Module 8:

Decontamination
Module 8: Decontamination

Module Description

This module covers the types, levels, and process of decontamination. Step-by-step decontamination procedures are explained, as well as the set-up of the area and equipment. Special decontamination situations such as decon for radiation and etiologic agents are discussed at the end of the module.

Prerequisites

• Students should have completed a hazardous materials operations level training program.

• Students should have completed Module 7: Personal Protective Equipment of this program.
## Objectives

Upon completion of this module, participants will be able to:

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<td>• Describe the importance of decontamination of decon personnel and equipment.</td>
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<td>• Given the possible contaminants, activities of an entry team, and appropriate resources, choose:</td>
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Module 8  
Prerequisite Quiz

1) When must a decontamination area be set up?
   a) As soon as the hazardous materials team arrives
   b) When personnel enter the Hot Zone
   c) Before personnel enter the Hot Zone
   d) When the backup team is suited

2) In emergency decontamination, which of the following is a *primary* concern?
   a) Remove solid contaminants.
   b) Remove all contaminants quickly.
   c) Avoid secondary contamination.
   d) Prevent severe injury.

3) If contaminants are corrosive, skin and mucous membranes must be flushed with:
   a) Large amounts of water
   b) No water
   c) Just enough water to remove the contaminant
   d) Large amounts of a neutralizing solution

4) Non-soluble contaminants should be removed from the skin with:
   a) Water
   b) Liquid soap and water
   c) An oil-based decontamination solution
   d) Dry blotting

5) Although other factors are involved, protective clothing is more likely to be permeated if:
   a) The contaminant is a liquid rather than a gas or solid.
   b) The ambient temperature is relatively cold.
   c) The chemical saturates a small area rather than a large area.
   d) The chemical is highly concentrated.

6) “Deactivation” is the use of cleaning agents, neutralizers, or disinfectants for decontamination and is generally used for:
   a) Loose solid contaminants
   b) Contaminants mixed with dust or debris
   c) Volatile liquids
   d) Organic compounds

7) In the decontamination process for liquid splash-protective garments, the SCBA facepiece is removed:
   a) As soon as possible
   b) After outer garments (boots and gloves) are removed
   c) After the splash suit is removed
   d) After a personal shower
8) How should you decontaminate a contaminated entry team member who experiences heat stress in the Hot Zone?
   a) Do not decontaminate; remove the protective clothing immediately
   b) Perform an emergency decontamination, then remove the clothing
   c) Perform a thorough decontamination, then remove the clothing
   d) Cool the responder, then thoroughly decontaminate and remove the clothing

9) Exposure to which type of chemical automatically prohibits the reuse of PPE?
   a) Carcinogens
   c) Hydrocarbons
   d) Combustible liquids
   e) Organic peroxides

10) PPE contamination levels can only be determined by:
    a) Thorough visual examination
    b) Wipe sampling
    c) Analysis of spent decon solutions
    d) Destructive testing
Introduction

Questions

1. What are the two main types of contamination?

2. Which type of contaminant is easier to remove, water-soluble or water-insoluble? Liquids or solids? Viscous or non-viscous liquids?

3. How do you decontaminate CPC contaminated with a water-reactive chemical?

At the Hazardous Materials Technician level, responders are trained to enter areas where contamination exists and carry out activities that may result in contamination of their protective clothing. They may also be called upon to perform rescue of unprotected persons.

It is only logical—given the premise that you are likely to get “dirty”—that equipment and procedures be employed that will ensure you get “clean”.

Your main mission is to leave the scene in better condition than when you arrived—to positively affect the outcome of the incident. Decontamination procedures can prevent the contaminant from spreading away from the initial area (“secondary contamination”) and therefore reduce the chance of exposure to people in other locations.

Decontamination Regulations

OSHA defines decontamination as “the removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health effects”. Basically it is the process used to make personnel, equipment, and the area safe by eliminating or reducing exposure to harmful substances. In actuality, decontamination is a fancy term for what our mothers always told us —“wash up well”.

OSHA 1910.120 (q)(3)(ix) states “After emergency operations have terminated, the individual in charge of the ICS shall implement appropriate decontamination procedures.”

OSHA 1910.120 (q)(6)(iii)(H) states Technicians shall “understand and implement decontamination procedures.”

These laws offer little guidance, other than specifying that decontamination must be done.
Contamination and Decontamination

Types of Contamination

There are two main types of contamination: surface contamination and permeation contamination.

Surface vs. Permeation Contamination

Surface contamination occurs when product remains on the surface of a protective garment. Dusts and other solids are usually surface contaminants. Liquids that do not permeate garment material remain as surface contaminants. Surface contamination is the easier type of contamination to detect and remedy.

Permeation contamination, on the other hand, is difficult to detect. Permeation contamination occurs when a contaminant soaks into a protective garment. Once the product has begun traveling through the material, it is very difficult to remove. If a suit is not being worn, sometimes it is best to allow a chemical to finish its journey before trying to deal with it. You can judge whether this type of contamination has occurred based on the properties of the chemical, the properties of the protective material, and the time, area and concentration of contact.

Activity

Direct and Secondary Contamination

There are also two methods of becoming contaminated: direct and secondary contamination, also referred to as cross-contamination.

Direct contamination occurs when an object or person comes into direct contact with the contaminant. In many instances it cannot be avoided (such as plugging and patch-
ing a large leak). However, all efforts should be made to avoid contact through the use of procedures, work practices and remote manipulation.

Secondary contamination occurs when a clean object or person comes into contact with a contaminated object or person. This is usually the result of poor management of the scene, inadequate procedures, or procedures that were not followed.

**Types of Decontamination**

There are two main types of decontamination: emergency decontamination and technical decontamination. The best way to protect yourself, however, is to avoid contamination in the first place.

**Avoidance**

Staying clean is the best type of decontamination. Work practices that stress non-contact with hazardous chemicals should be developed and stressed. These practices should be covered during the safety briefing.

Avoidance can be as simple as reminding responders to walk around puddles or as complicated as using remote devices like long poles to accomplish objectives. Decon personnel should be reminded to avoid touching entry members until they are thoroughly decontaminated.

Using disposable overgarments (gloves, boots, aprons, etc.) can reduce the overall contamination problem by simply removing contaminated articles.

