

LESSON PLAN

PART I
COVER SHEET

LESSON TITLE: Wartime Decontamination of Chemical/Biological Agents

TRAINING METHOD: Lecture

REFERENCES: AFMAN 32-4005, Personnel Protection and Attack Actions
AFR 355-7, Potential Military Chemical/Biological Agents and
Compounds
FM 3-5, NBC Decontamination
T.O. 11C15-1-3, Chemical Warfare Decontamination, Detection and
Disposal of Decontamination Agents
T.O. 11-1-35, Chemical/Biological Munitions and Related Equipment

AIDS AND HANDOUTS: PIN 606047DF Disaster Preparedness Training Video G2
(Wartime Decontamination of CB Warfare Agents)
Attachment 1 - Effectiveness of Natural Decontamination
Attachment 2 - Chart of Chemical Agents and Decontaminants

LESSON OBJECTIVE: Given a lecture on wartime decontamination of chemical and biological agents the students should understand the principles of wartime decontamination of chemical biological (CB) warfare agents. During the final course of instruction test, the student must demonstrate understanding of all three samples of behavior listed below.

SAMPLES OF BEHAVIOR:

1. State the factors that affect decontamination.
2. State the difference between the various levels of decon operations.
3. Identify the different types of decontaminants.

ORGANIZATIONAL PATTERN: Topical

SUGGESTED COURSE(S) OF INSTRUCTION: (Chemical Threat Area)
Disaster Preparedness Support Team
Contamination Control Team

STRATEGY: This lecture presents basic principles of wartime decontamination so the students will understand factors that could effect decontamination, what to consider when planning and preparing for decontamination, and types and methods of decontamination. Emphasize that decontamination is the removal, neutralization, or destruction of any harmful agents. Let students know that their unit is required to provide them additional training on operating procedures, facilities, and equipment.

LESSON OUTLINE:

- MAIN POINT 1. GENERAL FACTORS AFFECTING
 DECONTAMINATION OPERATIONS
- A. Planning Factors
 - B. Priorities
- MAIN POINT 2. LEVELS OF DECONTAMINATION
- A. Immediate
 - B. Operational
 - C. Thorough
- MAIN POINT 3. TYPES OF DECONTAMINANTS
- A. Natural
 - B. Standard
 - C. Miscellaneous Decontaminants
 - D. Biological Decontamination

PART II
TEACHING PLAN
INTRODUCTION

ATTENTION:

Chemical agents can kill or injure you. They can also render facilities, vehicles, aircraft, and equipment unsafe or unusable.

MOTIVATION:

However, you can meet immediate mission requirements and ensure maximum safety if you follow effective decontamination procedures.

OVERVIEW:

During this lesson, we will discuss:

- ⇒ factors affecting decontamination
- ⇒ levels of decontamination
- ⇒ types of decontaminants
- ⇒ biological decontamination

TRANSITION:

Let's begin by discussing general factors that affect decontamination operations.

MAIN POINT 1.
GENERAL FACTORS
AFFECTING
DECONTAMINATION
OPERATIONS

DECONTAMINATION MUST
BE AIMED AT RESTORING
MISSION CAPABILITY
RATHER THAN TOTALLY
ELIMINATING THE
HAZARDS.

A. PLANNING
FACTORS

BODY

In wartime, manpower and time are critical resources that cannot be wasted on nonessential tasks. Therefore, limit decontamination of areas, facilities, and equipment as necessary to allow protected personnel to resume operations.

During a decontamination operation, completing the mission is paramount. Protected people can work with contaminated equipment. Therefore, decontamination must be aimed at restoring mission capability rather than totally eliminating the hazards. Also, thoroughly decontaminate people to avoid injury and cross contamination.

A. The effectiveness of a decontamination operation for chemical or biological agents will depend on certain factors:

- ⇒ the need for decontamination
- ⇒ the level of decontamination
- ⇒ identification of the agents and decon area

(1) COMMANDER
DETERMINES NEED

(1) The commander determines the need for decontamination operations based on the tactical situation, the nature and extent of contamination, resources available, and potential results of the operation.

