR defense standards are to—

a. Achieve proficiency in those individual protective measures required to survive chemical, biological, and nuclear attacks and to operate in a chemical, biological, and radiological environment with minimum reduction in combat effectiveness.

b. Participate effectively in operations in which friendly forces employ chemical and nuclear weapons.

B-2. Specific Objectives

Each individual must be able to—

a. Recognize visual, vocal, and sound alarms for chemical, biological, and radiological hazards.

b. Properly put on, seat, clear, and check his protective mask (with hood attached) within 9 seconds and complete the attachment of the hood under the arms within 6 seconds for a total of 15 seconds following a chemical or biological attack alarm.

c. Properly put on chemical protective clothing and equipment and perform an assigned mission while in a mission-oriented protective posture—wearing complete chemical protective clothing

and equipment—during a minimum 1-hour period in moderate temperature.

d. Recognize, by appearance or effects, a chemical hazard; and take protective action.

e. Operate his individual or crew-served weapon effectively while wearing complete chemical protective clothing and equipment.

f. Perform simple decontamination of his person, clothing, personal equipment, and individual weapon and position.

g. Be familiar with proper procedures for relieving himself while dressed in chemical protective clothing in a contaminated area.

h. Perform proper first aid, to include mouth-to-mouth and mask-to-mouth resuscitation, for respiratory failure caused by chemical agents.

i. Recognize all standard NATO markers or signs that indicate chemically, biologically, and radiologically contaminated areas.

j. Cross chemically contaminated areas with minimum danger.

k. Maintain individual chemical protective equipment, including changing the filter elements of the M17-series protective mask.

l. Take proper individual protective measures against a nuclear attack.

Section II. UNIT CBR DEFENSE STANDARDS

B-3. General Objective

The general objective of these unit CBR defense standards is to develop and maintain a capability for performing tasks required to accomplish the mission—

a. While under a chemical or biological attack, and immediately after a nuclear attack, or in

support of a chemical or nuclear attack when made by friendly forces.

b. When operating in a chemical, biological, or radiological environment.

B-4. Specific Objectives

a. The unit must be able to—

(1) Determine a chemical hazard by the use of chemical alarm or detection devices, warn its personnel, and take proper defensive action.

(2) Determine a radiological hazard by the use of radiation detection equipment, warn its personnel, and take proper defensive action.

(3) Cross or function in a chemically contaminated area, decontaminating where necessary.

(4) Cross a radiologically contaminated area with minimum risk.

(5) Determine the chemical hazard from aircraft, warn its personnel, and take proper defensive action against aircraft spray.

(6) Take proper defensive action against chemical attack, activate the local alarm system, and take defensive action as prescribed in the SOP.

(7) Withstand an enemy chemical, biological, or nuclear attack with minimum interference to its assigned mission.

(8) Perform an assigned mission while personnel are in the mission-oriented protective pos-

ture—wearing complete chemical protective clothing and equipment—during a minimum 1-hour period in moderate temperature.

(9) Decontaminate personnel in an improvised personnel decontamination station.

(10) Decontaminate equipment in an improvised equipment decontamination station.

(11) Exploit friendly nuclear and chemical fires.

(12) Predict downwind hazards from a chemical attack, using the chemical hazard prediction system.

b. The unit must—

(1) Follow proper procedures for protection before, during, and following an enemy chemical, biological, or nuclear attack.

(2) Submit NBC 1 and 4 reports of enemy chemical, biological, and nuclear attacks promptly and properly.

(3) Maintain its chemical and radiological detection and decontamination equipment.

APPENDIX C

DECONTAMINATING MATERIALS AND THEIR USES

C-1. M13 Individual Chemical Decontaminating Kit

a. How Used. The M13 kit is used by the individual for limited decontamination of his person, clothing, and equipment.

b. Action. Skin pad (containing fuller's earth) removes liquid chemical contamination from the skin by adsorption. The cloth bags (containing XXCC3) neutralize small droplets and vapors of chemical agents on clothing and equipment by chemical action. A dye capsule in the bag, when crushed and kneaded into the chemical in the bag, indicates liquid chemical agent contamination if a red to brownish-red color develops.

Warning: Do not allow any of the powder from the skin pad or cloth bag to enter the eyes or mouth. Wear protective mask and gloves when using the cloth bag. After decontaminating the hands, wear protective gloves when using the cloth bags for decontaminating clothing and equipment.

C-2. STB Decontaminating Agent (Bleach)

a. How Used. STB can be applied undiluted but should be used either as a dry mix (with earth) or as a wet mix (with water). It should not be left on contaminated surfaces for longer than 24 hours because it corrodes metals.

b. Action. STB neutralizes liquid chemical agents by chemical action. Undiluted bleach in direct contact with liquid blister agents reacts violently and can cause flame and heavy vapor. STB is chemically active, causing vigorous corrosion of metals. Wet mix is effective against biological agents.

Warning: DO NOT USE FOR PERSONNEL DECONTAMINATION. DO NOT MIX WITH DS2 BECAUSE A FIRE MAY RESULT. Wear protective mask and gloves when handling STB.

C-3. DS2 Decontaminating Agent

a. How Used. Ready-to-use solution is available in 1 1/3-quart cans and 5-gallon drums. DS2 can be applied easily with the 1 1/2-quart decontaminating apparatus, a broom, or a swab. One application of DS2 should be made to the contaminated surface and, after 30 minutes, flushed with water. The solution is effective at temperatures from -15° to 125° F.

b. Action. DS2 neutralizes all known chemical agents and most biological agents. It reacts with G-agents, V-agents, and blister agents to reduce their hazards within 30 minutes after application.

Warning: DO NOT USE FOR PERSONNEL DECONTAMINATION. DO NOT MIX WITH STB BECAUSE A FIRE MAY RESULT. Avoid inhalation of vapors or contact of solution with the skin or eyes. Wear protective mask when using DS2. Because DS2 is flammable, the 1 1/2-quart decontaminating apparatus must not be confused with a fire extinguisher.

C-4. BPL Biological Decontaminant

a. How Used. Normally 1 gallon of BPL is required to decontaminate each 25,000 cubic feet (708 cubic meters) of space. BPL can be disseminated as an aerosol from a variety of devices. Recommended disseminators are—

- (1) Sprayer, insecticide, pushcart-mounted, mist-type gasoline-driven, 30 gph.
- (2) Sprayer, insecticide, skid-mounted, fog, gasoline-driven, 40 gph.

b. Action. BPL destroys microorganisms, including bacterial spores.

Warning: DO NOT USE FOR PERSONNEL DECONTAMINATION. BPL is toxic to man. Avoid repeated exposure to subirritating concentrations of BPL vapor. Personnel decontaminating the interior of buildings wear special-purpose mask, protective masks, or self-contained breathing apparatus and protective clothing.

C-5. Washing Soda (Sodium Carbonate)

a. How Used. A solution is made by stirring 2 pounds of washing soda into 2 1/2 gallons of water; it is then applied to contaminated surfaces.

b. Action. It neutralizes most chemical agents and is especially effective against G-agents. It is used as a washing agent against blister agents and irritant agents.

Warning: DO NOT USE FOR PERSONNEL DECONTAMINATION.

C-6. Caustic Soda (Lye)

a. How Used. A 5 percent solution is made by stirring 1 pound of lye into 2 1/2 gallons of water; it is then applied to contaminated surfaces.

b. Action. It neutralizes chemical agents and biological agents. It is especially effective against G-agents. Decontamination is faster with concentrated solutions.

Warning: DO NOT USE FOR PERSONNEL DECONTAMINATION. Both solid and solution damage skin, eyes, and clothing. Caustic soda corrodes metal surfaces, especially aluminum. Personnel handling caustic solutions wear protective masks.

C-7. Fuels and Solvents

a. How Used. Fuel is applied to contaminated surfaces and ignited. Solvent (like gasoline, kerosene, or carbon tetrachloride) is applied with swabs, taking care not to spread contamination.

b. Action. Ignited fuel destroys agents; solvents merely remove them, but sufficient solvents can dilute most dangerous contamination.

Warning: Do not inhale fumes of solvents for prolonged periods. Dangerous vapor concentrations that create a downwind hazard may be set up during burning.

C-8. Water or Steam

a. How Used. Water or steam is applied under high pressure; action of hot water is speeded by using soap or other detergent.

b. Action. It removes dirt or grease containing chemical agents or radioactive material. Hot soapy water destroys G-agents and physically removes other chemical and radiological contamination.

Warning: Water and condensed steam are drained into a sump and properly marked. If necessary to drain into a stream, friendly units downstream must be notified.

C-9. Hot Air

a. How Used. Hot air is used in special situations, such as decontamination of delicate instruments contaminated with liquid agents or decontamination of aircraft cabins by engine heaters.

b. Action. It evaporates liquid chemical contaminants.

Caution: Temperature and air velocities used should be safe for particular equipment involved. Effluent air will be contaminated.

APPENDIX D

CBR ANNEX TO A UNIT SOP: DEFENSE AGAINST CHEMICAL, BIOLOGICAL, AND NUCLEAR ATTACKS

D-1. General

Standing operating procedures (SOP) are published in the form most effective for the command. A unit SOP normally contains a CBR defense annex or a separate CB defense annex and a separate NR defense annex. The examples of a chemical and biological defense annex and a nuclear and radiological defense annex presented here are meant to be guides only and to apply, in general, to a company-size unit operating under the threat of chemical, biological, and radiological conditions. The examples can be combined into a single CBR defense annex to the unit SOP, if desired. However, the examples presented here must be modified, where necessary, to conform to the CBR annex of the parent unit and to the particular conditions under which the unit operates.

D-2. Division CB and NR Annexes to the SOP

The SOP at higher levels of command normally

contain a separate annex for defense against chemical and biological attack and a separate annex for defense against nuclear attack and radiological hazard. For example of a CB annex and an NR annex of an SOP at division level, refer to FM 61-100.

D-3. Unit (Company) CB and NR Annexes to the SOP

Appendix D-I is an example of an annex to a company SOP, Defense Against Chemical and Biological Attacks. Appendix D-II is an example of an annex to a company SOP, Defense Against Nuclear Attack and Radiological Hazard.

D-4. Division Intelligence Annex—CBR EEI

Appendix D-III contains a list of CBR essential elements of information that may be suitable for use in the intelligence annex of the division SOP.

APPENDIX D-I

**EXAMPLE OF A CB ANNEX TO A COMPANY SOP: DEFENSE
AGAINST CHEMICAL AND BIOLOGICAL ATTACKS**

Note. This SOP is intended only as a guide for units in the field. All units modify this example to take into consideration the peculiarities of their unit organization, mission, equipment, and environmental situation.

Company A, 2d Battalion
Fort McClellan, Alabama
1 January _____

Annex A (Defense Against Chemical and Biological Attacks) to SOP No. 3

1. GENERAL

This annex standardizes procedures for defense against chemical and biological attacks and for operations in a contaminated environment.

2. REFERENCES

FM 21-40, FM 21-41, FM 21-60, TM 3-220, TM 3-221, and AR 220-58.

3. ORGANIZATION

a. Subordinate Units. Each platoon leader will appoint a CBR defense NCO and alternates to assist in the conduct of CBR defense training and operations in a contaminated environment.

b. CBR Defense Team. A CBR defense team will be formed to operate under the supervision of the company commander. This team consists of the CBR team chief (CBR defense officer), two CBR defense NCO (one NCO to supervise the chemical detection and radiological survey parties and the other NCO to supervise the decontamination squad), and the personnel described below.

(1) Two chemical detection (and radiological monitoring) parties, one primary and one alternate, will be trained for each chemical agent detector kit and chemical agent alarm (and radiological survey meter) authorized the unit. Chemical reconnaissance personnel will be trained for the detection of contaminated terrain.

(2) A chemical decontamination squad will maintain a capability to perform minimum necessary decontamination of unit equipment and areas.

(3) Support and security personnel, as required.

4. RESPONSIBILITIES

a. Unit Commander. The unit commander is responsible for—

(1) Proficiency of the unit in all phases of chemical and biological (CB) defense.

(2) Designation and control of the unit mission-oriented protective posture (wearing of protective clothing and equipment) for operations in a chemical environment, consistent with the unit mission, temperature, and anticipated work rate.

(3) Insuring that appropriate warnings and alarms are transmitted on the unit voice radio command net immediately on receiving an alarm from the automatic chemical agent alarm system or other sources.

b. Unit CBR Defense Officer. The unit CBR defense officer makes necessary arrangements for personnel to operate any chemical protective and defensive equipment required, such as a collective chemical protection shelter and decontamination station.

c. Platoon Leader. The platoon leader designates personnel to set up the M8 automatic chemical agent alarm when occupying a new position.

d. CBR Defense Team. The unit CBR defense team uses chemical agent detector equipment and the

chemical agent alarm to detect a chemical attack, to reconnoiter terrain to be traversed or occupied by the unit, and to locate contaminated areas and mark their boundaries with designated markers. It decontaminates within its capabilities vital areas and equipment designated by the unit commander.

e. Sentries/Guards. Personnel designated for sentry/guard duty will have the following additional duties:

- (1) Be especially alert to chemical and biological agents and means of delivery.
- (2) Understand the unit's CBR warning system and means of warning.
- (3) Periodically check men sleeping near the assigned post or position to make certain that they are masked.
- (4) Know the location of company and platoon command posts.

f. All Personnel. All personnel must understand the unit system of personnel identification and recognition (para 9 below). All personnel must understand the indications of a chemical or biological attack and sound the alarm, when required.