Practice avoidance even on equipment, especially meters. Meters should be wrapped in plastic or other covering to keep chemicals from making contact. Sensor areas and displays can be left open so that proper readings can be made. Procedures that stress not putting meters down can also be helpful in keeping them uncontaminated.
Emergency Decontamination

Emergency decontamination procedures are designed to quickly decontaminate a civilian or responder who cannot wait for technical decontamination. Emergency decontamination may be necessary for someone who is in medical distress or has unexpectedly become exposed to a highly toxic chemical. The purpose is to remove, as quickly as possible, the contaminant from an exposed or ill person. The procedure should include stripping away any possibly contaminated clothing and a thorough washing. It is usually a deluge type wash with hoseline from fire apparatus. Whenever possible, the runoff should be contained or at least directed to a non-sensitive holding area. Follow up with medical evaluation or further cleaning procedures. Life saving actions should not be delayed to contain runoff.

Emergency decon is to be used in the event of an unexpected crisis. It should not routinely be used for decontamination. Jurisdictions should understand its uses and develop procedures for its use. These procedures may include duration of minimum wash, clothing used to approach victim (bunker gear and SCBA for example), methods to isolate runoff, and follow-up procedures.

Activity

Technical Decontamination

Technical decontamination is the planned and systematic removal of contaminants from personnel and equipment. It is a formalized set of procedures and equipment that is designed to progressively clean individuals and equipment.

Technical decontamination procedures also provide for the protection of those performing decontamination, protection of the environment, and isolation of any used equipment or solutions.

Technical decontamination is necessary when personnel have used chemical protective clothing for entry into the Hot Zone.
Methods of Decontamination

There are many different methods of decontamination. They range from simple (throwing away) to technical (chemical neutralization and degradation).

Dilution / Washing

Put simply, dilution is the use of water to carry away and/or dissolve or dilute a chemical hazard. Dilution effectively reduces the concentration of soluble chemicals.

Dilution is generally combined with washing. Surfactants or other agents are added to water and brushes are used to scrub contaminated items. The combination of these two methods allows you to physically remove and rinse the contaminant.

Different solutions of cleaning liquids are used for various contaminants. However, for most jurisdictions the solution of choice is a liquid detergent mixed with water. You should contact the manufacturer of the chemical protective clothing you are using before applying specialized decontamination solutions.

However, viscous substances such as fuel oils, adhesives, and ethylene glycol (antifreeze) are often difficult to remove with dilution and washing, especially if the product is not water soluble. If it cannot be adequately cleaned, clothing contaminated with viscous substances may have to be discarded. As a method of decontamination, dilution has a number of advantages. It is very effective for water soluble products; it can be used on all states of matter; it is relatively inexpensive and easy to use; and water is easily available to responders.

A major disadvantage is the generation of large quantities of contaminated runoff.

Absorption

Absorption is the process of soaking up a liquid contaminant with another medium. It is similar to wiping up a spill on the counter with a paper towel. Like dilution, absorption does not change the product or its hazards, but moves it...
from one place to another. Absorption is effective for soaking up large spills of liquid. In decon, absorbent pads are used to wipe contaminants from PPE. Examples of absorbent materials are cement dust, booms and pads, and other commercial products.

The advantages of absorption are that it produces less waste than dilution and it can be effective in removing contaminants from equipment that would not withstand dilution.

Among its disadvantages is that it does not change the hazard of the chemical; it is not very effective on chemical protective clothing; and it still produces hazardous waste.

**Adsorption**

Adsorption is the adherence of a chemical to the surface of another medium. The product does not soak through the medium as it does with an absorbent, but sticks only to the surface. Many commercial products are designed to absorb petroleum-based chemicals but not water.

Adsorption can be very useful in removing a liquid product floating on another (e.g., hydrocarbons on water). The advantages and disadvantages are similar to absorption.

**Isolation / Disposal**

Isolation is the process of segregating contaminated items from other items and personnel. Placing contaminated items in bags or specifically designated drums is an example of isolation.

Isolation is usually combined with disposal, the legal removal of contaminated items to regulated treatment or storage facilities. It is sometimes used after another method of decontamination has been performed.

Isolation is advantageous in that contaminants are not spread to other items, and the hazard is positively isolated from personnel. Disadvantages include the creation of hazardous waste which may become expensive to dispose.
Chemical Degradation / Neutralization

Chemical degradation is a process in which a hazardous chemical is changed or degraded into another, less hazardous compound by the addition of a non-reactive substance. Frequently used agents are isopropyl alcohol (rubbing alcohol), sodium hypochlorite (bleach), sodium hydroxide (drain cleaner), sodium carbonate (washing soda), calcium oxide (lime) and weak, dilute acids. These agents, usually used in a washing solution, react with the contaminant and change it to a less hazardous chemical.

Neutralization is a form of chemical degradation used with acids and bases. The products of an acid-base reaction are usually gas and some type of salt solution. The objective is to bring the pH as near to neutral (7) as possible.

Advantages of chemical degradation/neutralization include eliminating or changing the hazards of the contaminant, and production of less hazardous runoff.

However, there are a number of disadvantages to using chemical degradation/neutralization. It is difficult to determine correct concentrations; heat may be generated by chemical reactions; equipment (especially CPC) may be damaged by degradation agents; and it may be difficult to get specific information for agents to be used in degradation. Also, the agents should never be used directly on skin.

Chemical degradation is a complicated, technical procedure and should never be used on personnel or their CPC unless the reactions and products of reactions are known not to cause further damage. Remember that in this type of decontamination, the responder is deliberately exposing personnel and equipment to a chemical. You need to do comprehensive research before using this method on personnel.

Evaporation

Evaporation is a process where the liquid portion of a contaminant is allowed to evaporate or “off-gas”, either completely disappearing or leaving behind solids dissolved or suspended in solution. This process can happen without
responder intervention. For example, if an entry team member is exposed to volatile solvents such as acetone, alcohols, acrolein, or ethyl bromide, a product that begins evaporating immediately, there may be none left when the responder reaches decon.

Evaporation reduces or removes a hazardous chemical and produces less hazardous waste. However, the vapors that are generated may be dangerous and are difficult to control. Also, it may take an extremely long time for the process to be completed, depending on the vapor pressure of the liquid.

