Unit 3.4
Decontamination (Core)

TERMINAL OBJECTIVE
Given scenarios involving hazardous materials/WMD incidents, the participant shall identify when emergency decontamination is needed.
EDUCATIONAL OBJECTIVES

Identify ways that people, personal protective equipment, apparatus, tools, and equipment become contaminated. (2.4.1)

Describe how the potential for cross contamination determines the need for decontamination. (2.4.2)

Explain the importance and limitations of decontamination procedures at hazardous materials incidents. (2.4.3)

Identify the purpose of emergency decontamination procedures at hazardous materials incidents. (2.4.4)

Identify the factors that should be considered in emergency decontamination. (2.4.5)
UNIT TIMELINE

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<th>DURATION</th>
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<td>5 min.</td>
<td>Lecture</td>
<td>Decontamination</td>
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<tr>
<td>10 min.</td>
<td>Discussion</td>
<td>Types and Methods of Decontamination</td>
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<td>15 min.</td>
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<td>Stages of Decontamination</td>
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<td>10 min.</td>
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<td>Emergency Decontamination</td>
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<td>15 min.</td>
<td>Discussion</td>
<td>Technical Decontamination</td>
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<td>Review</td>
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<td>10 min.</td>
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<td>Decontamination</td>
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1 hr 20 min. TOTAL

REQUIRED MATERIALS

– Visuals for Unit 3.4
– Video “Decontamination”

ATTITUDES TO FOSTER

NOTE TO INSTRUCTOR: This unit presents the Core Competencies for decontamination only. If the responder will be functioning in the Mission Specific areas of technical decontamination then, the content of the Mission Specific Technical Decontamination unit should ALSO be presented.
UNIT 3.4 — DECONTAMINATION (CORE)

I) DECONTAMINATION (5 MINUTES)

A) Definition of contamination

1) Direct contamination (primary)
   (a) Contact with product or vapors

2) Cross contamination (secondary)
   (a) Contact with a contaminated object

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 NAERG

3) Use information provided in this course

4) Stay upwind and uphill

5) Avoid direct contact with the product

Persons exposed only to gases and vapors present very little risk of secondary contamination once clothing has been removed.

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.
E) Risks vs. procedural

1) What are the product hazards?

2) What is the physical state of the chemical(s)?

(a) Solids and liquids — Represent the greatest threat for cross contamination

(b) Gases and vapors — People exposed only to gases or vapors generally do not present a significant risk of secondary contamination once the 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.

II) TYPES AND METHODS OF DECONTAMINATION (10 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
UNIT 3.4 — DECONTAMINATION (CORE)

(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

III) 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 contaminates 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.

IV) 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 the 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?

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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

V) TECHNICAL DECONTAMINATION (15 MINUTES)

A) 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.

<table>
<thead>
<tr>
<th>Step</th>
<th>Process</th>
<th>Location</th>
</tr>
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<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></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>
<td>HOT Zone</td>
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### Step | Process | Location
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3 | **Gross Wash:** Head to toe flushing with water to physically remove and dilute the material. | 
4 | **Primary Wash:** 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 deconed (e.g., a victim), then mild soap and non-abrasive measures should be used, such as soft sponges. | Warm Zone
5 | **Final Rinse:** Flushing of the person or equipment with water to remove the decontamination solution and contaminates. Should be conducted away from the wash area. | 
6 | **Garment Removal:** 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. | 
7 | **Air Pack Removal:** Air pack is removed and isolated for further cleaning. | 
8 | **Inner Glove Removal:** 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. | 

### VI) 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 likelihood of 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.

VII) 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
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

Show Video (Optional 10 Minutes)

Decontamination

This video may be shown to familiarize the core responder with the technical decontamination process but it is not an educational objective that they perform technical decontamination at this level of response.