5. ALARMS AND WARNING SYSTEMS

Company radio/telephone operators will alert the platoons on the company radio/telephone net of a chemical or biological attack, will sound the local alarm (*b* below), and will transmit the appropriate NBC 1 chemical or biological attack report (app II) to the battalion.

a. Unit Chemical and Biological Attack Warning. The chemical alarm and warning system consists of the M8 automatic chemical agent alarm, chemical agent detector kits, and the radio/telephone warning net. Warnings of a chemical or biological attack will be transmitted on the company command net with a FLASH precedence to all units, using brevity code "GAS" for a chemical attack and "MASK" for a biological attack.

b. Local Alarm. The local alarm for a chemical or biological attack is given by the individual after putting on his protective mask (if not already masked according to the mission-oriented protective posture), and then giving the approved hand signals, the vocal alarm, and, if appropriate, the (designated) percussion-type alarm located at (_____). The vocal alarm for a chemical or biological spray attack is "SPRAY," for a chemical attack by any other means is "GAS," and for a biological attack by any other means is "MASK."

6. PROCEDURES

If alerted to a possible chemical or biological attack, units will assume that all artillery and air attacks are chemical attacks (until proved otherwise) and will take appropriate defensive action for a chemical attack. Individuals will mask automatically when under artillery and air attack, when they observe symptoms of chemical agents in personnel, or when they hear the chemical or biological attack alarm.

a. Action Before Chemical Attack. Units alerted to a possible or imminent chemical attack will acknowledge receipt of the alert and insure that—

- (1) Chemical detection and warning systems are operational.
- (2) Individual protective measures and the mission-oriented protective posture are adequately controlled.
- (3) Collective protection shelters, if any, are operational.

b. Action During Chemical Attack. Units will alert all personnel and make sure that they are adhering to the designated mission-oriented protective posture.

c. Action After Chemical Attack.

- (1) If appropriate, unit commander will consider changes in the mission-oriented protective posture.
- (2) Personnel will check their clothing and equipment to determine whether they are contaminated. If contaminated, personnel apply first aid and decontaminate themselves without orders.

They will draw fresh clothing and equipment, as required, from the supply point. Contaminated clothing will be processed at the supply point as directed. Personnel assigned to crew-served weapons and equipment will decontaminate them with STB slurry or DS2, as directed.

(3) Decontaminating personnel will assist in decontaminating areas, vehicles, and equipment designated by the unit commander.

(4) Filter elements of M17-series protective masks will be replaced as required (app VI).

7. DECONTAMINATION

a. Individual. Individuals decontaminate themselves and their equipment, when required, and continue their mission.

b. Crew-served Weapons and Equipment. Crews assigned to the weapons and equipment decontaminate them with STB slurry or DS2 and continue their mission.

c. Units. The unit commander will designate what must be decontaminated and the priority for decontamination.

8. INTELLIGENCE

a. CB Agent Detection and Identification System. All enemy chemical attacks will be reported to battalion with or without the identity of the agent used. If the agent used cannot be detected by the chemical agent detector kit, this information will be included in a subsequent report.

b. Reporting of Chemical and Biological Attacks and Warnings of CB Hazard Areas. See appendix II.

9. IDENTIFICATION OF PERSONNEL

When personnel are wearing chemical protective overgarments and protective mask and hood, the following identification procedures will be used:

a. Each person in a platoon will be issued two lengths of engineer tape (approximately 18 inches) color coded by platoons as follows:

- (1) 1st platoon—purple.
- (2) 2d platoon—scarlet.
- (3) 3d platoon—gold.
- (4) Weapons platoon—blue.

b. Strips will be attached to the web gear, with one placed on the pistol belt center rear and one placed on the harness below the first aid packet.

c. Subdued rank insignia will be worn on all headgear; 3-inch lengths of masking tape, bearing the individual's name, will be attached to the front and rear of the helmet.

d. Squad leaders will wear a color-coded (by platoon) triangle of masking tape above their name tape on helmet; platoon sergeants will wear a color-coded diamond.

JOHN DOE
CPT, Inf
Commanding

APPENDIX I. Roster of Personnel (omitted)

- II. Examples of NBC Reports (omitted) (See app E)
- III. Operation, Safe-Entry, and Exit of Protective Shelters (omitted) (See TM 3-221)
- IV. Operations in a Contaminated Area (omitted) (See para 4-26—4-30)
- V. Individual and Unit Decontamination (omitted) (See para 4-22—4-25, 8-18—8-21)
- VI. Replacement of Filter Elements for the M17-series Masks (omitted) (See para 4-3c).

APPENDIX D-II

EXAMPLE OF AN NR ANNEX TO A COMPANY SOP: DEFENSE
AGAINST NUCLEAR ATTACK AND RADIOLOGICAL HAZARD

Company A, 2d Battalion
Fort McClellan, Alabama
1 January _____

Annex B (Defense Against Nuclear Attack and Radiological Hazard) to SOP No. 3

1. GENERAL

This annex prescribes procedures for defense against nuclear attack and radiological hazard. It provides guidance for—

- a. Procedures to be followed by individuals and units during and following a nuclear attack.
- b. Prediction of fallout from a nuclear burst.
- c. Radiological monitoring and survey.

2. REFERENCES

Annex A, FM 21-40, FM 21-41, FM 3-12, TM 3-210, and AR 220-58.

3. ORGANIZATION

Unit personnel will be used on an additional duty basis. See appendix I for a roster of personnel.

- a. CBR Defense Team. Same as paragraph 3b, Annex A.
- b. Area Damage Control Party. The company will organize, equip, and train an area damage control party consisting of one NCO and six enlisted men for employment on call of the battalion. Equipment will include two 1/4-ton trucks or one 3/4-ton truck, shovels, axes, survey meters, dosimeters, and other items as directed.
- c. Light Rescue, Labor, and Decontamination Squad. The company will organize, equip, and train a light rescue, labor, and decontamination squad consisting of one NCO or specialist and six enlisted men for employment on call of the battalion. Equipment will include two 1/4-ton trucks or one 3/4-ton truck, a pick, two shovels, two axes, two wire cutters, survey meters, and dosimeters, as available.
- d. Emergency Decontamination Squad. The company will organize, equip, and train an emergency decontamination squad consisting of one NCO or specialist and enlisted men as required for employment on call of the battalion. The following equipment and supplies, if not organic, will be furnished as required: shovels, dosimeters and survey meters, personnel monitoring instruments, and such chemical decontaminating equipment and material as required.

4. RESPONSIBILITIES

- a. Unit Commander. The commander is responsible for—
 - (1) Proficiency of the unit in all phases of defense against nuclear attack and radiological hazards.
 - (2) Training and availability of personnel listed in paragraph 3.
 - (3) Actions to minimize exposure to radiological hazards (app III).
- b. CBR Defense Team. This team monitors terrain or surveys radiologically contaminated areas, as directed, and marks the radioactive boundaries with "ATOM" markers.

5. WARNINGS AND ALARMS

Designated personnel will report nuclear attacks and fallout warnings through the command radio/

telephone net, sound the local alarm when appropriate, and transmit NBC 1 and 4 reports (app II) to the battalion S2. The brevity code for fallout is "FALLOUT."

a. Unit Report. Information relative to nuclear burst and fallout will be reported according to appendix II.

b. Local Alarm. The local alarm will be given when fallout is expected in the unit area. The vocal alarm for fallout is "FALLOUT."

6. PROCEDURES IMMEDIATELY FOLLOWING A NUCLEAR ATTACK

Immediately following a nuclear attack, the following actions will be taken automatically, without orders:

a. Individuals and crews will establish contact with immediate superiors.

b. Individuals will take the following actions under fallout conditions consistent with the mission:

(1) Acquire the following protection in the order listed (remain in the shelter until the area has been declared safe or until exit is required for urgent reasons):

(a) Underground shelter.

(b) Foxhole with overhead cover.

(c) Armored vehicles, when shelters in (a) and (b) above are not available and time precludes constructing these shelters.

(d) Buildings of masonry construction in preference to buildings of wood or other construction.

(e) Clothing or shelter halves to cover all exposed skin; and additional cover under shelter halves, blankets, or canvas.

(f) Vehicles with sandbags used to cover floor and sides.

(2) After fallout has stopped, decontaminate themselves, if required, by taking the actions listed below, when practicable:

(a) Brush clothing and equipment thoroughly to remove fallout (this should be done away from the area that the individual will occupy).

(b) Bathe, if possible (preferably by showering), and change clothing.

(c) Decontaminate individual equipment by brushing, wiping, and, as appropriate, scrubbing.

(d) Decontaminate the immediate area where located by turning soil (or hosing, if practicable).

(e) Clean equipment, as required.

(3) Maintain full canteens and sufficient rations for at least a 24-hour stay in the contaminated area.

(4) Wear respirator or handkerchief over nose and mouth if dust hinders breathing.

(5) When practicable, reduce stay time in the contaminated area.

c. Subordinate units will—

(1) Turn on radiac instruments and start continuous monitoring.

(2) Report to next higher headquarters any element out of contact.

(3) Take the following protective measures:

(a) Prepare for early movement.

(b) Displace, as directed to avoid radiological hazard, and continue mission.

(4) Avoid doses in excess of radiation exposure guide in appendix III.

(5) Report information relative to nuclear burst by NBC 1 report (app II).

(6) Report initial time of arrival and dose rate of fallout in the unit area by NBC 4 report (app II).

7. RADIOLOGICAL FALLOUT PREDICTION

The company monitors the battalion net for fallout prediction data. When the company observes a

nuclear burst and before receiving fallout prediction data, the simplified fallout prediction method is used to obtain an estimate of the potential hazard area, provided that ground zero can be approximated. The M4A1 nuclear yield calculator of the M28A1 nuclear calculator set, nuclear burst data, the division effective downwind message, and the M5A1 radiological fallout predictor are used to predict the fallout area.

8. RADIOLOGICAL MONITORING

The company will maintain a monitor at the CP. When appropriate, the monitor will make routine checks of the company area and CP each hour.

a. Continuous monitoring will be initiated—

- (1) On receipt of a fallout warning (NBC 3 report).
- (2) When ordered by the commander.
- (3) After a nuclear burst has been seen or heard.
- (4) When the company is moving.
- (5) When a nuclear strike is reported.
- (6) When radiation above 1 rad/hr is detected by periodic monitoring.

b. During continuous monitoring, all readings will be made in the same location, except when the company is moving or other factors make it impracticable. The following information will be reported to battalion:

- (1) The location, dose rate, and time of the initial dose rate of 1 rad/hr.
- (2) The peak dose rate recorded.

Note. The dose rate, location, and time of an increase or decrease of 10 rad/hr are recorded until the dose rate reaches 50 rad/hr. Any increase or decrease from 50 rad/hr will be reported to the battalion. These dose rates are used for example only. Frequency of readings will depend on the situation, and dose rate criteria will be specified by higher headquarters.

- (3) The correlation factor data for the shelter or vehicle of the monitor.
- (4) Summary report described in paragraph 9c below.

c. Continuous monitoring will stop—

- (1) On instructions from the battalion.
- (2) When the dose rate falls below 1 rad/hr (except for units on the move).

9. REPORTING PROCEDURE

Refer to appendix II for details.

a. The initial detection of 1 rad/hr will be reported to the company with an IMMEDIATE precedence on the company command net. The report will be made in the clear (unless otherwise specified), giving location, dose rate, and time detected. The company will submit an NBC 4 report to battalion with an IMMEDIATE precedence.

b. Subsequent reports will be screened and consolidated by the company. These reports will include the average level of radioactivity in the company area and the location and time of the highest dose rate in the area. Reports will be submitted as the dose rate in the area is rising; at the first indication that the dose rate is beginning to decline; and after that as the battalion directs. These reports will be assigned an IMMEDIATE precedence, consistent with operational requirements for communication facilities.

c. A summary report will be submitted to battalion, when directed. This may consist of an overlay showing the radiation situation in the area as compiled from monitoring reports.

10. RADIOLOGICAL SURVEYS

Radiological surveys will be conducted only on orders of the battalion. Ground survey parties will fol-

low the prescribed course and will report the dose rate, location, and time of reading at points designated. Readings will be taken with the survey meter held approximately 1 meter above the ground (waist high). In open areas, readings will be taken at least 10 meters from buildings or other large structures. In built-up areas, readings will be taken in the center of the street or at intersections. Mounted monitors will determine the shielding correlation factors and include these data in the first survey report. Readings will be recorded on DA Form 1971-R.

