

**FM 3-5  
MCWP 3-37.3**

***NBC***  
***Decontamination***

**Headquarters,  
Department  
of the  
Army**


**Commandant,  
US Marine Corps**

**DISTRIBUTION RESTRICTION:** Approved for public release; distribution is unlimited.

## FOREWORD

This publication may be used by the US Army and US Marine Corps during training, exercises, and contingency operations.

**JOHN N. ABRAMS**  
General, United States Army  
Commanding  
Training and Doctrine Command



**J. E. RHODES**  
Lieutenant General, US Marine Corps  
Commanding General  
Marine Corps Combat Development  
Command

Washington, DC, 28 July 2000

# NBC DECONTAMINATION

## Contents

	<b>Page</b>
<b>PREFACE</b> .....	<b>vi</b>
<b>Chapter 1 INTRODUCTION</b> .....	<b>1-1</b>
Contamination Forms.....	1-1
Contamination-Hazards Transmission.....	1-1
Agent Classification .....	1-2
Decontaminants .....	1-2
Decon Concepts.....	1-2
Decon Decisions .....	1-2
Decon Principles .....	1-3
Decon Levels .....	1-4
Immediate.....	1-4
Operational.....	1-4
Thorough .....	1-4
Chemical-Agent-Resistant Coating (CARC) .....	1-5
Weather Effects .....	1-5
Temperature.....	1-5
Wind .....	1-5
Humidity and Rain .....	1-5
Sunlight.....	1-5
Time.....	1-5
Decon in Combat .....	1-5
<b>Chapter 2 IMMEDIATE DECON</b> .....	<b>2-1</b>
Skin Decon .....	2-1
Chemical.....	2-1

DESTRUCTION RESTRICTIONS: Approved for public release; distribution is unlimited.

\* This publication supersedes Field Manual (FM) 305/Fleet Marine Force Manual (FMFM) 11-10, 17 November 1993.

	<b>Page</b>
Biological .....	2-1
Radiological .....	2-2
Personal Wipe Down .....	2-2
Chemical.....	2-2
Biological .....	2-2
Radiological .....	2-2
Operator's Spray Down .....	2-2
Chemical.....	2-2
Biological .....	2-3
Radiological .....	2-4
<b>Chapter 3 OPERATIONAL DECON .....</b>	<b>3-1</b>
Techniques .....	3-1
Phases .....	3-1
Preparation .....	3-1
Execution.....	3-2
Site Clearance .....	3-2
Vehicle Washdown .....	3-3
MOPP-Gear Exchange .....	3-3
Buddy-Team Method.....	3-6
Triple Buddy-Team Method.....	3-6
Individual (Emergency) Method.....	3-6
<b>Chapter 4 THOROUGH DECON .....</b>	<b>4-1</b>
Planning .....	4-1
Preparation .....	4-2
Execution .....	4-3
Predecon Staging Area .....	4-4
DED and DTD Areas .....	4-6
Postdecon AA .....	4-6
Detailed Troop Decon .....	4-6
Station 1 - Individual-Gear Decon .....	4-7
Station 2 - Overboot and Hood Decon .....	4-10
Station 3 - Overgarment Removal .....	4-11
Station 4 - Overboot and Glove Removal.....	4-12
Station 5 - Monitor .....	4-15
Station 6 - Mask Removal .....	4-15
Station 7 - Mask Decon Point.....	4-16
Station 8 - Reissue Point .....	4-17
Resupply Support Responsibilities .....	4-17
Detailed Equipment Decon .....	4-18
Decon Stations .....	4-18
Recycle Criteria .....	4-22
Reconstitution Criteria .....	4-22
DED Layouts .....	4-22
Alternate-Layout Planning Considerations .....	4-23
Decon Platoon .....	4-23
Smoke/Decon Platoon.....	4-23
Thorough-Decon-Site Closure .....	4-29
Closing the DED Area .....	4-30
Closing the DTD Area.....	4-32