(2) DECON BEYOND
INDIVIDUAL LEVEL

(2) Decontamination beyond the individual level is accomplished by organizational personnel under the supervision of specially trained and assigned personnel (i.e. contamination control teams) using available decontamination equipment and supplies.

(3) IDENTIFICATION

(3) When planning an effective decontamination operation, you should be able to identify the agents, decon area, requirements, levels, manpower, and type of decontaminants needed.

IDENTIFY AGENT

⇒ Identify the chemical/biological agent. This information is necessary to make a decision on what type of decontaminant and procedures to use. Some decontaminants cause a toxic reaction when they come in contact with chemical agents.

DESIGNATE AND MARK
AREA

⇒ Designate and mark the area. Identify potentially contaminated people and take measures to prevent the contamination of additional people.

IDENTIFY WHAT IS
CONTAMINATED

⇒ Identify facilities, equipment, and material within the contaminated area. This step is required to prioritize decontamination of facilities, equipment, and material critical to the mission. The type of surface being contaminated is also a factor. Decontaminating a field or porous earth requires different procedures than cleaning a paved surface.

SELECT A SITE

⇒ Select a site for decontamination operations. Disposal of contaminated waste is your main concern.

SELECT THE LEVEL OF
DECONTAMINATION

⇒ Select the level of decon. Various levels of decontamination include immediate, operational, thorough, and reconstitution. Consider the type of agent, decontaminant, and procedures to use such as washing, brushing, burying, sealing, burning, etc., when selecting the level of decontamination.

CONCENTRATION

⇒ Contact time and concentration also play a big part. How long the decontaminant must remain in contact with the chemical agent in order to neutralize or destroy the agent. As for concentration, obviously the greater the concentration of the agent, the more effort decon will require.

AMOUNT OF HELP
NEEDED

⇒ Determine the number of people required to perform decon operations. Base the number on the types of decontaminants, procedures, and levels chosen for the operation.

SELECT THE
APPROPRIATE
DECONTAMINANT

⇒ Select the appropriate decontaminant and decontamination equipment. Ensure decontaminant is compatible and effective against the CB agent.

WEATHER

⇒ Finally, the current weather is also an important planning consideration. The temperature, humidity, wind, and precipitation all can affect how, where, and when you conduct your decon operations. The weather may affect your method, resources, and manning.

INSTRUCTOR'S NOTE: Attachment 1, in Part IV, shows the effectiveness of natural decontaminants.

B. PRIORITIES

B. Always give first priority to personnel decontamination to prevent casualties and reduce manpower losses. For the second priority, decontaminate mission-essential aircraft and related equipment and material/facilities. The commander establishes mission requirements. During wartime, expedite decontamination operations as the situation requires. Primary considerations will always be for effective mission accomplishment.

TRANSITION:

Let's continue this lesson by discussing levels of decontamination.

**MAIN POINT 2.
LEVELS OF
DECONTAMINATION**

Levels of decontamination are broken into four groups: immediate, operational, thorough, and reconstitution. To select the best level to use, consider the amount of time, materials required, and what level of decontamination is acceptable for mission activities.

A. IMMEDIATE

A. Immediate decontamination is aimed at minimizing casualties, saving lives, and limiting the spread of contamination. It is conducted by the individual as soon as someone suspects they have been contaminated. It involves decontaminating the skin, personal clothing, and equipment.

INSTRUCTOR'S NOTE: Refer to Army Field Manual, (FM 3-5) Appendix B, for decontamination of specific items and the best method to decon for a particular surface or material.

B. OPERATIONAL

B. Operational decontamination is aimed at minimizing contact or transferring hazards and sustained operations. It is conducted by individuals, crews, teams, or units when required by operations. It involves decontaminating specific parts of operationally essential equipment, material, work areas, and exchange of individual protective equipment.

C. THOROUGH

C. Thorough decontamination is aimed at reducing contamination to the lowest possible levels, to permit partial or total removal of IPE, and to maintain operations with minimum degradation.

CONDUCTED BY

It is conducted by units or wings, with or without external support, when permitted by operations, manning, and resources.

