UNIT 5.2
MISSION SPECIFIC:
Technical Decontamination

TERMINAL OBJECTIVE
Given scenarios involving hazardous materials/WMD incidents, the operations level responder assigned to technical decontamination operations, shall select a technical decontamination procedure that will minimize the hazard and spread of contamination, then determine the equipment required to implement that procedure. (OPS-TD 1.2)
EDUCATIONAL OBJECTIVES

Identify the advantages and limitations of technical decontamination operations. (OPS-TD 1.2.1)

Describe the advantages and limitations of each of the following technical decontamination methods:
- Absorption
- Adsorption
- Chemical degradation
- Dilution
- Disinfection
- Evaporation
- Isolation and disposal
- Neutralization
- Sterilization
- Solidification
- Vacuuming
- Washing (OPS-TD 1.2.2)

Identify sources of information for determining the correct technical decontamination procedure and identify how to access those resources in a hazardous materials/WMD incident. (OPS-TD 1.2.3)

Given resources provided by the AHJ, identify the supplies and equipment required to set up and implement technical decontamination operations. (OPS-TD 1.2.4)

Identify the procedures, equipment, and safety precautions for processing evidence during technical decontamination operations at hazardous materials/WMD incidents. (OPS-TD 1.2.5)

Identify procedures, equipment, and safety precautions for handling tools, equipment, weapons, criminal suspects, and law enforcement/search canines brought to the decontamination corridor at hazardous materials/WMD incidents. (OPS-TD 1.2.6)

Given a scenario involving a hazardous materials/WMD incident and the emergency response plan and/or standard operating procedures, demonstrate the technical decontamination duties assigned in the incident action plan. (OPS-TD 2.1)

Identify the role of the operations level responders assigned to technical decontamination operations during hazardous materials/WMD incidents. (OPS-TD 2.2)

Describe the procedures for implementing technical decontamination operations within the incident command system. (OPS-TD 2.3)
Demonstrate the ability to set up and implement the following types of decontamination operations:

- Technical decontamination operations in support of entry operations
- Technical decontamination operations for ambulatory and non-ambulatory victims (OPS-TD 2.4)

Given examples of contaminated items that have undergone the required decontamination, identify procedures for determining whether the items have been fully decontaminated according to the standard operating procedures of the authority having jurisdiction and/or incident action plan. (OPS-TD 3.1)

Given a scenario involving a hazardous materials/WMD incident, complete the reporting and documentation requirements consistent with the emergency response plan and/or standard operating procedures. (OPS-TD 4.1)

Identify the reports and supporting technical documentation required by the emergency response plan and/or standard operating procedures. (OPS-TD 4.1.1)

Describe the importance of personnel exposure records. (OPS-TD 4.1.2)

Identify the steps in keeping an activity log and exposure records. (OPS-TD 4.1.3)

Identify the requirements for filing documents and maintaining records. (OPS-TD 4.1.4)
### UNIT TIMELINE

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<td>5 min.</td>
<td>Discussion</td>
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<td>5 min.</td>
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<td>Decontamination</td>
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3 hrs TOTAL

### REQUIRED MATERIALS

- Visuals for Unit 5.2
- Video “Technical Decontamination”
I) INTRODUCTION (5 MINUTES)

A) Goal

B) Local policies and technician oversight requirement

1) Use of decontamination procedures in the hazardous materials/WMD setting must be directed by organizational policies and procedures or, directed by the technical over-sight of trained hazardous materials technicians.

C) Objectives

1) Describe the different methods of decontamination

2) Identify sources of information that can aide in the development of a decontamination plan

3) Identify equipment available to the responders for the performance of decontamination in their community

4) Describe how to integrate decontamination into the incident command system

D) Evolutions

1) Evolutions will be based upon the decontamination equipment provided by the organization.

II) DEFENSIVE OPERATIONS (5 MINUTES)

A) Conducting defensive operations

In this module we will discuss the means by which defensive operations can be carried out by operations level responders. These defensive operations may be those conducted at an incident which is operations level in nature or, incidents in which operations level personnel are providing support to technician level responders.
B) Operations that will be discussed
   1) Decontamination
   2) Spill control
   3) Leak control
   4) Fire control

C) Remember the rules of engagement
   1) Must be properly trained
   2) Must be protected
   3) Act from a safe distance

III) DECONTAMINATION OVERVIEW (5 MINUTES)

A) Definition of contamination
   1) Primary (direct) contamination
   2) Secondary (cross) contamination

B) Exposure vs. contamination

Discuss that only contaminated persons need to go through decontamination procedures. For instance, if a person is exposed to radiation and then removed from the area, he should not need decon unless he actually came in contact with the radioactive product. The same is true for responders. If the responders avoid contamination at a hazmat incident, they will not need decontamination.