	<b>Page</b>
Thorough Decon Under Unusual Conditions .....	4-33
<b>Chapter 5 SPECIAL DECON OPERATIONS .....</b>	<b>5-1</b>
Terrain Decon .....	5-1
Weathering .....	5-2
Removing/Covering .....	5-2
Neutralizing .....	5-2
Burning .....	5-3
Exploding .....	5-3
Flushing .....	5-4
Clearing .....	5-5
Fixed-Site Decon .....	5-5
Airfield .....	5-6
Helipad .....	5-6
POMCUS/Motor Park .....	5-7
Vulnerable Equipment Decon .....	5-7
Electronics .....	5-8
Optics .....	5-8
Ammunition .....	5-9
Canvas Items .....	5-9
Food and Water .....	5-9
Chemical Munitions Disposal and Decon .....	5-10
Handling .....	5-10
Contamination Control .....	5-11
Depleted Uranium (DU) Decon .....	5-11
Contaminated Remains Decon .....	5-12
Radiological Decon .....	5-12
Cesium .....	5-12
Cobalt .....	5-13
Plutonium .....	5-13
Strontium .....	5-13
Tritium .....	5-14
Uranium .....	5-14
<b>Chapter 6 EFFECTS OF ENVIRONMENTAL CONDITIONS .....</b>	<b>6-1</b>
Cold- and Arctic-Weather Areas .....	6-1
Decontaminants .....	6-1
Equipment-Decon Devices .....	6-3
Detection and Warning Devices .....	6-3
Equipment-Decon Stations .....	6-4
Warmed Areas .....	6-4
Urban Areas .....	6-5
Streets and Structures .....	6-5
Civilians .....	6-5
Supplies and Ammunition .....	6-5
Sanitation Systems .....	6-5
Mountains .....	6-5
Mobility .....	6-6
Wind .....	6-6
Temperature .....	6-6
Sunlight .....	6-6

	<b>Page</b>
Jungle .....	6-6
Temperature and Humidity .....	6-7
Time.....	6-7
Security.....	6-8
Resupply.....	6-8
Persistency .....	6-8
Desert .....	6-8
Water .....	6-8
Heat Stress.....	6-8
Weathering .....	6-8
Bearings and Other Critical Moving Parts .....	6-9
<b>Chapter 7 AVIATION .....</b>	<b>7-1</b>
Contamination Avoidance .....	7-1
Decontaminants .....	7-2
Aircraft Decon .....	7-2
Decon Types .....	7-3
Decon Stations .....	7-9
Recycle Criteria .....	7-14
Aircraft Decon-Site Selection .....	7-14
Decon-Site Layout .....	7-15
<b>Chapter 8 PATIENT EVACUATION AND DECON .....</b>	<b>8-1</b>
Evacuation Considerations .....	8-1
Patient Decon .....	8-2
Patient Decon at an MTF .....	8-2
Battalion Aid Station (BAS).....	8-3
Medical Company's Clearing Station.....	8-3
Hospital.....	8-3
Chlorine-Solution Preparation for Patient Decon .....	8-4
Chemical-Agent Patient Decon Procedures .....	8-4
Litter Patient .....	8-4
Ambulatory Patient .....	8-10
Biological-Agent Patient Decon Procedures .....	8-15
Litter Patient .....	8-15
Ambulatory Patient .....	8-19
Radiological-Agent Patient Decon Procedures .....	8-22
Litter Patient .....	8-22
Ambulatory Patient .....	8-25
<b>Chapter 9 LOGISTICS.....</b>	<b>9-1</b>
Skin Decon and Personal Wipe Down .....	9-1
Individual-Gear Decon .....	9-1
Operator's Spray Down .....	9-1
MOPP-Gear Exchange.....	9-1
Vehicle Washdown .....	9-2
Detailed Troop Decon .....	9-2
Detailed Equipment Decon .....	9-2