INVOLVES

It involves decontaminating personnel, equipment, material, or work areas and may include some terrain, beyond the scope of operational decontamination.

TRANSITION:

Now let's discuss types of decontaminants available for use.

MAIN POINT 3:
TYPES OF
DECONTAMINANTS

The three general types of decontaminants used to reduce or neutralize the hazards from chemical warfare agents are natural, standard, and miscellaneous.

INSTRUCTOR'S NOTE: Attachment 2, in Part IV, gives a sample of common chemical agents, methods and types of decontamination. Refer to T.O. 11C15-1-3 for the entire chart.

A. NATURAL

A. Natural decontamination is divided into four basic groups: weathering, earth, fire, and water. Weathering is the first of these groups we'll talk about.

(1) WEATHERING

(1) Weathering, which is the easiest method of decontamination, gradually decomposes chemical agents by aeration, evaporation, or hydrolysis. Aeration is simply exposure to air and hydrolysis is decomposition of a chemical agent by water.

The time necessary for decontamination by weathering depends on:

- ⇒ the persistency of the agents
- ⇒ the chemical make-up
- ⇒ climatic conditions
- ⇒ type of surface

THOUGH EASIEST
METHOD, PREDICTION
OF PERSISTENCY IS
DIFFICULT

Although weathering is the easiest method of decontamination to accomplish, it makes the prediction of agent persistency difficult because of all the weather variables. Mark any remaining contaminated equipment and surfaces that are left to the natural decontamination process.

WEATHER ELEMENTS
AFFECTING AGENTS

Weather elements that affect persistency of chemical agents are:

⇒ WIND SPEED

⇒ Wind Speed: High winds rapidly disperse vapors and can also increase evaporation.

⇒ TEMPERATURE

⇒ Temperature: Chemical agent persistency decreases as temperature increases.

⇒ PRECIPITATION
/HUMIDITY

⇒ Precipitation/humidity: For example, heavy rains can decompose or wash away a chemical agent quicker. Humidity effects evaporation.

⇒ SUNLIGHT

⇒ Sunlight: Sunlight speeds up evaporation.

(2) EARTH SEAL OR
ABSORBS

(2) Earth is used to seal or absorb contamination. Covering an area with approximately four inches of earth gives protection as long as the earth is not disturbed or the chemical agent exposed. An area treated in this manner will require periodic monitoring. In the absence of a better absorbent, you may use earth to remove liquid contamination from material by absorption.

Remember, soil will eventually become so saturated with contamination that it will have to be treated as contaminated waste.

(3) FIRE VAPORIZES
AND DESTROYS
AGENTS

(3) Fire vaporizes and destroys chemical agents. The ideal conditions for using fire are during falling temperatures with moderate winds blowing away from friendly forces. When using fire as a decontaminant remember to consider the possible downwind hazards.

(4) WATER FLUSHES

(4) Flowing water will flush agents from surfaces and will hydrolyze some agents. Hot water is more effective than cold water and adding soap or detergent produces an even more effective decontaminant. High pressure application produces a better cleansing action than low pressure.

TRANSITION:

The next type of decontaminants we will discuss are standard decontaminants.

INSTRUCTOR'S NOTE: Refer to the Army publication FM 3-5, NBC Decontamination, Appendix F, for a more complete list for the types and description of each decontaminant.

B. STANDARD

B. There are four basic types of standard decontaminants: super tropical bleach (STB), decontaminating standard number 2 (DS2), high-test bleach (HTB), and skin irritant decontaminant (SID).

(1) STB

(1) STB decontaminates most chemical agents and biological agents. STB is a mixture of chlorinated lime and calcium oxide in a white powder form. If needed, substitute household bleach for diluted STB. STB will decontaminate mustard, Lewisite, and nerve agents.

⇒ STB HAZARDS

⇒ STB is a strong oxidizing agent. It is very caustic and reacts with water to produce heat and toxic or corrosive vapors. STB and its solutions are very irritating to the skin, eyes, and respiratory system. Do not store STB with or near flammable chemicals such as DS2, solvents, paint removers, or petroleum products. When handling STB you should wear your individual protective equipment.