JOHN DOE
CPT, Inf
Commanding

- APPENDIX
- I. Roster of Personnel (omitted)
 - II. Examples of NBC Reports (omitted) (See app E)
 - III. Radiological Exposure Data (omitted) (See FM 3-12)
 - IV. Operations in a Contaminated Environment (omitted) (See para 6-6, 11-2, 11-6-11-10)

APPENDIX D-III
LIST OF QUESTIONS SUITABLE FOR THE INTELLIGENCE
ANNEX TO A DIVISION SOP
CBR ESSENTIAL ELEMENTS OF INFORMATION

1. What items of chemical protective equipment have been issued to enemy troops? Is there any difference in issue of items for particular areas? If so, what items for what areas?
2. Are there any new or recent immunizations indicated by prisoners during interrogations?
3. What immunizations have enemy troops received?
4. Are enemy troops equipped with protective masks? Is the individual required to carry the mask on his person? Are there any sectors where the mask is not required? What accessory equipment is issued with the mask?
5. Is protective clothing issued to enemy troops? If so, what type of clothing or articles? If special clothing is issued, is it for any particular area?
6. Have enemy units constructed chemical protective shelters? If so, what type?
7. Are enemy fortifications, individual and collective, provided with overhead cover?
8. Are enemy troops issued any protective footwear or other means to provide protection against liquid chemical agents?
9. Are enemy tanks or armored vehicles provided with protective equipment against chemical attack?
10. Are enemy troops issued chemical protective items, such as atropine or other antidotes for self aid?
11. Are there any areas for which additional or unusual CBR safety precautions have been established?
12. What is the size and composition of enemy CBR specialist troop units? What is their disposition?
13. Have enemy troops been issued any special instructions relative to consumption of food and water or handling of livestock in areas that may be overrun by enemy forces?
14. What training, if any, have enemy troops received in the use of incapacitating agents?
15. What items of chemical detection equipment have been issued to enemy troops? Are the items operated constantly, irregularly, or not at all? Is any difference made in their use in certain areas?
16. What types of radiac instruments are issued to enemy units? What is their range or limit? How are they distributed?
17. How many hours of training with radiac instruments have enemy monitoring and survey personnel received?
18. How many hours of CBR defense training have enemy troops received? How many hours of training are devoted individually to chemical, biological, and radiological operations? Have enemy troops received any special or accelerated training as opposed to what is considered routine?
19. Do enemy units have chemical decontamination materials on hand? If so, what type and in what quantity?
20. Have prisoners observed decontamination stations or installations in enemy area? If so, what is their location and composition?
21. Are enemy troop units issued biological detection and identification devices or sampling kits? If so, what is their type and/or composition?
22. Have prisoners observed any cylinders or containers that might contain bulk chemical agents?
23. Have prisoners observed any aircraft equipped with tanks which might indicate a chemical or biological spray capability?
24. Are prisoners aware of dumps of chemical-filled ammunition, bombs, clusters, or bulk chemical agents?
25. Do enemy artillery, mortar, or rocket units have chemical ammunition on hand?
26. Are prisoners aware of chemical mines being used in minefields?

APPENDIX E

**REPORTING NUCLEAR DETONATIONS, RADIOACTIVE FALLOUT,
AND CHEMICAL AND BIOLOGICAL ATTACKS**

(STANAG 2103)

Note. The North American Air Defense Command uses NORAD Manual 55-19, Vol. 8, NBC Reporting Procedures and Techniques.

Section I. GENERAL

E-1. NBC Reports

The reports of enemy or unidentified nuclear, biological, and chemical (NBC) attacks and the resulting chemical, biological, and radiological (CBR) hazardous areas are made according to the provisions of STANAG 2103. The expected chemical and radiological hazardous area resulting from nuclear and chemical attack by friendly forces is also reported. These reports are:

a. NBC 1. Report used by the observing unit to give initial and subsequent data of an enemy chemical, biological, or nuclear attack.

b. NBC 2. Report used for passing evaluated data of a chemical, biological, or nuclear attack.

c. NBC 3. Report used for immediate warning of expected chemical, biological, and radiological contamination or hazardous area.

d. NBC 4. Report used for radiation dose-rate measurements.

e. NBC 5. Report used to locate the area of chemical, biological, and radiological contamination or hazard.

E-2. Initial Nuclear, Biological, or Chemical Attack

The INITIAL enemy use of nuclear, biological, or chemical weapons is reported to the theater commander through the chain of command by the fastest means with the highest message precedence.

E-3. NBC Information Source

The information source may be a unit under

attack or a unit observing an attack. The NBC information source submits NBC reports through command, intelligence, or artillery communications channels, as appropriate, to the designated headquarters tactical operations center by the fastest means.

a. Nuclear Attack Report. The information source, normally headquarters of field artillery and air defense units, submits—

(1) An *initial* NBC 1 nuclear report to its next higher headquarters, with a FLASH message precedence.

(2) *Subsequent* NBC 1 nuclear reports to its next higher headquarters with an IMMEDIATE message precedence, giving followup data.

b. Chemical and Biological Attack Reports. The information source, normally headquarters of a company or independent platoon, submits—

(1) An *initial* NBC 1 chemical or biological report to its next higher headquarters with a FLASH message precedence. The next higher headquarters forwards the initial NBC 1 chemical or biological report through command channels to the NBC collection center with the same message precedence.

(2) *Subsequent* NBC 1 chemical or biological reports to its next higher headquarters with an IMMEDIATE message precedence, giving followup data. The next higher headquarters forwards subsequent NBC 1 chemical or biological reports through command channels to the NBC collection center with the same message precedence.

E-4. NBC Collection Center

The NBC collection center, normally the CBR element of the tactical operations center at division, consolidates NBC 1 nuclear, biological, or chemical reports of the same attack received from its various information sources and transmits an NBC 1 report to the NBC control center, normally the tactical operations center at field army headquarters. It transmits appropriate NBC 2, 3, 4, and 5 reports to subordinate, adjacent, and higher commands.

E-5. NBC Control Center

The NBC control center, normally the CBR element of the tactical operations center at field army, consolidates and evaluates NBC reports received from subordinate commands and Air Force, Marine Corps, and civilian installations and agencies. It directs reconnaissance and survey efforts; transmits evaluated chemical, biological, and radiological data to subordinate commands and adjacent area commands; and submits appropriate reports to higher headquarters, adjacent commands, and national agencies.

Section II. FORMAT OF REPORTS

(STANAG 2103, Edition No. 3, Abstract)

E-6. Description of Letter Items

- a. *Purpose.* To describe the meaning of the letter items that are used in NBC reports.
- b. *Notes.*

(1) The letter items as shown below are used in appropriate NBC reports.

(2) NATO forces operating in a NATO area use ZULU time *only* for these reports.

<i>Letter</i>	<i>Meaning</i>
	<i>Nuclear reports</i>
A.	Strike serial number (s).
B.	Position of observer (UTM or place).
C.	Direction measured clockwise from grid or magnetic north (state which) of the attack from observer (degrees or mils, state which).
D.	Date/time of detonation (local or ZULU time, state which). If local time is used, give the letter of the local time zone, if known. See FM 101-10-1 for time-zone charts. If the local time is used and the time-zone letter is not known, the word "local" will be transmitted with this item.
E.	Illumination time. (Report only when other data are not available. Report in seconds.)
F.	Location of attack (UTM or place) (actual or estimated, state which).
G.	Means of delivery, if known.
H.	Type of burst—air, surface, or unknown (state which)—including height, if known.
I.	(This letter item is not used for nuclear report.)
J.	Flash-to-bang time (seconds).
K.	Crater present or absent and diameter, if known (meters).
L.	Nuclear burst angular cloud width measured at 5 minutes after the detonation (degrees or mils, state which). (Do not report if data are obtained more than 5 minutes after the detonation.)
M.	Stabilized cloud-top angle and/or cloud-bottom angle (state which) or cloud-top height and/or cloud-bottom height (state which) measured at H + 10 minutes (degrees, mils, meters, or feet—state which).
N.	Estimated yield (KT).
O.	Reference date/time for estimated contours when not H + 1 hour.

<i>Meaning</i>
<i>Chemical or biological reports</i>
Strike serial number (s).
Position of observer (UTM or place).
Direction measured clockwise from grid or magnetic north (state which) of the attack from observer (degrees or mils, state which).
Date/time attack started (local or ZULU time, state which). If local time is used, give the letter of the local time zone, if known. See FM 101-10-1 for time-zone charts. If the local time is used and the time-zone letter is not known, the word "local" will be transmitted with this item.
Time attack ended (local or ZULU, state which).
Area attacked (actual or estimated, state which).
Means of delivery, if known.
Type of agent, if known (chemical or biological). Type of attack (chemical or biological).
Type and number of munitions or aircraft (state which).

Nuclear reports

Chemical or biological reports

- P. For radar purposes only:
 - P.A. UTM coordinates of points to outline external contours of radioactive cloud.
 - P.B. Effective wind direction (direction from which the wind is blowing) in degrees or mils (state which).
- Q. Location of reading (UTM).
- R. Dose rate (rad/hr). The words "initial," "increasing," "peak," or "decreasing" may be added.
- S. Date/time of reading (local or ZULU time, state which).
- T. H + 1 date/time (local or ZULU time, state which).
- U. 1,000 rad/hr contour line coordinates (UTM) (red).
- V. 300 rad/hr contour line coordinates (UTM) (green).
- W. 100 rad/hr contour line coordinates (UTM) (blue).
- X. 30 rad/hr contour line coordinates (UTM) (black).
- Y. Direction measured clockwise from grid north to the left and then to the right radial lines (degrees or mils, state which—4 digits each).
- Z. Effective windspeed (kmph), 3 digits; downwind distance of zone I (km), 3 digits; cloud radius (km), 2 digits. (When effective windspeed is less than 8 kmph, the NBC 3 report will contain only three significant digits, that is, the radial distance of zone I.)

Area of expected contamination (UTM).

Date/time contamination initially detected (local or ZULU time, state which).
 Date/time of latest reconnaissance of contamination in the area (local or ZULU time, state which).

Located area of contamination (UTM) (yellow).

E-7. NBC 1 Reports

a. *Purpose.* Report used by observing unit, giving initial data and subsequent followup data of an enemy nuclear, biological, or chemical attack.

b. *Notes.*

(1) NBC 1 report follows the same format as the SHELLREPS, MORTREPS, and BOMBREPS, which are included in STANAG 2008 dealing with conventional enemy attacks.

(2) The item "Type of Report," and letter

items D, H, and either B and C or F must always be reported; other items are optional.

(3) Users of NBC 1 reports are not confined solely to the use of the letter items shown in the examples; other letter items from paragraph E-6 may be added at the users' discretion.

(4) For examples of NBC 1 chemical report messages, see paragraph E-8.

(5) For examples of NBC 1 nuclear report messages, see FM 3-12.

**LET-
TER**

MEANING

**EXAMPLE
NUCLEAR**

**EXAMPLE
CHEMICAL**

**EXAMPLE
BIOLOGICAL**

LET-TER	MEANING	EXAMPLE NUCLEAR	EXAMPLE CHEMICAL	EXAMPLE BIOLOGICAL
	Precedence*	_____	_____	_____
	Date/time (local or ZULU time, state which)	_____	_____	_____
	Security Classification	_____	_____	_____
	From	_____	_____	_____
	To	_____	_____	_____
	Type of Report	NBC 1 (NUCLEAR)	NBC 1 (CHEMICAL)	NBC 1 (BIOLOGICAL)
A.	Strike serial number (as assigned by reporting unit).	A. 04	A. 02	
B.	Position of observer (UTM or place).	B. LB 196400	B. MARVILLE	

*As appropriate or as per unit SOP.

LET-
TER

MEANING

NUCLEAR

CHEMICAL

BIOLOGICAL

C.	Direction measured clockwise from grid or magnetic north (state which) of the attack from observer (degrees or mils, state which).	C. Grid 060 degrees		
D.	Date/time of detonation or date/time attack started (local or ZULU time, state which).	D. 201405 ZULU	D. 201405 (local)	D. 201405 HOTEL
E.	Illumination time (seconds) or time attack ended (local or ZULU, state which).		E. 201412 (local)	
F.	Location of attack (UTM or place) or area attacked (actual or estimated, state which).		F. LB 205305 estimated	F. LB 2030 actual
G.	Means of delivery, if known.		G. Artillery	G. Aircraft, 100 meters
H.	Type of burst—air, surface, or unknown (state which)—including height, if known; type of agent, if known (chemical or biological); or type of attack (chemical or biological).	H. Surface	H. Airburst, nerve	H. Aerial spray
I.	Type and number of munitions or aircraft (state which).			
J.	Flash-to-bang time (seconds).	J. 60		
K.	Crater present or absent and diameter if known (meters).			
L.	Nuclear burst angular cloud width measured at 5 minutes after the detonation (degrees or mils, state which). (Do not report if data are obtained more than 5 minutes after the detonation.)	L. 280 mils		
M.	Stabilized cloud-top angle and/or cloud bottom angle (state which) or cloud-top height and/or cloud-bottom height (state which) measured at H + 10 minutes (degrees, mils,			

LET- TER	MEANING	NUCLEAR	CHEMICAL	BIOLOGICAL
	meters, or feet—state which).			
S.	Date/time of reading or date/time contamination initially detected (chemical or biological). State whether local or ZULU time.		S. 201500 (local)	
X.	Located area of contamination (UTM).		X. LB 208303 LB 208308 LB 203303 LB 203308	

Note. When the contaminated area is a complete circle, the first coordinate will be repeated as a last coordinate.