	<b>Page</b>
<b>Chapter 10 DECON PROCEDURES FOR INDIVIDUAL AND CREW-SERVED WEAPONS</b> .....	<b>10-1</b>
Operational-Decon Procedures Using the IEDK .....	10-1
M60 Machine Gun .....	10-1
M249 Squad Automatic Weapon .....	10-2
M203 Grenade Launcher.....	10-2
M47 Dragon.....	10-2
Tow Missile (M220 Series) .....	10-3
AT4 Light Antitank Weapon.....	10-4
66-Millimeter Rocket Launcher .....	10-4
81-Millimeter Mortar.....	10-4
60-Millimeter Mortar.....	10-4
Javelin.....	10-5
Thorough-Decon Procedures Using the HTH Solution .....	10-5
Materials .....	10-7
Procedures .....	10-8
<b>Appendix A CONVERSIONS AND MEASUREMENTS</b> .....	<b>A-1</b>
<b>Appendix B DECONTAMINANTS</b> .....	<b>B-1</b>
<b>Appendix C DECON OF SPECIFIC SURFACES AND MATERIALS</b> .....	<b>C-1</b>
<b>Appendix D DECON KITS, APPARATUSES, AND EQUIPMENT</b> .....	<b>D-1</b>
<b>Appendix E DTD STATION CHARTS FOR CHEMICAL UNIT LEADERS AND NBC NCOS</b> ....	<b>E-1</b>
<b>GLOSSARY</b> .....	<b>Glossary-1</b>
<b>BIBLIOGRAPHY</b> .....	<b>Bibliography-1</b>
<b>INDEX</b> .....	<b>Index-1</b>

## Preface

FM 3-5 integrates the nuclear, biological, and chemical (NBC) fundamentals published in FM 3-100 and implements Standardized North Atlantic Treaty Organization Agreement (STANAG) 2426.

The extent and timing of decon depends on the tactical situation, the mission, the area of contamination, and the decon resources available. Survivability and reducing the effect of any chemical threat are the ultimate goals of decon. This manual provides detailed guidance on conducting decon operations performed by chemical and nonchemical personnel. Individual soldiers and leaders must be familiar with the basic procedures and concepts in this manual.

Appendix A contains an English to metric measurement conversion chart.

The proponent of this publication is Headquarters TRADOC. To submit changes for improving this publication use Department of the Army (DA) Form 2028 (Recommended Changes to Publications and Blank Forms) and forward to Commandant, US Army Chemical School, ATTN: ATSN-CMZ, Fort Leonard Wood, Missouri 65473-8926.

*Unless this publication states otherwise, nouns and pronouns do not refer exclusively to men.*



## Chapter 1

# Introduction

The use of NBC weapons creates unique residual hazards that may require decon. In addition to the deliberate use of these weapons, collateral damage, natural disasters, and industrial emitters may require decon. The presence of contamination generally reduces the effectiveness of our combat power. Contamination forces us into protective equipment that degrades our ability to perform individual and collective tasks.

### CONTAMINATION FORMS

1-1. The following are the different forms of contamination:

- Solids – radioactive particles, biological spores, or dusty agents that could appear as a fine dust.
- Liquids – liquid droplets that fall like rain. Droplets can range from thick and sticky to the consistency of water.
- Vapors or gases – created by bursting munitions or generators. These clouds are affected by the weather and can cover large areas.
- Aerosols – fine liquids or solid particles suspended in the air. They behave much like vapors.

### CONTAMINATION-HAZARDS TRANSMISSION

1-2. Contamination hazards can be transmitted in the following manner:

- **Transfer.** Anything that touches a surface covered with liquid or solid contamination will tend to pick up that contamination and move it from one surface to another.
- **Spread.** Touching a surface covered with liquid chemical agent can spread contamination on the same surface, thereby, increasing the size of the contaminated area.
- **Vapor.** Vapors can be carried through the air in the form of a dust, atomized liquids (aerosols), or true gases. Vapors in an open/outdoor area disperse rapidly, so there is no need to decon.
- **Desorption.** Liquid-chemical contamination absorbs into porous surfaces. Once absorbed, it begins to desorb or give off gas; that is, low levels of vapor pass out of the contaminated surface into the air and can be transferred to any surface that contacts it, including bare skin.
- **Radiation.** Radiation is given off by radioactive dust or dirt, most of which appears as fallout. For decon purposes, radiation can be thought of as a solid.