⇒ STB MIXTURES

⇒ Mixing STB with water or earth reduces the temperature resulting from its reaction with liquid mustard. Mix STB with water to form a wet mixture called "slurry" or dry earth to form a "dry mix".

⇒ STB SLURRY

⇒ There are two types of slurry: one for manual application, the other for application by a power-driven decontamination apparatus. For manual application with swabs, brushes, or brooms, the most effective slurry is approximately equal parts (by weight) of STB and water. The recommended load for a 500-gallon power-driven decontaminating apparatus is 1300 pounds of STB and 225 gallons, approximately 1800 pounds, of water.

Note: 12 and 1/2 lbs of anti-setting compound should be added to prevent solidification of slurry before use.

INSTRUCTOR'S NOTE: Field Manual (FM) 3-5, Appendix F, Table F-1, provides mixture proportions.

⇒ STB DRY MIX

⇒ The dry mix consists of STB thoroughly mixed with dry earth. The portions by weight are two parts of STB to three parts of earth or other dry material. You can use dry mix in shuffle boxes or place it under equipment to decontaminate agents flushed from it.

INSTRUCTOR'S NOTE: Refer to T.O. 11C15-1-3, page 4-3, par. 3b. for small area decon.

(2) DS2

(2) DS2 is a general purpose decontaminant available in ready-to-use solutions that effectively decontaminates all known toxic chemical agents and biological materials except bacterial spores if sufficient contact time is allowed.

⇒ DS2 CONTACT TIME

⇒ When using DS2, apply to the contaminated surface and leave for 30 minutes before rinsing with water. The solution is effective at temperatures from minus 15° to 125° degrees Fahrenheit (minus 26 to 51 degrees Celsius).

⇒ DS2 HAZARDS

⇒ DS2 is very irritating to the skin and eyes; therefore, wear individual protective equipment when using it. Because of its low flash point, DS2 presents a fire hazard if used on heat-producing devices or running engines.

(3) HTB

(3) HTB is a bleach in granular or tablet form. It has a higher percent of chlorine than STB, therefore, more corrosive. HTB is used for decontamination of individuals and personal protective equipment. HTB is effective against Lewisite, V-nerve agents, and all biological materials.

Dissolve 6 ounces of HTB and 6 ounces of detergent in 12 gallons of water to make a decontamination solution. This solution must be changed daily.

(4) SID

(4) Skin irritant decontaminant is effective in neutralizing the skin irritating properties of riot control agents CS and CN. SID can be locally manufactured using isopropyl alcohol, glycerin, and sodium bisulfate.

(Following procedures in T.O. 11C15-1-3) Mix 2 and 1/2 cups of 70% isopropyl alcohol with 1 cup water, 1/2 cup of glycerin, and 2 level tablespoons of sodium bisulfate. SID should be sprayed or poured directly on the contaminated skin and rubbed in with the hand.

TRANSITION:

Now let's talk about the miscellaneous decontaminants.

C. MISCELLANEOUS DECONTAMINANTS

C. Miscellaneous decontaminants consist of a wide variety of items found on most Air Force bases. They include soap or detergent, caustic soda, washing soda, ammonia, household bleach, common solvents, degreasing solvent similar to *GUNK*®, and absorbents.

(1) SOAP OR DETERGENT

(1) Soap or general purpose liquid detergent provides a good cleaning medium for removing surface contamination that may be chemical or biological material.

Soap solutions may be used in power-driven decontamination apparatuses or applied manually. General detergent is the only decontaminant for use in the M17 decontamination apparatus. Ten pounds of soap in 11 gallons of water is recommended for G-agents, according to Field Manual FM 3-5.

(2) CAUSTIC SODA

(2) Caustic soda or sodium hydroxide, which is more commonly known as lye, is a white solid that dissolves easily in water or alcohol.

Caustic soda will destroy G-nerve agents on contact. Caustic soda hastens hydrolysis of Lewisite. However, mustard, which is a blister agent, is destroyed only after prolonged contact.