**Solidification**

Solidification is a process by which another agent is added to a hazardous liquid and combines with it physically and/or chemically to produce a solid. Usually this is done by contractors to prepare the hazard for disposal.

As an example, there is a commercial product used for solidification which is a mixture of hydrocarbon polymers and additives. This grainy material can be used loose in sweeping operations or placed into booms or pillows for use on waterway spills. It is designed for use on hydrocarbon spills, such as gasoline, fuel oils, hydraulic oils, etc. It can also be used on aromatic and chlorinated solvents.

This product absorbs the target chemical quickly. Usually the target chemical is transformed into a rubber-like substance within an hour. The materials used are hydrophobic, which means they will not absorb any water.

Solidification limits the spreading of the hazard and makes it easier to handle. However, this method increases the amount of material you have to deal with, and it may not reduce the hazards of the substance.

**Vacuuming / Blowing**

Vacuuming uses High Efficiency Particulate Filter (HEPA) vacuum systems to remove dust or other solid hazardous materials from personnel or equipment. Advantages of vacuuming include removal and isolation of product;
removal of product down to 3 microns in size; and reduction in amount of waste generated. Vacuuming has disadvantages as well. It can be time consuming; equipment can be expensive; and filters need to be changed frequently.

Blowing uses compressed air to blow off or remove dust and some liquids. It is convenient for emergency responders because of the availability of compressed air. However, if the product is blown off, the possibility of further contamination exists unless the surrounding atmosphere can be controlled.

**Dry Decontamination**

Many teams practice a procedure called dry decontamination. Use dry decontamination methods only when the hazard involves a low-toxicity material, and only if it is a gas, vapor, or liquid with a high vapor density. In some cases, such as extremely cold weather or lack of water, dry decon may be your only option.

In this procedure, team members in CPC stand in an isolated area and remove their own chemical protective clothing by peeling it down around them and folding it down from the inside out. They then step away from the chemical protective clothing for removal of SCBA. (If they stand on a large isolation bag the suit can be immediately sealed and isolated).

This procedure has significant cross-contamination risks because usually decon personnel must help with the initial phases of chemical protective clothing removal. As a result, dry decon should be used only when absolutely necessary.
Setting Up a Decontamination Area

Decontamination activities take place in the Warm Zone, often known as the contamination reduction zone or CRZ. It is a separate corridor through the Warm Zone that serves as a bridge from the Hot Zone to the Cold Zone. The decontamination area should serve as a bridge—not as a pipeline for contaminants.

Placement

Decontamination areas must be set up before entry into the Hot Zone.

Decontamination corridors, known as the decon line have a “dirty” end where contaminated items or persons enter, and a “clean” end where decontaminated persons or items exit to the Cold Zone. Decontamination lines also have a clean side (usually upwind perpendicular to the line of travel), and a dirty side. Decontamination personnel usually stand on the clean side.
Decontamination should be located near the access point to the Hot Zone, where entry teams enter and exit. Whenever possible, decontamination is located so that contaminants flow back into the Hot Zone (including wind driven contaminants). It should be located in a sheltered area, away from wind, sun, or rain. Decontamination should also be located away from environmentally sensitive areas such as streams or watersheds. Finally, it should be clearly marked and easy to see.

A decontamination group/sector should be established. The supervisor should assist and confer with the IC or appropriate supervisor regarding placement of the decontamination area.

You may have to compromise when selecting a decontamination site. For example, the best site (proper terrain and shelter) may not offer proper access to the site. Or, because of weather, you may choose to set up inside a structure, even if it is some distance from the Hot Zone. In this case, a quick decon outside the work zone may be done before the formalized decontamination inside.

Emergency scenes are seldom ideal. You must completely understand decontamination procedures, equipment, and concepts to safely deploy it.

**Activity**

**Choosing a Method**

After it is decided that entry will be made, the type of decontamination must be determined. You must consider the following:

- **Product**—What product(s) will be encountered and what are their properties? Are the equipment and materials available for successful decontamination?
- **Weather and ambient conditions**—Is it too cold to use water outdoors? Is there a danger of runoff contaminating sensitive areas?
- **Topography**—Is a suitable, safe site available?

Many jurisdictions choose to equip themselves to only provide dilution/washing and isolation/disposal decontami-
nation at an incident. This is the easiest, least expensive, most familiar and most versatile type of decontamination. Chemical degradation is reserved for equipment and can be done off-site under controlled circumstances. Most jurisdictions have the ability to brush or blow off solid matter if necessary. As discussed previously, this method may cause additional problems.

In many cases the question is not what type of decontamination is necessary, but rather, is the available type adequate or can it be modified so that it is acceptable. These decisions should be made by personnel experienced in hazardous materials, entry, and decontamination (Technicians or outside experts).

**Station Concept**

As previously discussed, technical decontamination is a systematic approach designed to progressively clean contaminated articles. This progression is usually accomplished at a number of different stations.

A station is a stop-off where a particular procedure is performed before personnel or equipment can move further toward the clean end. There are many and varied ways to set up decon stations. The EPA has a model 19-station decontamination line that uses two separate stations to remove gloves and boots. The number of stations needed is not fixed, governed by law, or standardized; rather, it is determined by the jurisdiction based on likely hazards, equipment and personnel allocation.

Stations can also be set up, unmanned. An example would be a large shower that entry personnel turn on, or is turned on remotely. This type of shower does not require any intervention by a decontamination person, other than to observe and direct the occupant to the next station when the shower is completed.

The number of stations and level of decontamination should be governed by a risk analysis. Stations are organizational and visual tools to simplify decontamination, ensuring that it takes place efficiently, adequately, and safely.
Factors

The amount of decontamination required is directly related to the amount and type of contamination encountered. A number of factors affect the level of contamination of workers and their tools.

Work Activities

Avoid contact with contaminants by staying alert and using good procedures. If the entry team is engaged in activities requiring significant contact with products such as plugging and patching, then garments and tools may become contaminated.

Chemical Properties

State of Matter

While gases and vapors permeate faster than other forms of matter, minimal gas or vapor will be present on personnel garments when they reach the decon line (some may get trapped in creases and folds). These personnel will need a decontamination.