## AGENT CLASSIFICATION

1-3. Depending on the length of time agents will be a hazard, they are classified as—

- Nonpersistent – an immediate threat that lasts a few minutes. They rarely require decon.
- Persistent – takes a longer time to act and may last for days. In a protected environment, these agents can last for long periods of time. All agents are affected to some extent by the weather. Even radiological particles can “rain out” of the air and form hot spots on the ground. Biological organisms are greatly affected by sunlight. Chemical agents can be decontaminated by the weather. The duration of a hazard is a complex estimation that is based on numerous factors which include the—
  - Type of contamination.
  - Contamination density and droplet size.
  - Temperature.
  - Wind speed.
  - Sunlight.
  - Humidity and rain.
  - Composition of the contaminated surface.
  - Type of soil and terrain.

## DECONTAMINANTS

1-4. Decontaminants are described as follows:

- Natural – weather (rain, wind, and humidity).
- Standard – supertropical bleach (STB) and decontaminating solution number 2 (DS2).
- Nonstandard – soaps and detergents.

1-5. For more information on the types of decontaminants, see Appendix B.

## DECON CONCEPTS

1-6. Whenever soldiers are unable to avoid contamination and have to use protective measures, decon is necessary to allow them to remove their protective gear and resume normal operations. Weathering is the most desirable means of decon; however, time and operational needs may not permit that option.

1-7. This chapter describes when, where, and how much to decon. Protective clothing (mission-oriented protective posture [MOPP] gear), protective equipment, and collective protective shelters (CPSs) offer only a temporary solution. Decon is the removal, destruction, or naturalization of contamination. If you become contaminated, some decon must occur as soon as possible.

## DECON DECISIONS

1-8. The decision to decon is a risk assessment and is made within the context of the mission, enemy, terrain, troops, time available, and civilian

consideration (METT-TC) and the resources available. Decon must be considered if the contamination levels exceed the negligible risk levels as follows:

- Chemical and biological contamination causes mild incapacitation in 5 percent or less of unprotected soldiers operating for 12 continuous hours within 1 meter of contamination. For the chemical-agent monitor (CAM), this equates to a one-bar reading at a distance of 1 inch from the surface.
- Radiological contamination can cause mild incapacitation in 2.5 percent or less of unprotected, nonpreviously exposed soldiers. This equates to a reading of no more than 0.33 centigray per hour (cGy/hr).

1-9. MOPP-gear exchange provides excellent protection against field concentrations of agents; however, wearing the gear causes performance degradation. Decon is performed to restore the normal operating tempo, but the logistical support that is required to keep soldiers in MOPP gear impacts operations. Therefore, decon should be conducted as soon as practical. Table 1-1 provides comparison data for decon levels/techniques.

**Table 1-1. Comparison Data for Decon Levels/Techniques**

Levels	Techniques <sup>1</sup>	Best Start Time	Performed by	Advantages
Immediate	Skin decon	Before 1 minute	Individual	Stops agent from penetrating.
	Personal wipe down	Within 15 minutes	Individual or crew	
	Operator's spray down			
Operational	MOPP-gear exchange <sup>2</sup>	Within 6 hours	Unit	Provides possible temporary relief from MOPP <sup>4</sup> . Limits liquid agent spread.
	Vehicle washdown <sup>3</sup>		Battalion crew or decon platoon (-)	
Thorough	DED and DAD	When mission allows reconstitution	Decon platoon	Provides probable long-term MOPP reduction with minimum risk.
	DTD		Unit	

<sup>1</sup>The techniques become less effective the longer they are delayed.  
<sup>2</sup>Performance degradation and risk assessment must be considered when exceeding 6 hours. See FM 3-4 for battle-dress overgarment (BDO) risk assessment.  
<sup>3</sup>Vehicle washdown is most effective if started within 1 hour.