For a G-nerve and blister agents, a 5% water solution is prepared by dissolving 5 lbs of caustic soda in 12 gallons of water. For VX agents, a 5% alcoholic solution is prepared by dissolving 5 lbs caustic soda in 6 gallons of water and 6 gallons of alcohol.

Caustic soda will also destroy biological materials. As the name implies, this decontaminant is very caustic or corrosive and can easily burn skin and eat away clothing on contact. Wear protective equipment when using it.

(3) WASHING SODA

(3) Washing soda is a white alkaline powder. Common names include soda ash and laundry soda. A hot or cold solution of washing soda and water is very effective and recommended for decontaminating G-nerve agents.

(4) MEA

(4) Monothanolamine (MEA) is the most effective decontaminant for CS, CS-1, CS-2, and CN training and riot control agents.

(5) AMMONIA

(5) Ammonia or ammonia hydroxide which is an ammonia water solution is another decontaminant for chemical agents. It is effective against G-nerve agents.

(6) COMMON SOLVENT

(6) You can use common solvents such as de-icing fluids, kerosene, and alcohol for many chemical agents. Solvents remove agents from the contaminated surfaces; they don't destroy the agents.

(7) DEGREASING
SOLVENT

(7) A degreasing solvent, such as *GUNK*®, is a noncorrosive, water-soluble liquid commonly used to clean aircraft and automobile engines. After applying, allow it to remain 15 minutes or more. Use water, preferably under pressure, to remove the solvent and to flush the dirt, grease, oil, and chemical agents from the equipment. Dispose of the contaminated waste properly.

(8) ABSORBENTS

(8) Absorbents are materials used to soak up and then physically remove, but not destroy the agents. You could use charcoal, coal dust, clay, dirt, manufactured absorbent, sawdust, etc., as absorbents. Absorbents are contaminated after use and must be handled as contaminated waste.

(9) ADSORBENTS

(9) Adsorbent is a material used to adhere, become attached mechanically or chemically to a chemical agent, but which does not destroy the agent, i.e., *FULLER'S EARTH*. The adsorbent is contaminated after use and is treated as contaminated waste.

**D. BIOLOGICAL
DECONTAMINATION**

D. Hot, soapy water is the preferred decontaminant for biological contamination. Apply it with brushes and scrub the surface well. Rinse surface after scrubbing (no wait time is required). DS2 and STB is also effective against most known biological contamination, but because of their caustic nature are not preferred.

INSTRUCTOR'S NOTE: Other nonstandard biological decontaminants are listed in FM 3-5, NBC Decontamination, and in T.O. 11-1-35.

CONCLUSION

SUMMARY:

During this lesson we discussed:

⇒ Factors affecting decontamination such as planning considerations, preparations, and priorities.

⇒ The levels of decontamination.
Immediate decon is used to save lives and minimize casualties. Operational decon is restricted to parts of essential equipment and thorough decon is to reduce contamination to the lowest level possible.

⇒ The types of decontaminants which include natural, standard, and miscellaneous.

REMOTIVATION:

By decontaminating chemical and biological warfare agents, you can meet immediate mission requirements and maximize personnel safety.

CLOSURE:

This completes this lesson on wartime decontamination of chemical warfare agents.

TRANSITION:

(Develop locally to transition to the next topic.)

PART III
EVALUATION
STUDENT PERFORMANCE STANDARDS

TEST ITEMS

1. LESSON OBJECTIVE: State the factors that affect decontamination operations.

QUESTION: (TRUE or FALSE)

In wartime, manpower and time are critical resources that cannot be wasted on nonessential tasks. Therefore, decontamination of areas, facilities, and equipment will be limited to that necessary to allow protected personnel to resume operations.

- a. True
- b. False

KEY: a

REFERENCE: Main Point 1

QUESTION 2. State the factors that affect decontamination operations.

QUESTION: (Multiple Choice)

Which of the following is **NOT** a factor in planning decontamination operations?

- a. Identifying the toxic chemical or biological agent.
- b. Determining the level of capability to perform certain decon operations.
- c. Determining the need for a decon operation based on the tactical situation.
- d. All of the above.