Depending on ambient conditions, highly volatile liquids are also less likely to survive the trip to the decontamination line because they will probably evaporate.

Viscous liquids pose the greatest decontamination challenge because they cling to clothing surfaces. If non-soluble, they will be difficult to remove from clothing and will require substantial physical effort to scrub and wash away.

Solids usually do not present a major challenge to decon personnel. A station to brush, vacuum, or blow away as much product as possible can be used. After that, a minimal decon effort is required.
Toxicity and Route of Entry

Chemicals that are extremely toxic or pose skin absorption hazards should be removed thoroughly. These chemicals pose a significant risk to all personnel in the area and all efforts should be made to ensure they are removed completely.

Water Solubility

Water soluble chemicals are best removed by washing and dilution. Chemicals that are not soluble may also be removed by water and a surfactant, but will stay in the runoff intact (float or sink), and require more physical effort to remove.

Water Reactivity

Water reactive chemicals are very difficult to remove. Chances are that a water reactive chemical is already reacting when the entry member is decontaminated. This is because in most parts of the country there is enough moisture in the air to begin the reaction. Removal of the chemical by brushing, blowing, or vacuuming is recommended. After this, water dilution and washing may be necessary. As with many water reactives, copious amounts of water will help ensure safety.

Activity
Set-Up Considerations

Protection of Decon Personnel

Personnel performing decontamination also need chemical protective clothing and equipment to protect themselves from chemical hazards they may contact.

The amount of contaminant decon personnel are exposed to is considerably less than that of the entry team.

The level of protection required by decon personnel changes depending on the level of contamination encountered by the entry team and where the decon personnel are in the decon line. For instance, when an extremely toxic, skin-absorbed product such as a pesticide is suspected, the first decon person may be in Level A protection. If the risk analysis determines that the harmful effects of the product will be removed at that station, then the next person in line may be in Level B.

The work activities of the decon team may also affect their level of protection and risk of exposure. If your jurisdiction’s procedures and equipment are designed to minimize contact with contaminated personnel and equipment (e.g., using unmanned showers, long handled brushes and long rinsing wands), then the level of protection may not be as high as when decon personnel are required to “handle” contaminated personnel.

The most common level of protection in a decon line is Level B. If water is being used, there will be a splash hazard and SCBA is almost always available. The decision
on whether to use compliant or non-compliant, re-usable or limited use garments is made by your jurisdiction based on your needs, hazard analysis and resources.

Structural fire fighting gear can be worn by decon personnel in certain situations, such as when the contaminant has been identified and will not pose a hazard. It is not a recommended practice, however. In most cases, decon personnel should wear the same level of PPE as the entry team or, at a minimum, one level lower.

Whenever possible, decon personnel should wear disposable or limited use garments. This simplifies the level of decon they must receive, as well as overall maintenance considerations.

**Segregation of the Decon Line**

The area in which decontamination takes place should be separated from the surrounding Warm Zone. This is an administrative control that signals to responders where they should or should not go. It also serves as a visual check for the decon group/sector supervisor to see if inappropriate personnel are in the decon line.

This separation can be accomplished with the use of road cones, barrier tape, barricades, or other items that define the area.

Another method is to use a brightly colored tarp of appropriate size (at least 40’ by 20’) as the base for decon. The tarp delineates where the decon area is, makes it plainly visible and can serve as a secondary container for runoff.

**Contamination Containment**

If water and/or decon solutions are used, make every effort to contain them so that contaminated liquid can be disposed of properly. Use a containment device of some sort at each station where water or solution is used. A tarp or plastic sheet is usually suitable.

If a tarp or plastic sheet is used, place it over a hoseline filled with water to form a shallow pool. Even though it is only 3” high, a 40’ by 20’ pool could contain more than 1,400 gallons of water.
Isolate items removed during the decon process in containers to reduce the chances of cross-contamination. Use separate containers for items to be further decontaminated and reused, and those designated for disposal. Buckets, 55-gallon drums, or tarps are convenient to contain items.

**Adequate Personnel**

Like everything else in hazardous materials response, decontamination is a personnel-intensive operation. Adequate personnel must be present for the process to work. At a minimum, each set-up station (except those designed to be unstaffed) should have a decon person assigned. If possible, two personnel should be at each station at which the entry team is scrubbed.

There should be a supervisor for the entire decon operation. The supervisor should not be involved in the physical process of decontamination. Some jurisdictions require that the supervisor dress to the same level as the decon personnel, just in case an extra person is needed in the event of a crisis. In any case, if an entry member or decon person goes down or a suit breach occurs, the supervisor must ensure immediate intervention.

**Adequate Equipment**

Too often, a department’s efforts and monies are concentrated on the entry and backup aspects of hazardous material mitigation. What is forgotten is that for proper, safe mitigation to take place, sufficient decon resources are also needed.

Chemical protective clothing of the proper size, style and material must be available for decon personnel. Since there may be 3-6 (possibly more) personnel performing decon, a department will need a large number of suitable garments.

Adequate respiratory protection must also be available. Usually this is not a problem in a well equipped fire department, but you must consider the cylinder duration of SCBA. Decon personnel should be equipped with the longest duration, lightest weight cylinders available. Decon personnel should go on air when the entry team begins to exit the Hot Zone.
Adequate Procedures

Personnel involved in decontamination should be guided by specific procedures. These procedures should address normal operations as well as emergency situations.

Provisions for medical evaluations and proper hydration must also be considered. In many cases, decon personnel do more physical work than the entry personnel they are decontaminating. Decon personnel are subject to all the stresses of persons wearing and working in CPC and therefore should be treated the same regarding their pre and post use of chemical protective clothing.

Activity
Decontamination Equipment

Much of the equipment used in decontamination is readily available at hardware, department, or building supply stores. Many teams manufacture their own devices from plumbing or other supplies.

There are also many specialty decon items available from vendors. The main requirement for equipment used in decontamination is that it be effective and easy to use. If you are concerned about contamination of the decon equipment, use inexpensive, readily available items, so that disposal is a viable, cost effective option.

Required Equipment and Supplies

There are a number of items that decon set-up requires:

Equipment Drop

An equipment drop should be provided just before the entry into the decon area. Entry team members can leave possibly contaminated items in the area for re-use by another entry team or later decontamination.