E-8. Examples of Initial and Subsequent NBC 1 Chemical Reports

Company A, 2d Battalion of the 1st Brigade, is under artillery chemical attack. The call sign of the 2d Battalion is REDDOG and of the 1st Brigade is VICTOR. Examples of initial and subsequent NBC 1 chemical reports from the company through the brigade are given below. The actual message format follows the unit SOP.

a. Actions by Company A. First, the company alerts its subordinate units on the company net with a FLASH precedence brevity code "GAS."

(1) *Initial NBC 1 chemical report.* The company alerts the 2d Battalion (S3) with an initial NBC 1 report, assigning its own strike serial number as follows:

FLASH
201408 HOTEL
FROM ALFA
TO REDDOG
NBC 1 CHEMICAL
ALFA 02
BRAVO MARVILLE
DELTA 201405 HOTEL
FOXTROT LIMA BRAVO 205305 ESTI-
MATED
GOLF ARTILLERY
HOTEL AIR

The actual message might be transmitted as follows:

FLASH FLASH, REDDOG REDDOG, NBC 1 CHEMICAL, FROM ALFA, 201408 HOTEL, ALFA 02, BRAVO MARVILLE, DELTA 201405 HOTEL, FOXTROT LIMA BRAVO 205305 ESTIMATED, GOLF ARTILLERY, HOTEL AIR, END OF MESSAGE, MORE TO FOLLOW.

(2) *Subsequent NBC 1 chemical reports.*

(a) When the chemical agent used in the chemical attack has been identified, the company submits a *subsequent* NBC 1 report, using the same strike serial number as used in the initial NBC 1 report and giving followup data, as follows:

IMMEDIATE
201418 HOTEL
FROM ALFA
TO REDDOG
NBC 1 CHEMICAL
ALFA 02
ECHO 201412 HOTEL
HOTEL NERVE

(b) If a persistent chemical agent was used in the attack and the contaminated area is located, the company submits another *subsequent* NBC 1 report, giving followup data and using the same strike serial number as was used in the initial NBC 1 report, as follows:

IMMEDIATE
201438 HOTEL
FROM ALFA
TO REDDOG
NBC 1 CHEMICAL
ALFA 02
X-RAY LIMA BRAVO 208303, 208308,
203303, 203308

b. Actions by 2d Battalion. First, the battalion alerts its subordinate, attached, and supporting units on the battalion net with a FLASH precedence brevity code "GAS."

(1) *Initial NBC 1 chemical report.* The battalion submits an initial NBC 1 report to the 1st Brigade, based on the Company A NBC 1 report received (and repeats pertinent parts of the body of the message on the battalion net), assigning its own strike serial number, as follows:

FLASH
 201411 HOTEL
 FROM REDDOG
 TO VICTOR 3
 NBC 1 CHEMICAL
 FROM REDDOG 3
 ALFA 06
 BRAVO MARVILLE
 DELTA 201405 HOTEL
 FOXTROT LIMA BRAVO 205305 ESTI-
 MATED
 GOLF ARTILLERY
 HOTEL AIR

(2) *Subsequent NBC 1 chemical reports.*
 The battalion submits *subsequent* NBC 1 reports to the 1st Brigade, based on the NBC 1 reports received from Company A (and repeats pertinent parts of the body of the message on the battalion net), using the same strike serial number used in its *initial* NBC 1 report.

Note. If more than one company of the battalion submits NBC 1 reports for the same chemical attack, the battalion consolidates the several NBC 1 reports received and submits one NBC 1 report to the 1st Brigade.

c. Actions by the 1st Brigade. First, the brigade alerts its subordinate, attached, and supporting units on the brigade net with a FLASH precedence brevity code "GAS."

(1) *Initial NBC 1 chemical report.* The brigade transmits the 2d Battalion *initial* NBC 1 report to the division TOC (and repeats pertinent parts of the body of the message on the brigade net), assigning its own strike serial number.

(2) *Subsequent NBC 1 chemical reports.* The brigade transmits the 2d Battalion *subsequent* NBC 1 reports to the division TOC (and repeats pertinent parts of the body of the message on the brigade net), using the same strike serial number used in its initial NBC 1 report.

Note. If more than one battalion submits NBC 1 reports for the same chemical attack, the brigade consolidates the several NBC 1 reports received and submits one NBC 1 report to the division TOC.

E-9. NBC 2 Report

a. Purpose. Report used for passing evaluated data of a nuclear, biological, or chemical attack.

b. Notes.

(1) This report is normally based on two or more NBC 1 reports. It includes an attack location and, in the case of a nuclear detonation, an evaluated yield.

(2) When adjacent agencies (for example, Navy and Civil Defense organizations) use a different radiological fallout prediction system, this report may be sent to provide basic data for their fallout computations.

(3) Letter items A, D, F, H, and N may be repeated as often as necessary to produce a summary report.

(4) Users of NBC 2 reports are not confined solely to the use of the letter items shown in the examples; other letter items from paragraph E-6 may be added at the users' discretion.

LET- TER	MEANING	EXAMPLE NUCLEAR	EXAMPLE CHEMICAL AND BIOLOGICAL
	Precedence	_____	_____
	Date/time (local or ZULU time, state which)	_____	_____
	Security Classification	_____	_____
	From	_____	_____
	To	_____	_____
	Type of Report	NBC 2 (NUCLEAR)	NBC 2 (CHEMICAL)
A.	Strike serial number.	A. 24	A. 1
D.	Date/time of detonation or date/time attack started (local or ZULU time, state which).	D. 201405 ZULU	D. 200945 (local)
F.	Location of attack (UTM or place) or area attacked (actual)	F. LB 187486 actual	F. LB 126456 actual

LET- TER	MEANING	EXAMPLE NUCLEAR	EXAMPLE CHEMICAL AND BIOLOGICAL
	or estimated, state which).		
G.	Means of delivery, if known.		
H.	Type of burst—air, surface, or unknown (state which)—including height, if known; type of agent, if known (chemical or biological); or type of attack (chemical or biological).	H. Surface	H. Nerve
N.	Estimated yield (KT).	N. 50	

E-10. NBC 3 Report

a. Purpose. Report used for immediate warning of expected chemical, biological, or radiological contamination or hazardous area.

b. Notes.

(1) When adjacent agencies (for example, Navy and Civil Defense organizations) use a different radiological fallout prediction system, NBC 2 report may be sent to provide basic data for their fallout computations.

(2) Users of NBC 3 reports are not confined solely to the use of the letter items shown in the examples; other letter items from paragraph E-6 may be added at the users' discretion.

(3) When the effective windspeed is less than 8 kmph, the NBC 3 nuclear report will consist of the letter items D, F, and Z. Z will contain three digits only, that is, the radial distance of zone I.

LET- TER	MEANING	EXAMPLE NUCLEAR	EXAMPLE CHEMICAL AND BIOLOGICAL
	Precedence	_____	_____
	Date/time (local or ZULU time, state which)	_____	_____
	Security Classification	_____	_____
	From	_____	_____
	To	_____	_____
	Type of Report	NBC 3 (NUCLEAR)	NBC 3 (CHEMICAL/BIOLOGICAL)
D.	Date/time of detonation or date/time attack started (local or ZULU time, state which).	D. 201405 ZULU	D. 201415 (local)
F.	Location of attack (UTM or place) or area attacked (actual or estimated, state which).	F. LB 187486 actual	F. LB 206300 actual
P.	Area of expected contamination (UTM).		P. LB 208320 LB 210320 LB 206310 LB 204310
Y.	Direction measured clockwise from grid north to the left and then to the right radial lines	Y. 0272-0312 degrees	

<i>LET- TER</i>	<i>MEANING</i>	<i>EXAMPLE NUCLEAR</i>	<i>EXAMPLE CHEMICAL AND BIOLOGICAL</i>
Z.	(degrees or mils, state which—4 digits each). Effective windspeed (kmph), 3 digits; downwind distance of zone I (km), 3 digits; cloud radius (km), 2 digits. (When effective windspeed is less than 8 kmph, use three digits only for radial distance of zone I.)	Z. 019-025-05	

E-11. NBC 4 Report

a. Purpose. Report used for radiation dose-rate measurements.

b. Notes.

(1) Letter items Q, R, and S may be repeated as often as necessary.

(2) Radiation dose rates are measured in

the open, 1 meter above the ground. Other conditions will be specified in the message.

(3) Users of NBC 4 reports are not confined solely to the use of the letter items shown in the examples; other letter items from paragraph E-6 may be added at the users' discretion.

(4) For example of an NBC 4 radiation dose-rate message, see paragraph E-12.

<i>LET- TER</i>	<i>MEANING</i>	<i>EXAMPLE</i>
	Precedence Date/time (local or ZULU time, state which) Security Classification From To Type of Report	_____ _____ _____ _____ _____ NBC 4 (NUCLEAR)
Q.	Location of reading (UTM).	Q. LB 123987
R.	Dose rate (rad/hr). (This is NOT normalized to H + 1 hour.) The words "initial," "increasing," "peak," or "decreasing" may be added.	R. 35 INITIAL
S.	Date/time of reading (local or ZULU, state which).	S. 201735 (local)
		Q. LB 129965
		R. 60
		S. 201650 (local)
		Q. LB 146808
		R. 27 INCREASING
		S. 201710 (local)

E-12. Example of an NBC 4 Report Message

Company A, 2d Battalion of the 1st Brigade, is transmitting radiation dose-rate measurements described in the example, paragraph E-11. The call sign of the 2d Battalion is REDDOG. The local time zone is HOTEL. An example of the first NBC 4 radiation dose-rate message is given below.

REDDOG 3 REDDOG 3
IMMEDIATE NBC 4
FROM ALFA
201745 HOTEL
QUEBEC LIMA BRAVO 123987
ROMEO 35 INITIAL
SIERRA 201735 HOTEL

E-13. NBC 5 Report

a. Purpose. Report used to locate the area of chemical, biological, or radiological contamination or hazard.

b. Notes.

(1) The report is best sent as a trace or overlay if time and distance permit.

(2) When the contamination arises from a single enemy or unidentified nuclear burst, the dose rate always refers to H + 1 hour, and the letter item T is used. When there have been several nuclear detonations at different times or on different days and no single H + 1 hour is possible, the dose rates are reported as at a specified time, using letter item O. Letter items O and T are, therefore, alternative and cannot both be used in the same report.

(3) It is not necessary or even desirable to report all four of the contours of different dose rates. Four are given to provide flexibility. (In the example only two are reported.)

(4) When a contour closes to form a complete ring, the first coordinate is repeated at the end (see example for 300 rad/hr).

(5) Colors for plotting, and when sending the report as a trace, are as follows:

Red for 1,000 rad/hr.

Green for 300 rad/hr.

Blue for 100 rad/hr.

Black for 30 rad/hr.

Yellow for chemical and biological contamination or hazardous area.

(6) Contour lines are to be annotated with the dose rates.

(7) When requested, decay rates are to be transmitted according to letter item R.

(8) Users of NBC 5 are not confined solely to the use of the letter items shown in the examples; other letter items from paragraph E-6 may be added at the users' discretion.

LET- TER	MEANING	EXAMPLE NUCLEAR	EXAMPLE CHEMICAL AND BIOLOGICAL
	Precedence Date/time (local or ZULU time, state which) Security Classification From To Type of Report	_____ _____ _____ _____ NBC 5 (NUCLEAR)	_____ _____ _____ _____ NBC 5 (CHEMICAL/BIOLOGICAL)
A.	Strike serial number(s) causing contamination (if known).	A. 24	A. 1
O.	Reference date/time for estimated contours (see note (2) above) when not H + 1 hour.		
S.	Date/time contamination initially detected (chemical or biological) (local or ZULU time, state which).		S. 200800 (local)
T.	H + 1 date/time or date/ time of latest reconnais- sance of contamination in the area (chemical or biological). State whether local or ZULU time.	T. 201505 ZULU	T. 201045 (local)
U.	1,000 rad/hr contour line coordinates.		

**LET-
TER** **MEANING**

V. 300 rad/hr contour line
coordinates.

W. 100 rad/hr contour line
coordinates.

X. 30 rad/hr contour line
coordinates, or located
area of contamination
(chemical or biological).

**EXAMPLE
NUCLEAR**

V. ND 651455
 ND 810510
 ND 821459
 ND 651455

W. ND 604718
 ND 991686
 ND 114420
 ND 595007

**EXAMPLE
CHEMICAL AND BIOLOGICAL**

X. CHEMICAL
 ND 206991
 ND 201575
 ND 200787
 ND 206991

APPENDIX F
MARKERS FOR CONTAMINATED OR DANGEROUS LAND AREAS
(STANAG 2002)

Section I. DESCRIPTIONS OF MARKERS (SIGNS)

F-1. General

This appendix discusses markers or signs that are used in areas containing chemical, biological, and radiological contamination; chemical minefields; boobytraps; and unexploded munitions. The signs are in the shape of right-angled isosceles triangles and are made of plastic, metal, wood, or other rigid material, with holes or "ears" that are used for hanging them above the ground. They are placed on wire-boundary fences, poles, trees, or rocks. The coloring and markings of the signs are in consonance with STANAG 2002 (Edition No. 4) and are illustrated in figure F-1. The signs may be mass-produced by major commands for distribution to subordinate units or may be made locally.

F-2. Chemical Contamination Marker

The triangle is yellow on both sides. The word "GAS" in red 2-inch block letters is placed on the side of the marker facing away from the contamination (front). Fluorescent paint is used, if available. The name of the agent, if known, and the date and time of detection are also placed on the front of the marker.