C) Avoid contamination
   1) Follow SOPs
   2) Use the NAERG
   3) Use information provided in this course
   4) Stay upwind and uphill
D) Definition of decontamination

Decontamination is a systematic process of removing contaminates from victims, responders or equipment in order to reduce exposure and prevent the spread of contamination. Discuss the idea of risk based decontamination.

E) Decontamination can take on many forms

1) Emergency decontamination
2) Mass decontamination
3) Technical decontamination

F) Assess decontamination methods and resources

1) What are the product hazards?
2) What is the physical state of the chemical(s)?
   
   (a) Solids and liquids — Represent the greatest threat to cross contamination
   
   (b) Gases and vapors — People exposed only to gases or vapors generally do not present a significant risk of secondary contamination once their clothes have been removed.
      
      • However, if the gas is water soluble, it will mix with perspiration on the skin and then be absorbed into the bloodstream.

IV) TYPES AND METHODS OF DECONTAMINATION (20 MINUTES)

A) Types of decontamination

1) Emergency decontamination
2) Technical decontamination

3) Mass decontamination

B) Decontamination methods

1) Dry decontamination

(a) The process of physical removal by dry methods
   - Brushing
   - Removing
   - Vacuuming

(b) Does not involve the use of water or other liquids

(c) Is usually the first step of any decontamination procedure

(d) May be extremely important if the material is water reactive (e.g., sodium)

Dry decontamination methods generally start any decontamination process — the removal of clothing from victims, the brushing of bulk dry contaminates from the skin. These initial steps are generally followed by a more thorough “wet decontamination” process.

2) Wet decontamination

(a) Most commonly involves the use of water
   - Dilution of contaminates
   - Physical removal by flushing

(b) If the material involved is not water soluble (e.g., petroleum products) then a decontamination solution
may be used to enhance the water’s effectiveness.

- Most common solution is plain laundry detergent and water

3) Absorption
4) Adsorption
5) Chemical degradation
6) Dilution
7) Disinfection
8) Evaporation
9) Isolation and disposal
10) Neutralization
11) Solidification
12) Sterilization
13) Vacuuming
14) Washing

Talk about the advantages and disadvantages of each type of method and emphasize the fact that decontamination usually requires multiple methods.

V) STAGES OF DECONTAMINATION (15 MINUTES)

A) The stages of decontamination refer to the progressive “thoroughness” of the process.

1) Gross decontamination
2) Secondary decontamination
3) Tertiary decontamination
B) Gross decontamination

1) Takes place at the edge of the hot zone

2) **Goal:** Remove bulk contaminates and leave them in the isolation area

3) **Methods:** Generally a combination of dry, followed by wet methods

   (a) Dry: Remove bulk contamination by dry means

   (b) Wet: Flush with copious amounts of water to physically remove and dilute

4) **Considerations:** Gross decontamination is a “hands off” process so that cross contamination is minimized.

   This hands-off concept is very important for the operations level responder. The risk of secondary contamination is highest prior to gross decontamination. If the operations level responder can conduct this operation in a hands-off method, the risk of cross contamination is greatly minimized.

5) **Advantages:**

   (a) Once gross decontamination has been performed, the risk of cross contamination during the rest of the process is minimized.

   (b) After gross decontamination, the potential to achieve an airborne concentration that is above the permissible exposure limit is all but eliminated.

   This is not to say that achieving a PEL level in the decontamination process is not absolutely eliminated; however, it is greatly reduced. If other engineering controls and protective measures are employed, (e.g., wearing PPE, working from upwind and in a well ventilated area) then
the operations level responder should not be placed at an unacceptable risk.

There will be materials that present an exception to this rule. Highly toxic materials and carcinogens may require greater engineering controls and protective measures. However, during such instances the operations level responder will most certainly be operating with the assistance of hazardous materials technicians who can provide greater technical expertise in order to insure proper protection.