Key: d

REFERENCE: Main Point 1

2. LESSON OBJECTIVE: State the difference between the various levels of decon operations.

QUESTION: (Multiple Choice)

The levels of chemical and biological decon operations include:

- a. Immediate, Expedient, Detailed, and Restoration
- b. Operational, Thorough, Expedient, and Restoration
- c. Operational, Expedient, Thorough, and Reconstitution
- d. Immediate, Operational, Thorough, and Reconstitution

KEY: d

REFERENCE: Main Point 2

QUESTION 2. State the difference between the various levels of decon operations.

Which method of decontamination is carried out by the individuals upon being contaminated, to save lives and minimize casualties?

- a. Immediate
- b. Operational
- c. Thorough
- d. Reconstitution

Key: a

REFERENCE: Main Point 2

3. LESSON OBJECTIVE: Identify the different types of decontaminants.

QUESTION: (Matching)

Match the decontaminant in column A with its type in column B. Answers in column B may be used more than once.

- | <u>A</u> | <u>B</u> |
|-----------------|------------------|
| 1. MEA | a. Natural |
| 2. Fire | b. Standard |
| 3. Caustic Soda | c. Miscellaneous |
| 4. STB | |

KEY: 1c, 2a, 3c, 4b

REFERENCE: Main Point 3

QUESTION 2. Identify the different types of decontaminants.

QUESTION: (Multiple Choice)

The easiest method of decontamination used for contaminated surfaces, vehicles, or equipment that are not of vital importance should be left to which type of decontamination.

- a. Natural
- b. Organic
- c. Standard
- d. Miscellaneous

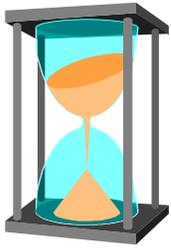
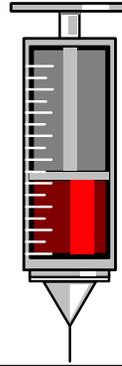
Key: a

REFERENCE: Main Point 3

PART IV
RELATED MATERIALS

Attachment 1: Effectiveness of Natural Decontaminants

Attachment 2: Chart of Chemical Agents and Decontaminants



Weathering/Aging



Earth



Fire



Water

	Fair	Fair	Fair
	Fair	Fair	Fair
	Useless	Excellent	Excellent
	Excellent	Fair	Poor

Nuclear

Biological

Chemical

AGENTS		DECONTAMINATION
CHOKING AGENTS	Phosgene and Diphosgene	None needed in field, aeration in closed spaces
NERVE AGENTS	TABUN - GA	Bleach slurry; dilute alkali, or DS2; steam and ammonia in confined area; M258A1, M291, M295 kits
	SARIN - GB	In confined area steam and ammonia; hot soapy water; M258A1, M291, M295 kits
	SOMAN - GD	Bleach slurry; dilute alkali, or DS2; steam and ammonia in confined area; M258A1, M291, M295 kits
	VX	STB, slurry or DS2 solution; hot soapy water, M258A1, M291, M295 kits
BLOOD AGENTS	AC and CK	None needed in the field
BLISTER AGENTS	Distilled Mustard - HD	Bleach, fire, DS2, M258A1, M291, M295 kits
	Nitrogen Mustard - HN-1, HN-2, HN-3	Bleach, fire, DS2, M258A1, M291, M295 kits
	Lewisite	Bleach, fire, DS2, caustic soda, M258A1, M291, M295 kits
VOMITING AGENTS	Adamsite - DM	None needed in the field; bleach or DS2 in confined spaces
TEAR AGENTS	CN	Aeration in the open; soda ash solution or alcoholic caustic soda in closed spaces
	CS	Water, 5% sodium bisulfite, and water rinse
INCAPACITATING AGENTS	BZ	Wash with soap and water; shake or brush; hypochlorite or caustic alcoholic solutions; detergent wetting solutions

Attachment 2 - Chart of Chemical Agents and Decontaminants

TRAINING PACKAGE COMMENT REPORT

RTP #	RTP DATE
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