F-3. Biological Contamination Marker

The triangle is blue on both sides. The letters "BIO" in red (fluorescent paint, if available) 2-inch 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.

F-4. Radiological Contamination Marker

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

F-5. Chemical Minefield Marker

The triangle is red on both sides. On the side facing away from the minefield (front) appear the words "GAS MINES" in yellow 1-inch block letters (fluorescent paint, if available) with a horizontal yellow 1-inch 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. For boobytrapped chemical minefields, the boobytrap marker (para F-6) will be alternated with the chemical minefield marker on the side of the minefield facing friendly forces.

F-6. Boobytrap Marker

The triangle is red on both sides. On the side facing away from the boobytrapped minefield or dangerous area (front), a horizontal white 1 3/4-inch stripe is painted.

F-7. Unexploded Munition Marker

The triangle is red on both sides. On the side facing away from the dangerous area (front), a white bomb is painted. The bomb symbol should be at least 4 inches long.

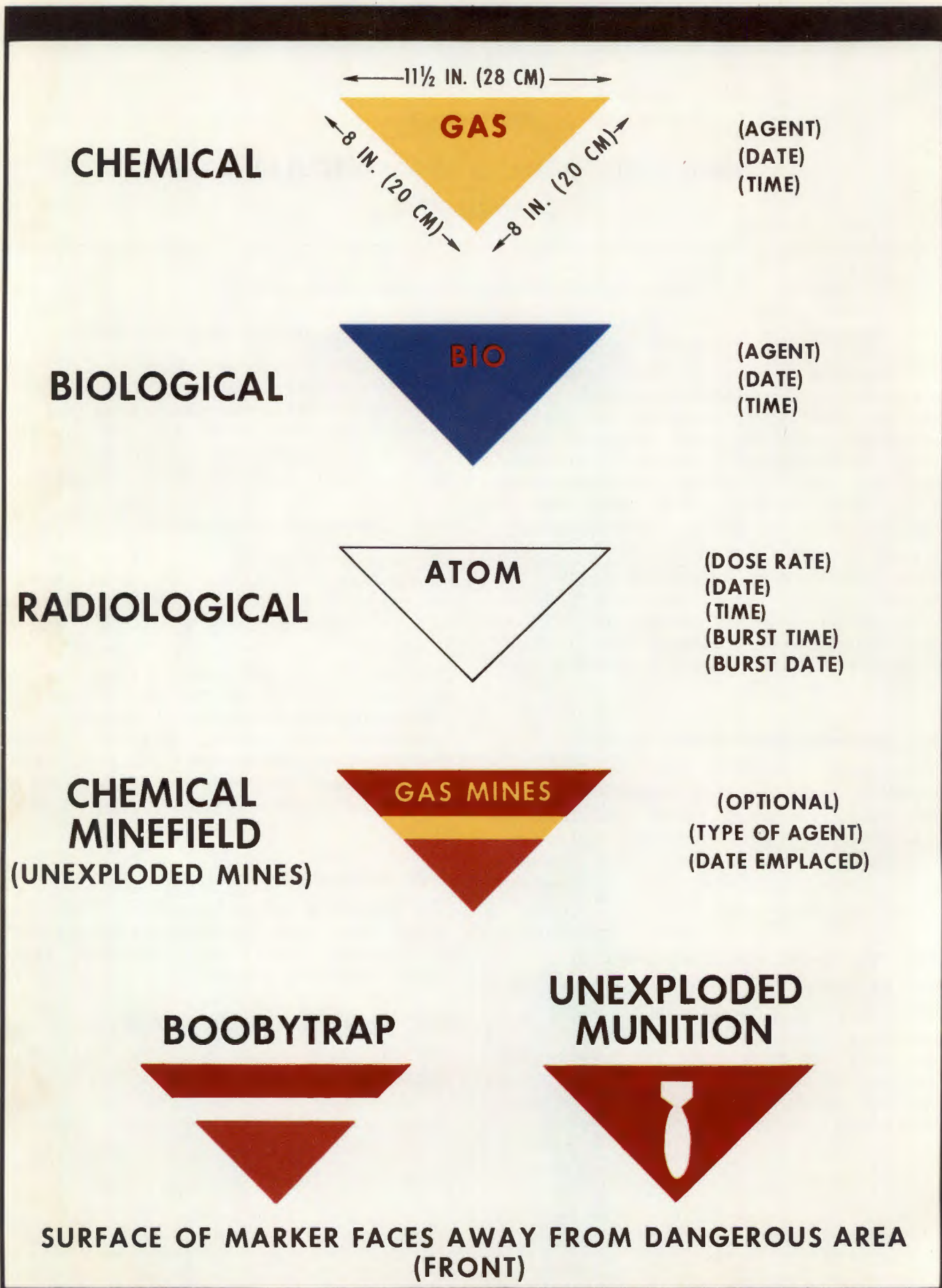


Figure F-1. Markers for contaminated or dangerous land areas.

Section II. MARKING OF CONTAMINATED OR DANGEROUS LAND AREAS

(STANAG 2002, Edition No. 4, Abstract)

F-8. General

The marking of chemically, biologically, and radiologically contaminated areas, chemical minefields, boobytraps, and unexploded munitions are covered in the following paragraphs. These areas will be marked by the triangular signs described in paragraphs F-1 through F-7, unless the area is to be abandoned to the enemy.

F-9. Color of Signs

The nature of the contamination or danger of the

considered area is to be indicated by the colors of the signs. These include—

- a. The primary color, used for the background of the front surface and for the entire back surface of the sign.
- b. A secondary color, used for additional markings and/or inscriptions on the front surface.
- c. The primary and secondary colors as indicated below. (Fluorescent red and yellow paint should be used whenever available.)

DANGER	PRIMARY COLOR	SECONDARY COLORS	
		MARKINGS	INSCRIPTIONS
Radiological contamination	WHITE	NONE	BLACK
Biological contamination	BLUE	NONE	RED
Chemical contamination	YELLOW	NONE	RED
Chemical minefields	RED	YELLOW (STRIPE)	YELLOW
Boobytrapped areas	RED	WHITE (STRIPE)	NONE
Unexploded munitions	RED	WHITE (BOMB)	NONE

F-10. Chemical, Biological, and Radiological Contamination, Chemical Minefields, Boobytraps, and Unexploded Munitions

In the case of danger due to chemical, biological, and radiological contamination and chemical minefields, the primary color and the pattern of the signs by themselves will be the principal means of recognizing the type of contamination or the type of danger. As a safeguard, the words "GAS" (for chemical), "BIO" (for biological), and "ATOM" (for radiological) will be painted or written with the secondary color on the front to indicate the type of contamination. For chemical minefields, the words "GAS MINES" and the stripe underneath the lettering will be painted in yellow to indicate the type of danger. In the case of danger due to boobytraps and unexploded munitions, the following markers will be used: boobytrap marker, a red background with white horizontal stripe; and the unexploded munition marker, a red background with white bomb. The inscriptions will be written parallel to the longer side of the sign.

F-11. Inscription on Signs

In addition, all known details of chemical, biological, and radiological contaminations will be written on the front of each sign. For biological contamination and for persistent or moderately persistent chemical agents, the name of the agent used and the date and time of detection are required. In cases of radiological contamination, the following information will be inscribed on each sign:

- a. Dose rate.
- b. Date and time of reading.
- c. Date and time of the detonation that produced the contamination.

F-12. Multiple Hazards

Areas that contain more than one type of contamination or other hazard will be marked with the relevant signs placed near each other.

F-13. Marking of Simulated Contaminated Areas

Simulated contaminated areas are marked the same as real ones.

F-14. Special Radiological Marking Procedures

The marking of radiologically contaminated areas merely indicates a hazard, the extent of which must be determined by newly arrived troops by means of instrument readings, surveys, and information from other units.

a. At the discretion of the commander, a radiologically contaminated area need not be marked when a military advantage would be obtained by not doing so. In this case positive measures will be taken to warn other friendly forces of the radiologically contaminated area.

b. Signs are placed on all probable routes leading into contaminated areas at the points where the dose rate reaches 1 rad per hour measured at 1 meter above the ground. When the dose rate is above 1 rad per hour, signs showing the actual dose rate are placed on all probable routes leading into the contaminated area at the boundary.

c. Lower levels normally are not marked even though significant doses might be produced by long stays in areas of old contamination. Units planning prolonged stays in any area during a nuclear war check the area with radiac instruments regardless of whether or not it is marked.

d. Signs are corrected or moved periodically to account for radioactive decay.

e. Commanders leaving an area or otherwise giving up responsibility for an area leave perimeter signs in place. The command taking over responsibility for the area will continue the periodic correction or movement of the signs or remove them when they are no longer necessary.

f. Dumps for radiologically contaminated material are marked at intervals around the perim-

eter with signs that are visible from one to another.

F-15. Size, Shape, and Composition of Signs

Existing stocks of colored triangular signs of slightly divergent shapes and sizes will be used until stocks are exhausted.

a. The triangle will be a right-angled isosceles triangle (90° by 45° by 45°). Holes or "ears" are placed near the 45° angles.

b. The base of the triangle will be approximately 11 1/2 inches (28 cm) and the opposite sides will be approximately 8 inches (20 cm). These dimensions may be varied to suit local material.

c. Triangles will be made of metal, wood, plastic, composition board, or any other adequate material available.

F-16. Placing of Signs

Signs will be placed above the ground, right-angled apex downward, on wire-boundary fences, trees, rocks, or poles, or by putting the apex into the ground. This latter method should not be used if the other methods can be adopted, as the signs might well be obscured by grass and other undergrowth. Further, they can be readily knocked down. The front side of the signs is to be posted facing away from the area being marked. In those cases where signs are posted within a contaminated area, the sign will face away from the area of higher dose rate, or higher concentration, if this can be determined.

F-17. Night Signing

No standardization for lighting of signs is specified. Each army will provide lighting or reflecting devices where deemed necessary.

APPENDIX G

**EMERGENCY WARNINGS FOR CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL
HAZARDS OR ATTACKS**

(STANAG 2047)

Section I. INTRODUCTION

G-1. General

Emergency warnings and alarms of chemical, biological, and radiological hazards resulting from actions by enemy forces are made according to STANAG 2047. In those instances where no standard local alarm has been agreed upon, each army prescribes its own local emergency alarm.

Note. STANAG 2047 is under revision by NATO. The latest draft eliminates standardized local vocal alarms and recommends that each nation establish its own vocal alarms. The U.S. proposal included vocal alarms of "SPRAY" for a chemical or biological spray attack, "MASK" for a chemical or biological attack by any other means, and "FALLOUT" for a radiological fallout hazard.

G-2. Types of Warnings and Alarms

If chemical, biological, or radiological hazards result from enemy actions, the following two types of alarms or warnings may be given:

a. General Warning. The general warning is given by major commands when the chemical, biological, or radiological hazard is expected to involve large areas. The warning will be sent by normal communications to the headquarters of commands that may be affected.

b. Local Alarm. The local alarm is given in all cases when the presence of chemical or biological agents or radioactive material is detected or suspected. The vocal alarm is considered the most effective means of informing troops of an emergency chemical, biological, or radiological hazard. The alarm of a chemical or biological hazard can also be given by certain visual signals. In addition, the alarm can be given by the use of any device that produces a sound not easily confused with other sounds encountered in combat.

Section II. EMERGENCY WARNINGS OF HAZARD OR ATTACK

(STANAG 2047, Edition No. 2, Abstract)

G-3. General

When operating on land, military units use the signals and sounds described in STANAG 2047 to give emergency warnings of chemical, biological, and radiological hazards. These hazards include radioactive matter and chemical or biological agents in the vicinity of friendly troops.

a. Principles. The emergency warnings or alarms prescribed in this STANAG are—

(1) Designed for use in combat units and in installations, depots, and headquarters of various commands.

(2) Suitable for use in both forward and rear areas.

(3) Given in all cases as soon as an attack or a hazard is detected. The alarm is given by means that cannot easily be confused with other signals or sounds encountered in combat.

(4) Generally limited in range and are repeated swiftly throughout the unit area by all who hear or see the original alarm.

(5) Normally supplemented by vocal alarms over radio and telephones.

b. Visual Signals. Visual signals are included in this STANAG to replace the sound alarms

under conditions when sound alarms may be lost because of battlefield noises or when the situation does not permit the use of sound signals.

G-4. Signals for Emergency Warnings of Attack or Hazard

The following signals are used to give emergency warnings of chemical, biological, or radiological hazards and the "all clear":

a. Visual Signals. The visual signal for chemical or biological hazard consists of putting on the protective mask, extending both arms horizontally sideways with fists doubled facing up and rapidly moving the fists to the head and back to the horizontal position, repeating as necessary (FM 21-60).

b. Vocal Signals. The vocal signal for a chemical and biological spray attack is "SPRAY" and for a chemical attack by any other means is "GAS," after putting on the protective mask (if not already masked).

c. Sound Signals. The following sound signals may also be used as an emergency warning for a chemical, biological, and radiological hazard if automatic-type alarms are not in use:

(1) By percussion—rapid and continuous beating on any object that produces a loud noise, such as bells, metal triangles, or empty shell cases.