The equipment drop can be as simple as a tarp, sheet of plastic, or some type of closed container.

Base Cover

As suggested earlier, a salvage type synthetic disposable tarp may be used. It should be large enough to contain the maximum decon effort. It can be covered by a plastic sheet to protect it for later re-use.

Containment pools

Decon pools to contain runoff from washing and rinsing are necessary. Specialty companies market fold-out pools of
various sizes but many hazardous materials teams use rigid or inflatable children’s wading pools. They are inexpensive and can hold relatively large amounts of liquid. Any station that uses liquid in the decon process should be equipped with a pool.

Isolation Steps

Pools should contain some kind of elevated device on which the person being decontaminated can stand to keep his/her feet out of the runoff. These platforms can be made from discarded plastic milk or bread cases, and disposed of when appropriate.

Shower(s)

There are many commercially produced decon showers available. These showers produce even flows of coarse water, many from a lateral as well as a vertical direction.

A shower just needs to provide an adequate flow of water. Even a hoseline with applicator attached and hung from an A-frame ladder can do the job.

 Brushes

Soft-bristled, synthetic car wash type brushes with long handles can be used to scrub chemical protective clothing. A handle three to five feet long is sufficient. These brushes are usually inexpensive enough to be considered disposable.

Solution containers

Commercially available buckets can be used as containers to hold decon solution. Brushes can be dipped into the solution and then applied to the contaminated garment. However, this does cause a slight cross-contamination problem.

Some jurisdictions place their decon solutions in pump-type garden sprayers and spray the solution onto the items to be decontaminated. This creates less splash and keeps the solution relatively isolated.
**Discard Containers or Drops**

Containers to hold discarded or removed items should be maintained at any station where items are removed.

You can use trash cans, waste baskets, half barrels or similar containers. Heavy bag-lined cardboard boxes can also serve the purpose.

In any case, containers used for the storage or disposal of contaminated items should be lined with a heavy plastic bag. This protects the container for later reuse and facilitates the removal of the items for final decontamination or disposal.

**Rescue Devices**

You will need patient-carrying devices in case there are non-ambulatory victims (or entry persons) at the scene. Perhaps the easiest to use is a wire-type stokes basket. Its wire mesh construction is especially useful in allowing decontamination solution and rinse water to flow around a victim. Stokes baskets are also easily cleaned.

Plastic or fiberglass types of stretchers with openings can serve the same purpose, without the danger of wire puncturing skin or garments. Wooden backboards are generally not recommended because they are difficult to decontaminate.

**Stabilization devices**

Entry personnel entering decon usually are tired, hot, and anxious to get out of their CPC. They may be suffering from heat stress and may be visually impaired by fogging.

Moving from station to station is difficult at best. Team members often need assistance in maintaining their balance.

Rather than have decon personnel risk secondary contamination by touching or holding the entry team member, supply a support for the entry personnel to hold onto. Hospital type walkers have been very effective in assisting
entry personnel in keeping their balance. They are readily available, easily cleaned and relatively inexpensive. A stabilizing device should be located at each station where personnel will be expected to climb in and out of pools or lift their feet for boot removal.

**Water Transport and Supply**

Many decon operations can be handled by an engine’s tank water (500 gallons). If you expect the operation will require more water, you should arrange for an additional supply in advance. Fire engines can be used to transport the water, but most hoselines are too big to be easily used for technical decon.

Better suited for water delivery to the decon line are regular heavy duty garden hoses. They offer flexibility, standard connections, and are readily available and inexpensive. Typical garden type spray nozzles work well. The wand type nozzles offer a gentle, controllable spray with long reach capabilities. Manifold systems that split a 1 1/2 or 2 1/2 into multiple garden hose connections are available from specialty vendors, or can be easily fabricated.

Fire pumps should not be engaged for long periods of time without recirculating water through the tank. Water can become extremely hot and scald responders.

**Specialty Devices**

A number of specialty devices are produced and marketed to the hazardous materials community. While not absolutely necessary, they can expedite your decon operations.

Specialty devices include inflatable decon shelters, disposable decon containment devices for stretchers, and special circular rinsing devices that spray a 360° fine mist around the person being decontaminated.
Examples of Decontamination Shelters
Set-ups designed specifically for hazardous materials
decontamination are commercially available.

Ease of Use

The equipment and procedures used in decon should be
easy to understand, deploy, and perform. In most jurisdic-
tions, decontamination is not conducted often enough to
become second nature.

Some jurisdictions have developed an easy-to-use decon
system often called decon in a box. In these systems, a
base tarp or plastic is pre-marked with the name and loca-
tion of equipment. Even the proper orientation of the tarp
can be indicated with the words “hot” and “cold.” Pools,
brushes and sprayers can be color coded and matched to
colors on the base or with each other. Hose connections
can be configured with quick-connects so that no matter
what end of hose a responder has, it will properly hook up
with its intended device.
Decontamination Procedures

To ensure efficient and safe decontamination, develop and practice procedures for deploying and performing decontamination. Since each jurisdiction’s equipment and staffing needs are different, and each incident requires different levels of decontamination, procedures will also be different. However, there are basic concepts that you must adhere to in deploying and performing decontamination. Furthermore, remember that decon must be established before any entry is attempted.

Activity

Deployment

After the site has been selected, adequate personnel must be allocated to the decon group/sector supervisor to set up the agreed upon decontamination line.

Protective clothing for those deploying decon must be predetermined by the jurisdiction. Remember, when decon is being set up, there must be no contaminant in the area. The guiding factor will be the ambient conditions and jurisdictional policy.

During deployment, the decon group/sector supervisor must ensure that designated decon personnel are dressing to the required level of protection. Personnel must be hydrated and medically checked. Decon personnel must dress to stand-by position and be allowed to rest in a sheltered area.

The decon group/sector supervisor must brief decon personnel on the activities to be carried out by the entry team, probable hazards, and types of decontamination to be performed. He or she must also notify the appropriate command level that decon is ready.
Decontamination of Rescued Victims (Civilians)

Victims who arrive at a technical decontamination setup must first have any contaminated clothing removed. This may eliminate 70-80% of the contamination.

The decon group/sector supervisor must supervise properly protected decon personnel in this action. Contaminated clothing must be left in the Hot Zone.

