



**Fundamentals of Fire Fighter Skills** Chapter 33

## Objectives

- Describe how the potential for secondary contamination determines the need for emergency decontamination.
- Identify the types of decontamination.
- Identify emergency decontamination procedures.
- Identify where and how decontamination takes place.

NFPA 2 IAFC

## Introduction

- The fire service responds to the release of hazardous chemicals and agents.
- Some chemicals and agents can injure or kill.
- Proper decontamination reduces the possibility of injury or death from exposure to these substances.

## What is Decontamination?

- The physical or chemical process of reducing and preventing the spread of hazardous materials by persons and equipment

## Contamination

- Process of transferring a hazardous material from its source to people, animals, the environment, or equipment, which may act as carriers of the contaminant

## Secondary Contamination (1 of 2)

- Occurs when a contaminated person or object comes into direct contact with another person or object
- Also known as cross contamination

## Secondary Contamination (2 of 2)

- Can occur when:
  - Contaminated victim comes into contact with a fire fighter
  - Bystander comes into contact with a contaminated object
  - Decontaminated fire fighter re-enters the decontamination area and comes into contact with a contaminated person or object

## Decontamination

- Government and industrial agencies responsible for decontaminating the environment
- Fire fighters responsible for establishing decontamination corridor for crews and victims

## Types of Decontamination

- Major categories of decontamination:
  - Emergency decontamination
  - Gross decontamination
  - Formal decontamination
  - Fine decontamination
  - Rapid decontamination

## Emergency Decontamination

- Used in potentially life-threatening situations, regardless of a formal decontamination corridor
- Formal decontamination process may follow later.
- Involves rapid removal of contaminants
  - Remove contaminated clothing.
  - Douse victim with large quantities of water.

## Gross Decontamination (1 of 2)

- Controlled through the decontamination corridor
- Reduces surface contamination by a continuous shower of water and removal of outer clothing
- High-pressure, low-volume water flow used to rinse off and dilute contaminants

## Gross Decontamination (2 of 2)

- Removal of outer clothing before proceeding to the next step
  - Fire fighters wearing fully encapsulated PPE should continue to wear SCBA.
- Proceed to formal decontamination

## Formal Decontamination

- Performed after gross decontamination and is a more thorough cleaning
- May involve several stations or steps
- Cleaning process
  - Water spray
  - Cleaning solution
  - Scrubbing with brushes or swabs

## Fine Decontamination

- Performed in isolated area of hospital
- Involves:
  - Cleaning eyes, ears, and fingernails
  - Checking body orifices
  - Swabbing nasal passages and mouth area
- Notify hospital in advance.



## Rapid Mass Decontamination

(1 of 2)

- Used in incidents involving unknown agents and large groups of people
- Quick performance of gross decontamination
- Washing off as much contaminant as possible with a massive water spray is the best and quickest method.

## Rapid Mass Decontamination

(2 of 2)

- Primary concern is to remove contaminant from a large number of victims.
- Environmental concerns are secondary; usually not time to build structures to contain runoff.
- Victims will need further decontamination

## Methods of Decontamination

- Absorption
- Adsorption
- Dilution
- Disinfection
- Disposal
- Solidification
- Emulsification
- Vapor dispersion
- Removal
- Vacuuming

## Absorption

- Spongy material mixed with liquid hazardous material
- Contaminated mixture is collected for disposal.
- Used to decontaminate equipment and property
- Effective only on flat surfaces

## Adsorption

- Contaminant sticks to surface of added material, rather than combines with it.

## Dilution (1 of 2)

- Uses plain water or a soap-and-water mixture
- Fast and economical
- Used in:
  - Gross decontamination
  - Formal decontamination
  - Mass rapid decontamination

## Dilution (2 of 2)

- Considerations
  - Will contaminant react with water?
  - Is contaminant soluble in water?
  - Will contaminant spread to a larger area?
- Water
  - Increases the hazardous waste generated, complicating safe disposal

## Disinfection (1 of 2)

- Destroys disease-carrying microorganisms
- Commercial disinfectants available
  - Consult product information for capabilities and limitations.

## Disinfection (2 of 2)

- Familiarize yourself with facilities having possible biological hazards.
  - Research labs
  - Hospitals
  - Clinics
  - Mortuaries
  - Universities
  - Medical waste disposal facilities

## Disposal (1 of 2)

- Two-step process for items that cannot be properly decontaminated
- Contaminated item is removed and isolated, then packaged and transported to an approved facility.