C) Secondary decontamination

1) Occurs after gross decontamination has been completed
   (a) Conducted in the warm zone

2) **Goal:** Systematic removal of contaminants in a head to toe fashion

3) **Methods:** Generally involves a thorough wash, rinse and removal of protective equipment
   (a) Should be hands-off until both the wash and rinse have been completed
   (b) Processes will vary

Depending upon whether it is being performed on a victim that does not have protective clothing on or a responder in PPE, the steps may vary. This program will discuss secondary decontamination from the standpoint of decontaminating protected responders.

4) **Advantages:** Once gross decontamination has been performed, the risk of secondary contamination is greatly reduced.

D) Tertiary decontamination

1) Involves the fine removal of any remaining contaminates
2) A tertiary decontamination is generally determined by health care professionals.

3) May involve
   
   (a) Personal hygiene showers

   (b) Skin debridement (removal of debris from dead or damaged tissues)

   (c) Dialysis

   (d) Surgical interventions

4) Personal hygiene showers immediately following the incident are the most common form of tertiary decontamination.

VI) OTHER DECONTAMINATION ISSUES (15 MINUTES)

A) Preservation of evidence

1) Decontamination efforts should attempt to minimize impact upon evidence when feasible

2) Life safety takes precedence

3) Simple actions such as ripping clothing or garments using holes started by shrapnel can be very detrimental to prosecution

4) Any evidence being brought out must be properly packaged and tracked

   (a) Triple packaging

   (b) Chain of custody

B) Disposition and decontamination of tools and equipment including weapons

1) Tools that will be used again on subsequent entries are dropped in the hot zone
2) Isolate other tools until final decontamination methods and be determined

3) Law enforcement weapons should be locked in secure containers and monitored

C) Decontamination of animals and criminal suspects

1) Safety issues for both must be addressed

2) Animal response teams should be considered for large populations of animals

   (a) Fowl

   (b) Heards

3) Veterinary assistance should be considered for both domestic and livestock

4) Ample security must be provided for suspects

Suspect decontamination and treatment should follow the same principles as any other person. However, unique system impacts and human resource requirements must be considered to insure safety of all personnel and bystanders.

D) Ambulatory victims

1) Generally triaged for decon later depending upon signs and symptoms

2) May be able to provide much of their own decontamination needs

E) Non-ambulatory victims

1) Very human resource demanding

2) 3 to 4 persons needed to handle one non-ambulatory patient

F) Determine the effectiveness of decontamination
G) Contain runoff

VII) EMERGENCY DECONTAMINATION (10 MINUTES)

A) The rapid removal of contaminates by a combination of dry and wet methods

B) Goal:
   1) Prevents or minimizes continued exposure and cross contamination
   2) Leaves gross contaminates in the hot zone (isolation area)
   3) Allows emergency medical care to be started as soon as possible
   4) Does not eliminate the need for complete gross and secondary decontamination

C) Method: Generally involves a stripping and flushing process
   1) Efforts made to retain contaminates if conditions allow
   2) Can be accomplished with standard engine company equipment

D) Advantages:
   1) Fast; greatly reduces victim exposure by getting the products off them quickly
   2) Enables supportive emergency medical care to occur rapidly
   3) Requires no specialized equipment
   4) Can be performed by first responder operations personnel provided that they have been trained and protected
      (a) Hands-off until complete
(b) Any contact after decontamination must be conducted with cautious regard for residual contamination.

5) Minimizes the risk to downstream personnel and responders

E) Setup of emergency decontamination

1) Location

   (a) Uphill
   (b) Upwind

2) Availability of water supply

3) Ability to retain runoff

4) Is the patient ambulatory or non-ambulatory?

Show overhead of how to set up engine company decontamination.

This program shows one model of engine company decontamination. Describe the setup procedures that the authority having jurisdiction will use. Discuss risk/benefit analysis with the participants. Life safety is always number one priority. If the health risk to the patient is great, doing a quick emergency decontamination would take priority over making sure we could contain runoff. Also, discuss other options to containing decontamination runoff. For example, on a street with a curb, simply dike both ends to prevent spread into a storm drain. In addition, consider if the surface is permeable or non-permeable and if you can find a natural retention area to use.