Depending on whether the victim is ambulatory or has sustained any injuries, technical decontamination may need to be altered. At a minimum, contaminated areas must be flushed and washed thoroughly. All efforts must be made to deliver a clean patient to medical personnel.

The decon group/sector supervisor must consider the patient’s privacy as long as it does not interfere with decontamination and care. Clean dry sheets can be used to cover exposed areas of the patient.

Decontamination of Entry Personnel

The decon group/sector supervisor must be alerted to the exit of entry personnel so he/she can instruct decon personnel to finish donning gear, go on air, and take their places at appropriate stations.

When they exit the Hot Zone, entry personnel leave tools/equipment at equipment drop and enter the first decon station.

The decon group/sector supervisor oversees personnel performing decon and advises them as to areas of high contamination. He or she can get this information from the entry team leader or information can be requested verbally from entry personnel.
Decontamination at each station must follow a standardized, logical sequence, working from head to feet. Boots and hands are always treated as extremely contaminated. Give these items special consideration.

The decon group/sector supervisor also signals when the next entry member should begin the decontamination process. In addition, the supervisor:

- Ensures that his/her personnel do not cross-contaminate by traveling up and down the decon line
- Ensures that overgarments are removed and isolated correctly at the designated stations
- Ensures that decon personnel do not circle the entry person, but have the entry person turn to expose different sides of the garment
- Visually evaluates overall effectiveness

As personnel exit decon they are led to a doffing area where clothing is removed and medical surveillance is done. Personal decon (full shower), must follow as soon as possible. On scene, personnel must be provided a place to wash hands and face.

**Activity**

**Decontamination of Equipment**

The decon group/sector supervisor should determine if equipment will be used again at that particular incident. If not, equipment decontamination should begin.

The first person in the decon line retrieves the tools, places them in the first station, and proceeds to decontaminate them. The tools are passed down the line, and decontamination is performed at each succeeding station. When tools reach the end of the line, they are isolated on a tarp or in a container for later evaluation.
Decontamination of Decon Personnel

Once equipment has been decontaminated, decon personnel must undergo appropriate decontamination. They may be required to go through the entire line if there was significant exposure, or possibly through just the last station(s). Your incident hazard analysis will help you determine how much decon is needed.

Decon personnel decontaminate each other until one person remains. The last decon person will decontaminate himself or herself under close supervision of the decon group/sector supervisor.

Evaluating Decontamination

Evaluating decontamination procedures can be difficult. First, visually inspect the outer surfaces of the garments and equipment to ensure that the visible contamination is completely removed. In the case of invisible contamination, use monitoring instruments to determine if detectable product is still on or in the garment. In the case of corrosives, you can swipe test with pH paper. However, destructive testing is really the only way to accurately determine if contamination levels have been reduced to acceptable levels. Any PPE or equipment that may have been exposed to a carcinogen must not be reused.

After garments have been decontaminated and doffed, place them in containment bags. If any product was left on the garment, vapors will concentrate in the bag. Monitoring devices can be used later to detect these vapors.

Special Procedures

Procedures to deal with predictable events should be developed by each jurisdiction. For example, your department may develop priorities that triage the decontamination process; injured persons are first to be decontaminated, followed by persons low on air, and so on until the cleanest of the decon team is the last to be decontaminated.
You may have to change your decontamination procedures to handle emergency situations that involve civilian injuries. The severity of the injury will determine the level of decon performed. In non-life threatening injuries, full decontamination may be possible. In life threatening injuries, only a gross wash may be possible so that life saving measures (such as airway insertion or CPR) can be started. In these cases, handle the victim carefully and take measures to protect other personnel.

You may also need to alter decon procedures when responders are injured or low on air. Responders who become unconscious for an unknown reason are highest priority. It could be a fainting spell, heat stroke or cardiac problem. Perform a gross wash, then carefully open the CPC and begin medical evaluation.

You should develop procedures specifically for dealing with extreme heat or cold. Avoid decon in extreme heat or hot sunlight. Solutions dry out before rinsing, and personnel tire quickly. If possible, find a shaded area or structure. Provide additional cooling for personnel in air conditioned fire department vehicles or through cooperation with transportation agencies that use large buses. You can provide additional cooling (as well as ventilation) with positive pressure fans. Electric or hydraulic powered fans are preferable because they do not generate exhaust gas.

Decon in extremely cold weather may not be possible because solutions and rinse water may freeze. In this case shelter must be provided, either through a portable decon shelter or structure. You can also protect transport vehicles and transport the entry team to the indoor decon. Some jurisdictions may have decon trailers available. Check with your county/state/province environmental agencies.

Activity
Special Decon Situations

There are a number of uncommon hazardous materials situations that you may come across. In these cases, you may have to change your decon procedures radically.

Radiation

The best way to protect yourself from radiation contamination is to avoid exposure. Practice the time honored and very effective strategy of time, distance, and shielding. Procure experts from hospital labs or nearby universities or colleges to assist in the initial assessment. The Department of Energy can supply information and response teams and can be contacted through CHEMTREC. (800-424-9300)

If possible, use a separate area for decontamination of persons or equipment. This area should be equipped with its own containment devices for liquids and solids.

Victims should be monitored with a Geiger-Mueller detector with alpha capability before they are decontaminated. Contaminated clothing (non-chemical protective clothing) should be removed and isolated, then the person should be thoroughly washed and rinsed. Team members wearing CPC should be monitored, then completely washed and rinsed. CPC should be removed and isolated and the person monitored again. A personal shower should follow as soon as possible, and another monitoring done. Special areas of concern are near the nostrils, ears, feet and hands. Any items the person may have had contact with should also be monitored.

Infectious Agents

Infectious agents may need to be destroyed by sterilization. The exact methods and procedures vary from agent to agent. The Centers for Disease Control (404-633-5313) may be able to provide additional information. Local poison control centers or hospitals may also be useful.
**Terrorist Actions**

Terrorism is becoming an increasing concern to the response community. Terrorists have used explosives (World Trade Center), nerve agents (Sarin in Japan) and biological agents (Anthrax in Japan) in their activities. Usually, responders are dealing with accidental releases. Terrorist activities are, however, premeditated attempts to injure and kill.