## DECON PRINCIPLES

1-10. Decon immediately for a chemical agent on the skin. Perform higher levels of decon as a result of the risk assessment. Personnel should—

- Decon as soon as possible. The sooner the contamination is removed, the sooner MOPP levels can be reduced and combat power can be restored.
- Decon only what is necessary. Weathering is the least costly method of decon. Expend resources where they count.
- Decon as far forward as possible. While METT-TC dependent, performing decon as close to the point as possible reduces the spread of contamination and minimizes any transfer hazard.
- Decon by priority. The commander identifies which items are most critical to the mission. Restoring combat power and reestablishing operating tempo are key.

## **DECON LEVELS**

1-11. The three levels of decon operations are immediate, operational, and thorough (see Table 1-1, page 1-3).

### **IMMEDIATE**

1-12. Skin decon is a soldier's basic survival skill and should be performed within 1 minute of being contaminated using the skin decontaminating kit (SDK).

1-13. Personal wipe down should be performed within 15 minutes. This is done to remove contamination from individual equipment by using an individual equipment decon kit (IEDK). Use detector paper or a CAM to locate the agent. For radiological contamination, use a radiac set to locate it and then brush, wipe, or shake it off.

1-14. Operators' spray down should be done within 15 minutes. Operators use the on-board decon apparatus to decon surfaces that they must touch or contact to operate the equipment. Radiological contamination in the form of dust particles may be wiped, scraped, or brushed off.

### **OPERATIONAL**

1-15. A MOPP-gear exchange should be performed within 6 hours of being contaminated when thorough decon cannot be done. Soldiers will continue to wear MOPP gear and the operating tempo will be reduced.

1-16. Vehicle washdown should be performed within 6 hour of being contaminated when the mission does not permit a thorough decon. This process removes gross contamination and limits the spread of it.

### **THOROUGH**

1-17. Detailed equipment decon (DED) and detailed aircraft decon (DAD) restore items so that they can be used without MOPP gear. Normally, the DED and the DAD are conducted as part of a reconstitution or during breaks in combat operations. These operations require support from a chemical decon unit.

1-18. Detailed troop decon (DTD) normally takes place in conjunction with DED/DAD. The contaminated unit conducts this process and supports the DED/DAD operations.

## **CHEMICAL-AGENT-RESISTANT COATING (CARC)**

1-19. Army equipment is painted with CARC, which precludes the absorption of chemical agents and, thus, facilitates decon. By preventing penetration of an agent, contamination is easier to remove. Thickened agents are still a problem, but detergent and water should remove them.

1-20. The proper CARC paint colors should be used to paint bumper numbers, spot painting, and so forth. Do not use other paints in lieu of CARC.

## **WEATHER EFFECTS**

1-21. If METT-TC allows, leaving the contamination alone is the easiest method of decon. However, marking, reporting, and periodically rechecking the contamination are required.

### **TEMPERATURE**

1-22. The higher the temperature, the faster the rate of evaporation. Contamination persistency decreases as the temperature rises. It has no effect on radiological contamination.

### **WIND**

1-23. Aeration aids in decon. Agents are dispersed by the wind, thus reducing the concentration.

### **HUMIDITY AND RAIN**

1-24. Moisture tends to break down chemical agents but does so slowly. Heavy rain physically removes contamination; however, contaminated runoff may build up in drainage areas. Biological agents dehydrate (dry out) in low humidity, thus reducing their persistency. Rain may prevent the desorption of aerosols and leach contamination into the soil.

### **SUNLIGHT**

1-25. Sunlight hastens the evaporation and decomposition of agents. Ultraviolet and infrared radiation in sunlight rapidly kills most biological agents.

### **TIME**

1-26. Only time will neutralize and destroy radiological contamination. Other techniques merely shield or remove the problem.

## **DECON IN COMBAT**

1-27. Combat effectiveness is degraded by MOPP. Decon can remove the contamination and restore combat power. The detection and warning network is vital to ensure that soldiers and equipment are protected when contamination is encountered. Considerations of decon in combat are—

- Immediate decon. It saves lives and permits the use of individual equipment and key systems.
- Operational decon. It reduces the spread and the level of contamination. In some cases, when combined with weathering, MOPP levels may be reduced without further decon.
- Thorough decon. It removes the unit from the fight but allows it to return with restored effectiveness.