(2) With horns and sirens—a horn signal of three short blasts, followed by 2 seconds of silence with the signal to be repeated for 1 minute; a siren signal of three long warbling sounds, each separated by a silence.

d. All Clear. The "all clear" signal—used to indicate that the danger for which an alarm has previously been given no longer exists—will normally be given *orally*. When circumstances permit, the following sound signals may be used: A continuous sustained blast for 1 minute on a vehicle horn, siren, or similar instrument.

APPENDIX H

PREDICTION OF CHEMICAL AND BIOLOGICAL HAZARD AREAS FROM AN ENEMY ATTACK

Note. STANAG 2103 is under revision by NATO to include the addition of an annex that will describe NATO-approved methods for predicting hazard areas resulting from an enemy chemical or biological attack. The United States proposals are described in sections II and III of this appendix.

Section I. INTRODUCTION

H-1. General

A method of predicting downwind chemical and biological hazard areas from an enemy attack is needed so that the hazard can be promptly evaluated and downwind units in the hazard area can be promptly warned. This involves estimation of the extent and duration of the hazard area and includes the issuance of timely warning to units in the area and consideration of the impact of the hazard on operations and planning. The basic methods described in this appendix can be used by any unit and at any level of command.

H-2. Reliability

Predictions of hazard areas are approximations because the input data used are approximations, based on *initial* NBC 1 reports that provide fragmentary data. Therefore, this method cannot take into consideration the type of chemical agent used in the attack, the number of munitions employed, and the impact area covered by the munitions, all of which are needed for accurate predictions. In addition, the equation used is safe-sided for troop safety purposes. Nevertheless, the method provides estimations of probable downwind areas that *could* become hazardous and in which units must be alerted.

Section II. PREDICTION OF HAZARD AREA FROM AN ENEMY CHEMICAL ATTACK

H-3. Basic Method

The basic method described below involves the use of a transparent map overlay. However, a pliable transparent predictor can be constructed to scale (para H-4) which, when used, eliminates steps *a* through *e* below.

a. On an overlay, select the point designated in the NBC 1 report as the *approximate* center of the area attacked with chemical agent.

b. Draw a line from this point in the actual or predicted direction of the wind. Whenever possible, the latest wind direction data should be used.

c. Draw a semicircle with a 500- or 1,000-meter radius, as appropriate, around the selected point.

(1) The 500-meter radius is used for an enemy artillery, mortar, or rocket attack.

(2) The 1,000-meter radius is used for an enemy aircraft or missile attack.

d. Draw two short lines tangent to the circumference of the semicircle, parallel to and in the direction of the wind.

e. Draw two radial lines tangent to the circumference of the semicircle and at an angle of 20 degrees from the short lines that are parallel to the wind direction. Extend these lines to a scaled length of about 30 kilometers.

f. Determine the predicted temperature gradient and windspeed.

g. Convert the temperature gradient to a number representing the total number of hours that

the chemical cloud can travel downwind by using the following guidance: for temperature gradient of lapse, 1 hour; for neutral, 2 hours; for inversion, a maximum of 10 hours.

h. Predict the downwind hazard distance of the chemical cloud by multiplying the surface windspeed in kilometers per hour (kmph) by the total number of hours that the cloud can travel.

i. Draw an arc on the overlay using the attack location point as center, with a radius equal to the downwind hazard distance as determined by *h* above; the arc should intersect the radial lines described in *e* above.

j. Select four coordinates representing the envelope of the chemical hazard area.

k. Disseminate this information to subordinate and adjacent units in an NBC 3 report with a FLASH precedence.

l. If the wind direction should change significantly during inversion temperature gradient, a corrected prediction should be transmitted to the units affected.

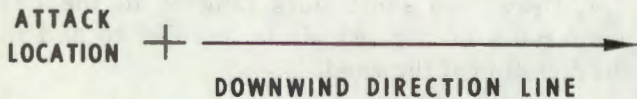
H-4. Construction of a Chemical Hazard Predictor

A chemical hazard predictor can be constructed from any transparent, pliable material to any desired map scale as follows:

a. Step 1. Draw a line on the material from the point selected as the attack location. This line represents the downwind direction (⊙, fig H-1).

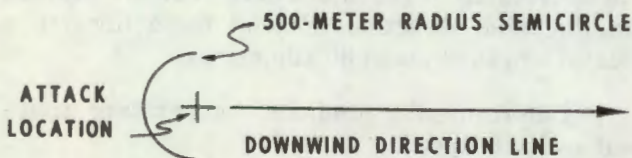
b. Step 2. Draw a semicircle with a 500-meter radius upwind of the attack location point (⊙, fig H-1).

c. Step 3. Draw short lines tangent to the



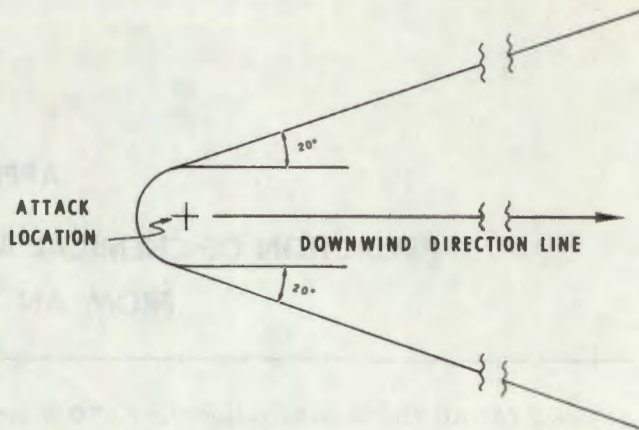
⊙

Figure H-1. Construction of chemical hazard predictor.



⊙

Figure H-1—Continued.



⊙

Figure H-1—Continued.

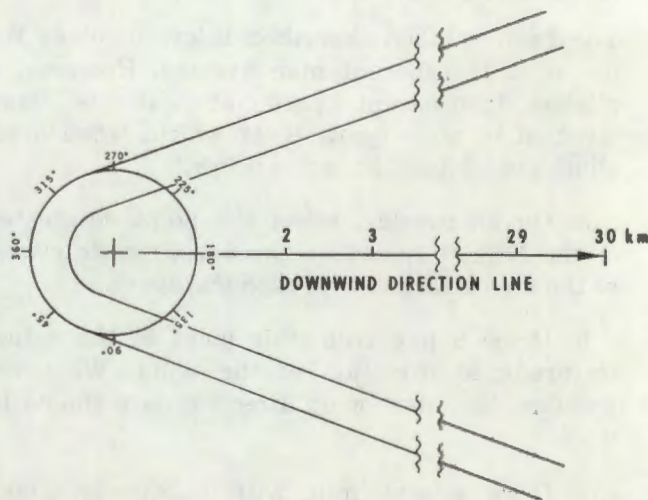
circumference of the semicircle and parallel to the downwind direction line. Rotate each tangent line outward 20 degrees and extend these radial lines to a scaled length of about 30 kilometers (⊙, fig H-1).

d. Step 4. Using the selected map scale, graduate the downwind direction line in kilometers (⊙, fig H-1).

e. Step 5. Draw a 1,000-meter radius circle around the attack location point. Repeat step 3. Graduate the circumference of this circle in degrees or mils to expedite orienting the predictor (⊙, fig H-1).

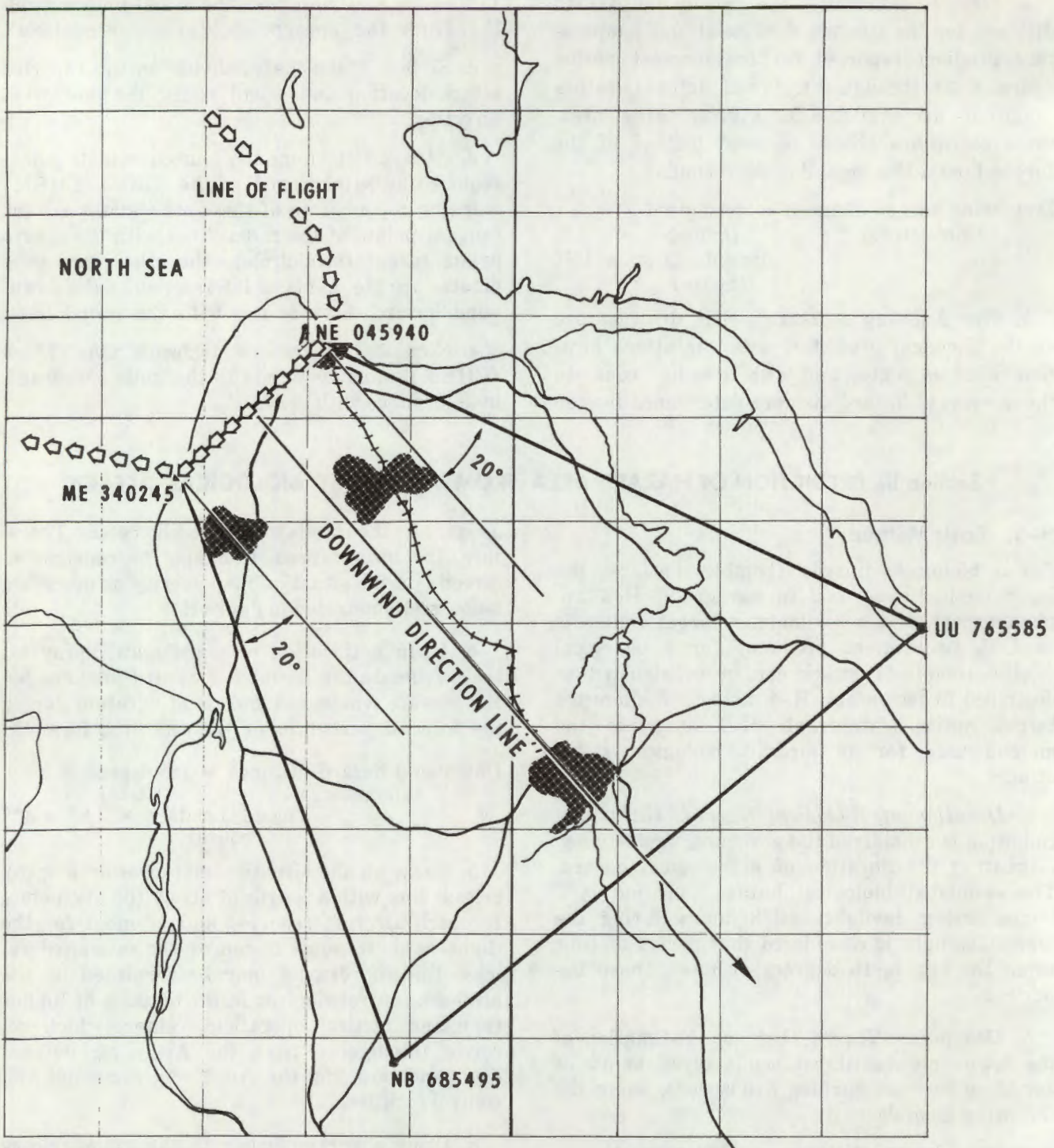
H-5. Using the Chemical Hazard Predictor

Upon notification of a chemical attack by means of an NBC 1 report giving the coordinates of the approximate center of the target area, the chemical hazard predictor is used as follows:



⊙

Figure H-1—Continued.



Not to scale

Figure H-2. Biological hazard prediction for a spray attack.

d. At both ends of the spray release line, draw exterior lines at an angle of 20° from the short lines (c above) and downwind to the estimated downwind hazard distance (a above).

e. Erect a perpendicular to the line representing the downwind direction (c above), so that it

intersects the exterior lines at NB 685495 and UU 765585.

f. Determine the four coordinate points required by letter item P of the NBC 3 (BIO) report (NE 045940, ME 340245, NB 685495, and UU 765585).

g. Disseminate this information to subordinate and adjacent units in an NBC 3 report with a FLASH precedence. If the direction changes sig-

nificantly during inversion temperature gradient, a corrected prediction should be transmitted to the units affected.