Identifying the agents involved is critical, but most responders do not have suitable monitoring equipment. You will most likely need outside help. As of this time there is no national plan for notification of a single agency for help. If terrorist activity is of genuine concern to your jurisdiction, find out which local, state and federal authorities will be able to provide assistance.

An additional problem with decontamination in these types of incidents may be the number of victims. A standard technical decon setup will not be adequate for large numbers of civilian casualties. Also, the lethality of many suspected chemical/biological terrorist weapons may make rescue operations difficult.

If you are handling large numbers of victims (who in most probability will have to travel to decon on their own), you may have to set up a mass emergency decon area. For example, you could use fog streams from aerial devices. Try to control runoff, but victim decon is your first priority. (Mass decontamination in terrorist situations is discussed in Module 12 of the Technician program.)

**Other Special Situations**

If the incident involves a pesticide, you can call the Pesticide Hotline at Texas Tech University (800-858-7378). This organization can provide information regarding pesticides, however the line is only staffed from 0800-1800 hrs CST. Many manufacturers can provide specific decon information regarding their products. If you know the manufacturer, the easiest way to get in touch with them is through CHEMTREC.

MSDSs may also provide specific information on product properties and methods for decontamination.
Frequently Asked Questions

What should be done with decontaminated items that were isolated?
These items require further decontamination by either the fire department or specialists. Garments and equipment are immersed and rinsed thoroughly off-site at a designated area. When performing this decontamination, chemically resistant gloves and eye protection should be worn. Always follow manufacturers’ recommendations for this kind of cleaning.

What happens to equipment that was not fully decontaminated?
Whenever in doubt about a garment or equipment, there are two reasonable choices available. 1) Send the item to a lab or other expert in the field for further testing and decontamination. 2) Dispose of the item. It is better to dispose of a clean item than re-use a contaminated item.

What about monitoring equipment that may still be contaminated?
If the monitoring equipment is still believed to be contaminated, call the manufacturer to determine the best method for cleaning. Some disassembly may be required to fully clean the unit. Suitable protective clothing should be worn for the cleaning. Immersion is not an option for electronic meters.

What about large items (vehicles, large equipment, hose)?
When decon is required for large items such as fire apparatus, contractors are usually hired. Most fire departments do not have the equipment or monitoring capability to handle this type of large-scale operation. However, if your department performs its own vehicle decon, remember that, as always, the properties of the products will dictate the type and amount of decon. The properties of the contaminated items may also play a role. If the items are porous, like fire hoses, and the chemical is extremely toxic and a skin hazard, disposal may be the best method. Otherwise three to four complete wash and rinse cycles with brushing may be adequate.
For vehicles or other large items which are not porous, three to four complete wash/rinse cycles with soap should be adequate. Special attention should be paid to wheels, wheel wells and other hidden areas. Equipment may need to be removed to gain access to hidden contamination.

Whenever this type of decon is to be done, a clean “pad” should be the base. If equipment can be moved to a solid diked concrete area, the contaminant can be contained. Otherwise a containment area will need to be constructed around the object.

Again, this is not easy because of the size of the object, but time is available to gather the adequate resources (equipment and personnel) and plan the process.

What happens to all the contained runoff and the equipment?
After the incident is over, the decon set-up remains with the “contaminated”, contained runoff. Knowing the products and properties will indicate where to look for the hazards. For example, if a petro-chemical was the contaminant, then it would be found floating on top of runoff. Monitoring and testing equipment can determine if hazards are present and to what degree.

If there was no contamination to remove in the first place, the runoff will be clean and may be disposed of at the site (with an environmental agency’s approval). Otherwise the fluids, solids and bagged disposable items need to be removed by a licensed waste hauler or treatment facility.

Decon equipment can usually be washed, depending on the properties of the chemicals. This can take place on or off site. If possible, wash items when a clean-up contractor is on site and have them remove any runoff.

What about water reactive chemicals?
Initially, the wet decon of a water reactive chemical may appear to be contraindicated. However, if a chemical is a true water reactive, it is probably already reacting with the moisture on the CPC. First, perform dry decontamination by brushing, blowing, or vacuuming. Then, with appropriate approval, use copious amounts of water to overwhelm any reaction that may take place.
What about cylinder change stations?
Sometimes decon is deployed with a cylinder change-out area. This is usually a path before the end of the decon line where the entry team has part of their protective clothing opened or removed, and the air cylinder for their SCBA is changed. At this point the same entry team returns to work activities.

As discussed previously, entry personnel working in CPC are susceptible to heat related injuries and can suffer great amounts of fluid loss. Their work activities and work time should be carefully monitored. When entry personnel leave the Hot Zone for any reason, it is recommended that they are fully decontaminated and proceed to the doffing area. Here they can receive fluids and medical monitoring.

When another entry is required, the backup team becomes the entry team. This gives the original entry team time to get re-hydrated and medically cleared to continue wearing and using CPC. Ideally, there should be enough trained personnel available so that no team enters the Hot Zone more than once.

**Decontamination Requirements**

Decontamination should seem a natural process; personnel are risking contamination, so a counter measure, decontamination, should be available.

Each jurisdiction must provide the equipment, training and procedures they believe are necessary to meet their local needs.

There are no specific methods or techniques that are mandatory by law or standard, yet decontamination is required by both law and standard. More importantly it is called for by common good sense and a desire not to be injured.

In the final analysis...*The success of the decontamination procedures used are directly proportional to how seriously personnel treat those procedures.*
Application Exercise
Application Exercise

You will need

- Level A/fully-encapsulated vapor protective ensembles (enough for each group)
- Level B/liquid splash-protective ensembles (enough for each group)
- Departmental decontamination equipment and supplies
- Water sources
- Departmental SOPs covering entry and decontamination
- Cornstarch, powder, shaving cream, or other material to represent different types of “contaminants”
- One or more manikins or other simulated “victims”
- Stokes basket or fiberglass stretcher
- Chalkboard or flip chart and markers
- A copy of the Competency Checklist (following page) for each student

Preparation

This exercise is intended to give students hands-on experience in setting up decontamination equipment and conducting both full and emergency decontamination. Keep the student/instructor ratio about 5 to 1. If necessary, enlist the assistance of another instructor while conducting this exercise. The specific procedures you use should follow departmental SOPs.