1-28. Figure 1-1 depicts the drop in effectiveness as the affected unit and soldiers react.

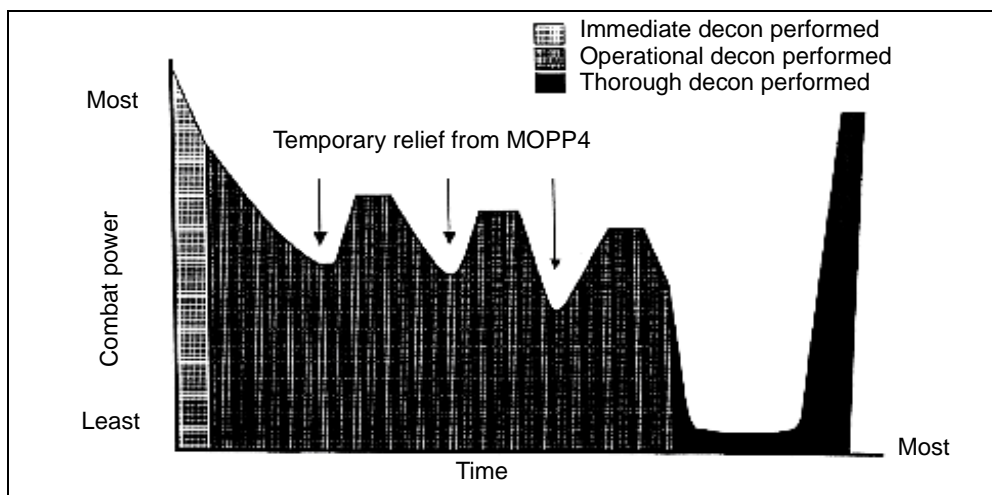


Figure 1-1. How Decon Affects Combat Effectiveness

## Decon-Operation Scenario

*You are the commander of the 155-millimeter Self-Propelled Howitzer Battery. Your unit is hit by a persistent nerve agent. Soldiers react by taking cover and going to MOPP4. The warning system provided sufficient alert and only a few have to conduct skin decon; most contamination is on the outside of your howitzers and vehicles.*

*The ongoing fire mission continues with minimal disruption, and the enemy is being detected. Your well-trained soldiers complete a personal wipe down and an operator's spray down as soon as possible. During this period, you are capable of providing fire support and moving, as necessary.*

*The temperature is 55°F, and humidity is low. While the work rate is strenuous, your troops drink water and suffer no heat casualties. However, after several hours, your response times to the fire mission are getting longer and soldiers have not eaten in more than 12 hours.*

*Upon making a decision to decon, you request support from your battalion. Coordination is made for an operational decon en route to an alternate position. You have 2 ½ hours to complete the movement and be in a firing position. The alternate position is 20 minutes away, with the decon site about halfway.*

*You send the advance party to meet the supporting power-driven decon-equipment (PDDE) crew and organize the site. The crew sets up and runs the vehicle washdown while the advance party, with battery supply personnel, prepares the MOPP-gear exchange.*

*The battalion chemical noncommissioned officer (NCO) directs the vehicle washdown as you rotate one platoon at a time through the site. The firing platoons go quickly as it is critical to have the artillery firing tables available. You complete the operation and are in position to fire at the prescribed time. Your soldiers are in MOPP4 because a vapor hazard still exists from the residual contamination. The advance party found the new area clear of contamination, and ammo resupply commences.*

*As sections begin improving their positions, gun crews one and two leave one soldier on each gun and move the rest of the soldiers 65 feet upwind. After a check on contamination proves negative, the battery NBC NCO directs unmasking procedures using two crew members. When no symptoms show up, the crews eat and get relief from the masks. The wind direction is monitored to ensure that the soldiers stay upwind of any vapors desorbing from their equipment.*

*Soldiers on the guns rotate into the clean area for rest and relief. Those returning to the guns assume MOPP4.*