INDEX

	Paragraph	Page		Paragraph	Page
Agents. (<i>See</i> Biological agents and Chemical agents.)					
Air spray attack, protection against	4-9c	4-11			
Alarm:					
Chemical agent	7-3, 8-15	7-2, 8-9			
General	7-4	7-3			
Local	4-9b, 5-6, 6-4b	4-10, 5-2, 6-2			
STANAG	App G	G-1			
Alpha particles	2-28d	2-13			
Amyl nitrite ampul (fig 4-5)	4-6c	4-7			
Army:					
CBR agent/material detection organization	14-1— 14-7	14-1— 14-5			
CBR defense organization	13-4, 13-5	13-1			
CBR defense responsibilities (fig 14-2)	12-1—12-4	12-1, 12-2			
NBC attack warning system	14-8— 14-13	14-5— 14-8			
Atropine injector (fig 4-5)	4-6b	4-7			
Battalion:					
CBR agent/material detection organization	14-2	14-1			
CBR defense organization	13-2	13-1			
CBR defense responsibilities	14-1, 14-10, 14-22	14-1, 14-7, 14-11			
Chemical agent detection (fig 8-2)	8-15	8-9			
NBC attack reports	14-10	14-7			
Radiation status reports	14-32	14-15			
Beta particles	2-28e	2-13			
Biological agents:					
Aerosols	2-21a	2-8			
Casualties	2-18, 9-6	2-7, 9-2			
Characteristics	2-17	2-7			
Decontamination	5-7, app C	5-2, C-1			
Detection	5-5, 7-3b(2)	5-2, 7-2			
Dissemination methods	2-21	2-8			
Effects	2-18	2-7			
Enemy threat	2-16	2-7			
Identification	14-7	14-5			
Infection factors	2-19	2-8			
Protection against (table 5-1)	5-2	5-1			
Sampling	14-4b	14-4			
Vectors	2-21b	2-9			
Weapons	2-22	2-9			
Biological attack:					
Alarms	5-6, 9-3, app G	5-2, 9-1 G-1			
Decontamination	9-5	9-2			
Defense measures (table 5-1)	5-1	5-1			
Detection	5-5	5-2			
Downwind hazard	App H	H-1			
Reporting	App E	E-1			
Techniques	2-22	2-9			
Biological defense:					
Commander and staff	12-1	12-1			
Individual	5-1—5-7	5-1—5-2			
Unit	9-1—9-7	9-1, 9-2			
Biological threat	2-16— 2-24	2-7— 2-10			
Blast, nuclear	2-25—2-27	2-11			
Bleach	4-23c, app C	4-14, C-1			
Blister agents:					
Characteristics (fig 2-1)	2-8	2-4			
Decontamination	4-16a, 4-22— 4-25, 8-19, app C	4-13, 4-14, 4-15, 8-14, C-1			
Detection (fig 2-1)	3-4	3-1			
First aid	4-16a	4-13			
Physiological effects	2-8	2-4			
Blood agents:					
Characteristics (fig 2-1)	2-9	2-5			
Detection (fig 2-1)	3-4	3-1			
First aid	4-17a	4-13			
Physiological effects	2-9	2-5			
Boots, combat:					
Decontamination	4-24c	4-15			
Leather dressing, M2	4-6a	4-7			
Brigade:					
CBR agent/material sampling	14-3	14-3			
CBR defense responsibilities	13-3, 13-4, 14-11	13-1, 14-7			
“Buddy” system	4-29a	4-17			
Casualties:					
Biological	2-18, 9-6	2-7, 9-2			
Chemical	2-6—2-13	2-2—2-5			
Nuclear	2-25, 6-1	2-11, 6-1			
Radiological (table 2-1)	6-7, 11-1a	6-3, 11-1			
CBR agent/material:					
Detection and identification system (fig 14-1)	14-1— 14-7	14-1— 14-5			
Sampling and analysis team	14-4	14-3			
Sampling and analyzing kit, M19	14-4	14-3			
Sampling kit, M34	13-4	13-1			
CBR center	2-3c, 13-5a(4)	2-2, 13-2			

	Paragraph	Page	Paragraph	Page
CBR defense:			14-19—	14-11
Definition	1-5a	1-2	14-22	
Doctrine	2-2	2-1	Downwind hazard	App H H-1
Organization	2-3	2-1	Enemy techniques	2-15 2-5
Planning	2-5	2-2	First aid	4-13— 4-12—
Responsibilities:			4-21	4-14
Command and staff	12-1—12-4	12-1, 12-2	Masking	4-10 4-11
General	2-4	2-2	Protection against	8-1—8-12 8-1—8-6
Individual	3-1—3-4	3-1	Reports	7-4, 7-3,
Unit	7-1—7-6	7-1—7-3	14-8—	14-5—
Standards of proficiency	App B	B-1	14-13,	14-8,
Team	7-2	7-1	app E	E-1
CBR element	2-3c,	2-2,	Unidentified chemical agents	4-14, 4-12,
	13-5a(4),	13-2,	14-4a,	14-4
	14-30,	14-14,	14-6	
	14-33	14-15	Unmasking	4-12 4-11
CBR threat	2-1	2-1	Chemical defense:	
Chemical agent alarm	7-3, 8-15	7-2, 8-9	Commander and staff	12-1, 12-1,
Chemical agent detector kits:			14-22	14-11
M15A2A	8-16	8-11	Individual	4-1—4-30 4-1—4-17
M18A2	13-2	13-1	Unit	8-1—8-21 8-1—8-15
Chemical agents:			Chemical detection (reconnais-	
Blister agents. (See Blister			sance) team	7-2a, 8-3 7-1, 8-2
agents.)			Chemical laboratory. (See General	
Blood agents. (See Blood			chemical laboratory.)	
agents.)			Chemical NCO	2-3a 2-1
Characteristics (fig 2-1)	2-6—2-13	2-2—2-5	Chemical officer	2-3a, 2-1,
Choking agents. (See Choking			13-2—	13-1
agents.)			13-4	
Decontamination:			Chemical threat	2-6—2-11 2-2
Individual	4-13,	4-12,	Choking agents:	
	4-22—	4-14,	Characteristics (fig 2-1)	2-10 2-5
	4-25	4-15	Detection (fig 2-1)	2-10 2-5
Support	14-19—14-22	14-11	First aid	4-18a 4-14
Unit	8-18—8-21	8-14, 8-15	Physiological effects	2-10 2-5
Detection (fig 2-1)	2-6,	2-2,	Clothing:	
	4-5b(2),	4-7,	Contaminated	4-2b, 4-24b 4-3, 4-15
	7-3,	7-2,	Decontamination. (See	
	8-15—	8-9—	Decontamination.)	
	8-17	8-12	Protective. (See Protective	
Detector paper	4-6d	4-7	clothing.)	
Dissemination methods	2-14	2-5	Collection center, NBC reports	14-8b 14-5
Dose	2-6	2-2	Collective protection:	
Effects	2-6—2-13	2-2—2-5	Combat vehicles	14-14b 14-8
Enemy threat	2-6	2-2	Hospitals	14-14c 14-8
Enemy use	2-15	2-5	Shelters	14-16 14-9
First aid	4-13—	4-12—	Command and staff:	
	4-21	4-14	CBR agent/material detection	
Identification of	14-4a, 14-6	14-4	organization	14-1— 14-1—
Incapacitating agents. (See			14-7	14-5
Incapacitating agents.)			CBR defense:	
Munitions, enemy (fig 2-2)	2-14	2-5	Collective protection:	
Nerve agents. (See Nerve			Operation of	
agents.)			shelters	14-18 14-10
Odors	2-6h	2-4	Types of shelters	14-16, 14-9,
Persistency	2-6f	2-4	14-17	14-10
Protection against	4-1—4-6	4-1—4-7	Decontamination, large-	
Chemical attack:			scale:	
Decontamination	4-13,	4-12,	Equipment stations	14-20 14-11
	4-22—	4-14,	Levels of	14-19b 14-11
	4-25,	4-15,	Personnel stations	14-21, 14-11
	8-18—	8-14,	14-22	
	8-21,	8-15,	Doctrine	2-2 2-1
			Equipment required	12-4 12-2

	Paragraph	Page		Paragraph	Page
Intelligence	12-2	12-1	Area and terrain	8-19, 9-5, 11-8	8-14, 9-2, 11-5
Operational considerations	12-3	12-1	Biological	9-5	9-2
Organization	2-3, 13-1-13-5	2-1, 13-1	Bleach	4-23c, app C	4-14, C-1
Planning	2-5, 12-1	2-2, 12-1	Blister agents. (See Blister agents, decontamination.)		
Responsibilities	2-4, 12-1	2-2, 12-1	Boots	4-24c	4-15
Specialized units	13-5	13-1	Buildings	8-19, 9-5	8-14, 9-2
Tactical dosimetry:			Caustic soda	App C	C-1
Operation exposure guide	14-31, 14-34	14-15, 14-17	Clothing	4-2b, 4-5, 4-24b	4-3, 4-7, 4-15
Radiation status reports	14-32, 14-33	14-15	Detergent (hot soapy water)	App C	C-1
NBC attack reports	14-8-14-13, app E	14-5-14-8, E-1	Dry mix	4-23c, app C	4-14, C-1
Radiological surveys	14-23-14-30	14-13, 14-14	DS2	4-23b, app C	4-14, C-1
Control	14-26	14-13	Equipment:		
Organization	14-24	14-13	Individual	4-24	4-15
Survey party briefing	14-27	14-13	Unit	4-25, 8-20, 9-5, 11-8	4-15, 8-14, 9-2, 11-5
Tactical operations centers	14-30	14-14	Food and water	8-19, 11-10	8-14, 11-6
Commander's guidance:			Kit, decontaminating and re-impregnating	4-5, 4-23a, app C	4-7, 4-14, C-1
Mission-oriented protective posture	8-8-8-13	8-4-8-7	Leather (boots)	4-24c	4-15
Operations in the field	8-1-8-7	8-1-8-3	Levels	14-19b	14-11
Protective clothing	8-9	8-4	Materials for	App C	C-1
Company:			Nerve agents. (See Nerve agents, decontamination.)		
CBR defense organization	7-2	7-1	Personnel	8-21, 9-5, 11-9	8-15, 9-2, 11-5
CBR defense responsibilities	7-1-7-6	7-1-7-3	Protective clothing	4-2b, 4-24b	4-3, 4-15
Chemical agent detection	8-14-8-17	8-9-8-12	Protective mask	4-24a	4-15
Radiation detection	11-4, 11-5	11-2, 11-3	Radiological	6-6	6-2
Contaminated areas:			Rubber tires	4-25a	4-15
Duration of hazard (table 8-3)	8-12	8-6	Solvents	App C	C-1
Markers for	App F	F-1	Techniques	4-24, 5-7a, 6-6, app C	4-15, 5-2, 6-2, C-1
Operations in	4-26-4-30, 8-13, 9-7, 11-2	4-16, 4-17, 8-7, 9-2, 11-1	Washing soda	App C	C-1
Reconnaissance of	8-3, 11-4	8-2, 11-2	Water	4-23d, app C	4-14, C-1
Contaminated clothing. (See Clothing.)			Wet mix (slurry)	4-23c, app C	4-14, C-1
Contaminating attacks	2-15c(1)	2-7	Detection:		
Contamination:			Biological attack	5-5	5-2
Equipment and supplies	8-20	8-14	Chemical agents (fig 2-1)	2-6h, 4-5b(2), 7-3, 8-14-8-17	2-4, 4-7, 7-2, 8-9-8-12
Food and water	8-19	8-14	Radioactive material	11-4-11-6	11-2, 11-3
Markers	App F	F-1	Detector:		
Control center, NBC reports	14-8c	14-5	Bag	4-5b	4-7
Corps CBR defense responsibilities (fig 14-1, 14-2)	13-4, 14-3, 14-13	13-1, 14-3, 14-8	Crayon	8-17b	8-12
Dangerous areas, markers for	App F	F-1	Kits:		
Dazzle	2-27c	2-13	M15A2A	8-16	8-11
Decontaminating and reimpregnating kit, ABC-M13 (fig 4-4)	4-5	4-7	M18A2	13-2	13-1
Decontamination:			M19	14-4	14-3
Apparatus	App C	C-1	Paper (fig 4-5)	4-6d, 8-17a	4-7, 8-12
			Division:		
			CBR defense organization (fig 14-1, 14-2)	14-3	14-3

	Paragraph	Page
CBR defense responsibilities ..	12-1—	12-1,
	12-4,	12-2,
	13-4,	13-1,
	14-12	14-7
Doctrine:		
CBR defense	2-2	2-1
Defense against chemical attack	8-8	8-4
Mission-oriented protective posture	8-8—8-13	8-4—8-7
Dose	2-6	2-2
Dose rate	11-4	11-2
Dose-rate meters	11-5	11-3
Dosimeters	11-5	11-3
Dosimetry:		
Dosimeter readings	11-5b, 11-6	11-3
Operation exposure guide	14-34	14-17
Processing data	11-6,	11-3,
	14-33	14-15
Radiation status	14-32	14-15
Records	11-6,	11-3,
	14-33	14-15
Reporting	14-33	14-15
Downwind hazard	App H	H-1
Explosive ordnance disposal (EOD) unit (fig 14-1)	13-5b, 14-5	13-1, 14-4
Fallout:		
Cause	2-29	2-13
Contamination from	2-30	2-15
Detection	11-5, 14-4	11-3, 14-3
Prediction	11-3	11-2
Protective measures	6-5, 11-2	6-2, 11-1
Field decontamination stations ..	14-20—	14-11
	14-22	
Filter element, protective mask ..	4-3c	4-4
Fireball, nuclear (fig 2-4)	2-26	2-11
First aid:		
Amyl nitrite ampul	4-17a	4-13
Atropine injector	4-15a	4-13
Measures, chemical agents ..	4-13—	4-12—
	4-21	4-14
Treatment, nuclear radiation ..	6-7	6-3
Unidentified chemical agent ..	4-14	4-12
Flash burns. (See Thermal radiation.)		
Food:		
Decontamination	8-19c	8-14
Protection	8-7	8-3
Foxholes (See also Shelters, protective)	6-2	6-1
Gamma radiation. (See Nuclear radiation, gamma rays.)		
Gas mask. (See Protective mask.)		
Gas-particulate filters	14-15	14-8
General chemical laboratory (fig 14-1)	13-5a, 14-6	14-4
Heat. (See Thermal radiation.)		
Hoods, protective (fig 4-2, 4-3) ..	4-3b	4-4
Identification of chemical agents ..	14-4a, 14-6	14-4
Impregnated clothing. (See Protective clothing.)		