5) Decontamination steps (simplified)

   (a) Strip the patient
   (b) Flush the patient
   (c) Wrap the patient
VIII) TECHNICAL DECONTAMINATION (15 MINUTES)

A) Decontamination steps (simplified)

(a) Strip the patient
(b) Flush the patient
(c) Wrap the patient

A thorough step by step process used to remove contaminates from responders or victims in a non-urgent manner

B) Goal: Thorough removal of contaminates

C) Methods: See the table below

The instructor should be thoroughly familiar with the technical decontamination process discussed here or that is employed by the organization. There are many key points in the video that you should discuss with the participants at this time. The following table represents the steps that are demonstrated in the video:

<table>
<thead>
<tr>
<th>Step</th>
<th>Process</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Tool and Equipment Drop: Responder drops tools and equipment that might be used again or that cannot tolerate wet decontamination processes (e.g., electronic equipment).</td>
<td>HOT Zone</td>
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<tr>
<td>2</td>
<td>Outer Glove and Boot Cover Removal: Removal of outer gloves and boot covers that are NOT integrated to the protective ensemble is carried out. These two areas (the hands and feet) are most likely the most contaminated areas of the body. By removing these items, a large amount of contamination is removed.</td>
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<tr>
<td>Step</td>
<td>Process</td>
<td>Location</td>
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<tr>
<td>3</td>
<td><strong>Gross Wash:</strong> Head to toe flushing with water to physically remove and dilute the material.</td>
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<tr>
<td>4</td>
<td><strong>Primary Wash:</strong> After completing gross decontamination, the victim or responder is moved to the primary wash. At this point decontamination solutions (generally soap and water) are used to loosen or degrade the contaminates. If human skin is being decontaminated (e.g., a victim), then mild soap and non-abrasive measures should be used, such as soft sponges.</td>
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<tr>
<td>5</td>
<td><strong>Final Rinse:</strong> Flushing of the person or equipment with water to remove the decontamination solution and contaminates. Should be conducted away from the wash area.</td>
<td>Warm Zone</td>
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<tr>
<td>6</td>
<td><strong>Garment Removal:</strong> Removal of the protective garment while maintaining respiratory protective measures. Only once the garment has been removed and the responder is away from the immediate area, should respiratory protection be removed. This may be tricky if the garment is under the air pack.</td>
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<tr>
<td>7</td>
<td><strong>Air Pack Removal:</strong> Air pack is removed and isolated for further cleaning.</td>
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<tr>
<td>8</td>
<td><strong>Inner Glove Removal:</strong> Surgical gloves are worn inside the protective ensemble to insure that cross contamination is minimized during garment removal. The last step of decontamination is to remove and dispose of these gloves.</td>
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**IX) MASS DECONTAMINATION (10 MINUTES)**

A) May be required for overwhelming numbers of victims

B) **Goal:** Rapid flush of large numbers of victims in order to reduce the spread of contamination or long term adverse health effects

1) The need for mass decontamination procedures has increased in recent years due to the potential for terrorist activities.
2) When large numbers of victims are involved, environmental and runoff concerns become a lesser priority.

This is not to suggest that environmental concerns should not be taken. Efforts should still be made to contain runoff by natural means (e.g., isolating storm drains, using natural retention means such as ditches).

C) Methods: Numerous methods exist

1) Single engine company

2) Multiple engine company

The instructor should show the slides of the various methods and discuss them.

D) Considerations:

1) Large numbers of panicked people may be encountered; scene control will be a major concern.

2) Use of hand lines and deck guns in a controlled and safe manner is necessary.

3) These are hands-off operations. Getting too close to a panicked crowd can be dangerous.

X) SUMMARY (5 MINUTES)

A) Decontamination is a very important operations level competency.

B) Types of decontamination

1) Emergency

2) Technical

3) Mass

C) Methods of decontamination
UNIT 5.2 — MISSION SPECIFIC: TECHNICAL DECONTAMINATION

1) Dry decontamination
2) Wet decontamination
3) Most systems use a combination of these methods.

D) Stages of decontamination
1) Gross
2) Secondary
3) Tertiary

Activity 5.2 (60 minutes)
Field Evolution
This is a field evolution in which participants will be expected to demonstrate their ability to perform decontamination in accordance with the steps outlined both in the Instructor Guide and accompanying video. The evolution can be done at this time or later in combination with the Spill Control Field Evolution.