## Disposal (2 of 2)

- Contaminated disposable coveralls
  - Should be collected, bagged, and tagged
- Contaminated tools and equipment
  - Should be placed in bags, barrels, or buckets

## Solidification

- Chemical process to turn a hazardous liquid into a solid
  - Does not change hazardous properties
  - Easier to handle and dispose of the solid

## Emulsification (1 of 2)

- Changes the chemical properties of a hazardous material
  - Neutralizes the material
  - Reduces its harmful effects
- Local regulations may apply to use of emulsification products.

## Emulsification (2 of 2)

- Limitations
  - Product still requires proper disposal.
  - Chemicals used in emulsification may be harmful to the fire fighter.
  - Time is required to determine which chemicals can be used and to check their availability.

## Vapor Dispersion

- Process of separating and diminishing harmful vapors
- Water spray commonly used
- Use caution!
  - Rapid introduction of a large volume of air can have unexpected results.

## Removal

- Used specifically for contaminated soil
  - Toxic materials cannot be rendered harmless.
  - On-site treatment poses high risk.
  - Treatment costs exceed disposal costs.
- Reduces clean-up time
- Limits exposure risk to fire fighters

## Vacuuming (1 of 2)

- High-Efficiency Particulate Air (HEPA) vacuum cleaner utilized to remove
  - Dusts
  - Particles
  - Powders
  - Fibers
  - Some liquids

## Vacuuming (2 of 2)

- Filtering system prevents re-circulation of contaminated material.
  - Particles must be 0.3 microns or larger.
  - Filters must be replaced regularly.

## The Decontamination Process

(1 of 2)

- All personnel leaving hot zone must be decontaminated.
- Takes place in decontamination corridor
  - Between hot zone and warm zone
  - Clearly marked entry point
  - Well-lit at night

## The Decontamination Process

(2 of 2)

- The decontamination team:
  - Must wear SCBA
  - Must wear a level of PPE equal to those being decontaminated
  - Must undergo decontamination themselves before leaving area

## Steps in Decontamination

(1 of 7)

1. Tools placed in tool drop area
  - Container
  - Recovery drum
  - Special tarp
2. Gross decontamination
  - Water shower (high-pressure, low-volume water flow)

## Steps in Decontamination

(2 of 7)

3. Formal decontamination
  - Scrub and swab PPE
  - Contain water run-off
  - One to three wash-and-rinse stations
    - One decontamination team member washes; the second rinses.
    - Special attention to gloves, kneecaps, boot bottoms
    - Only one contaminated fire fighter per station

## Steps in Decontamination

(3 of 7)

4. Removal of outerwear (chemical protective clothing)
  - SCBA remains in place.
  - Removal of outer gloves
  - Decontamination team unzips PPE
  - Suit is peeled back.
  - Contaminated side only contacts itself.

## Steps in Decontamination

(4 of 7)

5. Removal of additional equipment
  - Remaining PPE
  - Support equipment
  - SCBA
    - Face shield is the last item to be removed.

## Steps in Decontamination

(5 of 7)

6. Remove inner gloves
7. Bag equipment
  - Place on contaminated side of decontamination corridor.
  - SCBA should be isolated until thoroughly cleaned at later time.
  - Tape all bags and place in recovery drum.

## Steps in Decontamination

(6 of 7)

8. Remove personal clothing.
9. Wash entire body.
  - Overhead shower is more effective than hose line.
  - Use small brushes and sponges.
  - Liquid surgical soaps in plastic squeeze bottles give best results.
  - Special attention to head and groin

## Steps in Decontamination (7 of 7)

10. Dry using towel or sheet.
  - Towels used only once
  - Place dirty towels in bags on contaminated side.
11. Don clean clothes.
  - Cotton coveralls or hospital gowns
  - Hospital booties, slippers, or flip-flops

## Medical Follow-up

- Medical evaluation following decontamination
  - Vital signs compared with baseline data
- Note and report any open wounds or breaks in skin surface.
  - Clean and treat appropriately.

## Summary (1 of 4)

- Proper decontamination reduces the possibility of injury or death from exposure to hazardous substances.
- Decontamination is the physical or chemical process of reducing and preventing the spread of hazardous materials by persons and equipment.

## Summary (2 of 4)

- Five types of decontamination:
  - Emergency
  - Gross
  - Formal
  - Fine
  - Rapid mass

## Summary (3 of 4)

- Ten methods of decontamination:
  - Absorption
  - Adsorption
  - Dilution
  - Disinfection
  - Disposal
  - Solidification
  - Emulsification
  - Vapor dispersion
  - Removal
  - Vacuuming

## Summary (4 of 4)

- Decontamination corridor established between hot zone and warm zone
- All personnel leaving the hot zone must be decontaminated.