	Paragraph	Page
Incapacitating agents:		
Characteristics (fig 2-1)	2-11	2-5
Decontamination	4-19b	4-14
First aid	4-19a	4-14
Physiological effects	2-11	2-5
Individual:		
Biological defense	5-1—5-7	5-1, 5-2
Measures after biological attack	5-7	5-2
Measures before biological attack (table 5-1)	5-4	5-2
Protection	5-2	5-1
CBR defense:		
Responsibilities	3-1—3-4	3-1
Standards of proficiency ..	3-3, app B	3-1, B-1
Chemical defense:		
Actions after chemical attack	4-11	4-11
Actions before chemical attack	4-8	4-10
Actions during chemical attack	4-9	4-10
Actions in a chemical environment	4-26—	4-16,
	4-30	4-17
Defecating and urinating	4-30	4-17
Drinking water and eating	4-28	4-16
Sleeping, shaving, bathing, and changing clothing ..	4-29	4-17
Decontamination	4-13,	4-12,
	4-22—	4-14,
	4-25	4-15
Defensive measures against chemical attack	4-7—4-12	4-9—4-11
First aid	4-13—	4-12—
	4-21	4-14
Masking	4-10	4-11
Mission-oriented protective posture	4-7b	4-9
Protective clothing and equipment	4-1—4-6	4-1—4-7
Unmasking	4-12	4-11
Nuclear and radiological defense:		
Measures after nuclear attack	6-4—6-7	6-2, 6-3
Measures before nuclear attack	6-2	6-1
Measures during nuclear attack	6-3	6-2
Protection	6-1	6-1
Information source, NBC reports ..	14-8a	14-5
Intelligence	12-2	12-1
Irritant agents:		
Characteristics (fig 2-1)	2-13	2-5
Decontamination	4-21b	4-14
First aid	4-21a	4-14
Physiological effects	2-13	2-5

	Paragraph	Page
Kits:		
CBR agent sampling and analyzing kit, M19	14-4	14-8
CBR agent sampling kit, M34	13-4	13-1
Chemical agent detector kits	8-16, 13-2 14-4	8-11, 13-1, 14-3
Decontaminating and reimpregnating kit, M13	4-5	4-7
Leather dressing, vesicant gas resistant, M2 (fig 4-5)	4-6a	4-7
Markers for contaminated or dangerous land areas	App F	F-1
Masking:		
Guidance for	4-10	4-11
Proficiency	App B	B-1
Masks. (See Protective mask.)		
Medical laboratory (fig 14-1)	13-5b, 14-7	13-2, 14-5
Military intelligence company, technical intelligence (fig 14-1)	13-5b, 14-4	13-2, 14-3
Mines, marking chemical	App F	F-1
Mission-oriented protective posture (table 8-1, 8-2)	8-8-8-13	8-4-8-7
Monitoring:		
CBR defense team	7-2	7-1
Continuous	11-4b	11-2
Instruments for	11-5	11-3
Periodic	11-4b	11-2
Planning	11-4	11-2
Responsibility	11-1, 11-4a, 11-7	11-1, 11-2, 11-5
NBC:		
Attacks	14-8	14-5
Reports	14-9- 14-18, app E	14-5- 14-8, E-1
Nerve agents (see also Chemical agents):		
Characteristics (fig 2-1)	2-7	2-4
Decontamination	4-15b, 4-22- 4-25, 8-19, app C	4-13, 4-14, 4-15, 8-14, C-1
Detection (fig 2-1)	3-4	3-1
First aid	4-15a	4-13
Physiological effects	2-7	2-4
Neutron-induced radioactivity. (See Neutrons.)		
Neutrons	2-28c	2-13
Nuclear attack:		
Casualties	2-25, 2-27, 10-10	2-11, 10-3,
Defense against	6-1-6-3	6-1, 6-2
Detection devices. (See Detection, radioactive material.)		
Effects of nuclear explosions	6-1	6-1
First aid	6-7, 10-10	6-3, 10-3
Protection against	6-2, 6-3	6-1, 6-2
Protective shelters (see also Shelters, protective)	6-2b, 10-3	6-1, 10-1

	Paragraph	Page
Reporting	10-8, 14-8- 14-13, app E	10-2, 14-5- 14-8, E-1
SOP	App D	D-1
Target acquisition defense	10-2	10-1
Unit procedures	10-1- 10-10, app D	10-1- 10-3, D-1
Nuclear defense:		
Commander and staff	12-1, 13-1	12-1, 13-1,
Definition	1-5d	1-2
Individual	6-1-6-7	6-1-6-3
Unit	10-1- 11-14	10-1- 11-6
Nuclear radiation:		
Alpha particles	2-28d	2-13
Beta particles	2-28e	2-13
Detection devices	11-5	11-3
Dose. (See Radiation.)		
Dose rate. (See Radiation.)		
Effects (fig 2-4) (table 2-1)	2-28	2-13
Gamma rays	2-28b	2-13
Neutrons	2-28c	2-13
Operation exposure guide	14-34	14-17
Protection against	6-2, 6-5, 11-2	6-1, 6-2, 11-1
Nuclear threat		
	2-25- 2-30	2-11- 2-15
Nuclear weapons:		
Bursts (types)	2-26	2-11
Effects of	2-27	2-11
Operation exposure guide. (See Nuclear radiation, operation exposure guide.)		
Proficiency standards, individual and unit		
	App B	B-1
Protection:		
Biological (table 5-1)	5-2	5-1
Chemical:		
Collective	14-16- 14-18	14-9, 14-10
Individual	4-1- 4-12, 8-8- 8-12	4-1- 4-11, 8-4- 8-6
Unit	8-1-8-13	8-1-8-7
Fallout	6-5, 11-2	6-2, 11-1
Nuclear	6-2, 6-3, 10-3	6-2, 10-1
Protection of:		
Food and water	8-7	8-3
Personnel	4-1-4-12, 8-8- 8-13	4-1-4-11, 8-4- 8-7
Supplies and equipment	8-7	8-3
Protective clothing:		
Doctrine for wearing	8-8-8-13	8-4-8-7
Ensemble	4-1, 4-2	4-1
Hood. (See Hoods, protective.)		
Issue of	4-2	4-1
Maintenance of	4-2b	4-3

	Paragraph	Page
Permeable	4-2a	4-1
Replacement guide	4-2b(2)	4-3
Protective dubbing. (See Leather dressing, vesicant gas resistant, M2.)		
Protective mask:		
Accessories (fig 4-3)	4-3b	4-4
Aircraft	4-4b	4-6
Canister	4-4	4-6
Carrier	4-3d	4-4
Filter element replacement criteria	4-3c	4-4
Fitting and adjustment	4-3e	4-4
Hood. (See Hoods, protective.)		
M9	4-4d	4-6
M14	4-4a	4-6
M16	4-4d	4-6
M17-series	4-3	4-3
M24	4-4b	4-6
M25	4-4a	4-6
M28	4-4c	4-6
Masking	4-10, app B	4-11, B-1
Proficiency in masking	App B	B-1
Protection offered	4-3, 4-4, 4-7, 5-2	4-3, 4-6, 4-9, 5-1
Riot control, M28	4-4c	4-6
Special-purpose	4-4	4-6
Speed in masking	App B	B-1
Tank	4-4a	4-6
Unmasking	4-12	4-11
Water-drinking device	4-3a	4-4
Waterproofing bag	4-3a	4-4
Wearing	4-3e, 4-7, 4-9, 4-27	4-4, 4-9, 4-10, 4-16
Protective shelters. (See Shelters, protective.)		
Radiac instruments	11-5	11-3
Radiation:		
Dose (table 2-1)		2-14
Dose rate	11-4	11-2
Thermal. (See Thermal radiation.)		
Radioactive contamination. (See Radiological contamination.)		
Radioactive material	2-28, 2-29	2-13
Radiological contamination:		
Decontamination	6-6	6-2
Detection	11-4, 11-5	11-2, 11-3
Extent. (See Fallout.)		
Monitoring of	11-4	11-2
Occupation of areas	11-1d, 11-2	11-1
Overlay	14-30, app E	14-14, E-1
Protection against	6-2, 6-3, 10-3	6-1, 6-2, 10-1
Survey of	14-23—14-30	14-13, 14-14
Time of entry—time of stay	14-34b	14-17
Radiological defense:		
Commander and staff	12-1—12-3, 14-31—14-34	12-1
Individual	6-1—6-7	6-1—6-3

Unit	Paragraph	Page
.....	11-1—11-14	11-1—11-6
Radiological operations:		
Analysis of the situation ..	10-9	10-3
Command and staff problems ..	14-31—14-34	14-15—14-17
First aid	10-10	10-3
Monitoring. (See Monitoring.)		
Radiological survey	14-23—14-30	14-13, 14-14
Radiological threat	2-25—2-30	2-11—2-15
Reconnaissance	8-3, 11-4	8-2, 11-2
Removal of masks	4-12, 8-12	4-11, 8-6
Reports, NBC	App E	E-1
Riot control agents. (See Irritant agents.)		
Selection of routes and positions ..	8-3, 8-4	8-2, 8-3
Sentries and guards	7-2c	7-2
Shelters, protective:		
Entry-exit procedures	14-18b	14-10
Gas-particulate filters	14-15	14-8
Location and design	14-17	14-10
Nuclear	10-3	10-1
Operation	14-18	14-10
Types	6-2, 14-16	6-1, 14-9
Shielding	14-30a	14-14
Spectacles, mask	4-9a(2)	4-10
Spray, aircraft, protection against	4-9c	4-11
Standardization agreements (STANAGS)	1-3	1-1
Standards of proficiency. (See Individual CBR defense standards of proficiency and Unit CBR defense standards of proficiency.)		
Standing operating procedures. (See Unit CBR defense SOP.)		
Survey. (See Radiological survey.)		
Tables:		
2-1. Probable effects of nuclear (gamma) radiation on exposed personnel		2-14
5-1. Defense measures against antipersonnel biological agents		5-1
8-1. Example variations of the mission-oriented protective posture		8-7
8-2. Work pacing guidance for personnel dressed in chemical protective clothing		8-7
8-3. Approximate duration of hazard in contaminated terrain		8-8
14-1. Gas filter replacement criteria for mobile collective protection equipment		14-9
Terms, explanation	1-5	1-2

	Paragraph	Page
Thermal radiation	2-25, 2-27	2-11
Threat (<i>See</i> Biological threat, Chemical threat, Nuclear threat, and Radiological threat.)		
Time of entry—time of stay. (<i>See</i> Radiological contamination.)		
Training responsibilities	2-3, 3-1—3-4, 7-1, 12-1	2-1, 3-1, 7-1, 12-1
Unidentified chemical agents	4-14	4-12
Unit:		
Biological defense:		
Alarms and warnings ..	9-3	9-1
Casualty treatment	9-6	9-2
Decontamination	9-5	9-2
Detection	9-2	9-1
Operations in a contami- nated environment	9-7	9-2
CBR defense:		
Organization	7-1, 7-2	7-1
SOP	7-6, app D	7-3, D-1
Standards of proficiency ..	7-5, app B	7-3, B-1
Teams	7-2	7-1
CBR hazard detection	7-3	7-2
Chemical agent detection	8-14—8-17	8-9—8-12
Chemical decontamination	8-18—8-21	8-14, 8-15
Chemical defense:		
Collective protection ...	8-6	8-3
Measures	8-1—8-7	8-1—8-3
Mission-oriented protec- tive posture	8-8—8-13	8-4—8-7
Personnel needs	8-13	8-7
Plans	8-2	8-1
Protection of equipment ..	8-7	8-3
NBC attack reports	7-4, app E	7-3, E-1

	Paragraph	Page
Nuclear defense:		
After an attack	10-8	10-2
Analysis of the situation ..	10-9	10-3
Casualty treatment	10-10	10-3
During an attack	10-7	10-2
Enemy target acquisi- tion	10-2	10-1
Preparation	10-8	10-1
Radiological defense:		
Against hazards	11-1d	11-1
Alarms and warnings ..	11-14	11-6
Decontamination	11-8— 11-10	11-5, 11-6
Fallout prediction	11-3	11-2
Monitoring	11-4	11-2
Neutron-induced radia- tion	11-12	11-6
Protection against fall- out	11-2	11-1
Radiac instruments	11-5	11-3
Tactical dosimetry	11-6	11-3
Unmasking after chemical attack ..	4-12	4-11
Vomiting agents (<i>see also</i> Irritant agents):		
Characteristics	2-12	2-5
Decontamination	4-20b	4-14
First aid	4-20a	4-14
Physiological effects	2-12	2-5
Warning. (<i>See</i> Alarm.)		
Waterproofing bag, protective mask	4-3a	4-4
Weather, effect of	2-15b, 2-23, 2-7, 2-9, 2-29, 9-5b	2-13, 9-2
Winterization kit, protective mask ..	4-3b	4-4

By Order of the Secretary of the Army:

Official:

VERNE L. BOWERS,
Major General, United States Army,
The Adjutant General.

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Distribution:

To be distributed in accordance with DA Form 12-11 requirements for Chemical, Biological and Radiological Operations.