Position the manikin(s) out of site of the decontamination area before you begin the activity. “Contaminate” the manikin with the cornstarch, powder, or shaving cream in areas of the body that are likely to be touched by rescuers. The level of contamination should be realistic and reasonable. The manikin will be found by the entry team and will need emergency decontamination.

On the flip chart or chalkboard, diagram an “incident” incorporating landmarks around the training facility. Identify a Hot Zone and describe a short scenario that is realistic for the jurisdiction. (Or, base your scenario on a recent actual incident). Inform the students that a victim is lying unconscious in the Hot Zone. Instruct the students to set up warm and Cold Zones and establish a contamination reduction area using the available decontamination equipment. Supervise closely to make sure the layout is acceptable.

After students have set up the equipment, walk through the contamination reduction area and explain decon procedures based on existing SOPs. Identify the “contaminant” (represented by the cornstarch, powder, shaving cream, etc.) and assign a student to research its chemical and physical properties. Appoint officers for a donning/doffing team, an entry team, a decontamination team (and, if numbers permit, a backup team). Allocate personnel to each team, as available. Instruct the donning team to don two members for entry (and two for backup) following SOPs. Instruct the other teams to deploy and dress as needed.
Order the entry team (with EMS equipment) into the Hot Zone. Lead them out of sight of the decon team to the area where the manikin was placed. Tell the entry team that the victim has come in extensive contact with the chemical and will need emergency decontamination.

Return the entry team and the victim to the contamination reduction zone. Supervise the decontamination team to make sure the victim undergoes the proper emergency decontamination procedures and that the entry team undergoes full decontamination. EMS equipment should be decontaminated as well. The decon team should decontaminate one another and themselves. Doffing should take place according to SOPs. All participants should be rehydrated.

Repeat the exercise with personnel performing different functions until each student has had an opportunity to serve on the decon team. (The type of contaminant and scenario should be varied as well). Complete the Competency Checklist on the following page for each student.
Competency Checklist

Name of Student: ____________________________________________

Indicate student competency in the following areas:

- Don the CPC appropriate for decontamination in this incident? □ Yes □ No
- Don CPC in the proper sequence? □ Yes □ No
- Demonstrate a knowledge of decon equipment? □ Yes □ No
- Take steps to avoid contamination and secondary contamination? □ Yes □ No
- Use the appropriate decontamination methods for the contaminant? □ Yes □ No
- Perform each step of emergency decon according to SOPs? □ Yes □ No
- Perform a thorough emergency decon? □ Yes □ No
- Perform each step of full decon according to SOPs? □ Yes □ No
- Perform a thorough full decon? □ Yes □ No
- Concentrate on areas most likely to be contaminated (e.g. hands and feet)? □ Yes □ No
- Properly decontaminate or dispose of EMS equipment? □ Yes □ No
- Decontaminate self thoroughly? □ Yes □ No
- Attempt to control runoff from decon procedures? □ Yes □ No
- Follow departmental SOPs? □ Yes □ No
- Demonstrate adequate supervision? (if acting as team leader) □ Yes □ No

Remarks (including skills to be improved):

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Module 8: Decontamination
Action Statement
Action Statement

You have just completed the eighth module of the Hazardous Materials Technician course. The topics included:

- Types of contamination
- Types and methods of decontamination
- Procedures for setting up a decontamination area
- Factors affecting the type and amount of decontamination
- Decontamination equipment
- General decontamination procedures
- Special decontamination situations

Knowing how you respond to emergencies in your first due areas, would you change your actions or habits based on the information covered in this module? Listed below are some suggested actions. Some you may already do, and others may not fit your work environment. If there are actions you have not done in the past, do you think you will begin doing them as a result of this training?

As a result of this training I will:

1. Practice setting up and using the decontamination equipment in my department
2. Take more care to avoid secondary contamination
3. Read the decontamination SOPs for my department
4. Research or practice decontamination in special situations, such as for exposure to radiation or infectious agents
5. Work with superiors to ensure that the most appropriate type of decontamination equipment is purchased
6. (Create my own action statement)
Appendix A

Activities
**TDI Activity 1**

On a winter morning, emergency responders arrive at a vehicular emergency in which a cargo tank carrying toluene-2,2-diisocyanate (TDI) has rolled over on a highway. The temperature is very cold, about 30°F. Fire fighters wearing turnout gear assist the driver, who is pinned beneath the cab. Later, responders notice that a small amount of TDI has leaked from the truck and solidified into puddles. (The melting point of TDI is 68°F). The fire fighters undergo decontamination as a precaution.

As fire fighters are returning to the station, several who assisted the driver begin complaining of headaches, dizziness, and other central nervous system problems.

**Questions**

1. What is one likely cause of the symptoms experienced by the fire fighters?

2. Is additional decontamination necessary?
Emergency Decontamination Activity 2

As the first arriving engine company to a reported industrial accident, you find an employee in the loading dock area whose leg is trapped beneath a 55-gallon drum. The employee is screaming and gagging on what appear to be vapors rising from the spilled liquid contents of the drum. The drum has a label which is black over white.

Question

What actions should you take?
Decontamination Set-up Activity 3

Read the short scenario below and refer to the diagram on the following pages.

You respond to an incident at the paper mill shown on the following page. A tank car carrying chlorine has derailed. The derailment caused an unloading valve to open and a large chlorine vapor cloud is dispersing. It is early in the morning and only five employees are working; all five meet you at the main entrance. They explain the situation and complain of skin irritation and burning eyes. The facility is in a remote area with no residences or other businesses nearby.

Questions:

1. What are your initial actions?

2. Draw the approximate area of the Hot Zone and label the isolation distance.

3. Indicate where you would set up the decontamination area.
**Chemical Properties Decontamination Activity 4**

Complete the table below, then discuss the answers as a class.

<table>
<thead>
<tr>
<th>Chemical</th>
<th>State of Matter (@ 72°F)</th>
<th>Primary Route of Entry</th>
<th>Primary Hazard</th>
<th>Decon Method</th>
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<tr>
<td>Gasoline</td>
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</tr>
<tr>
<td>Diesel Fuel</td>
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<tr>
<td>Sulfuric Acid</td>
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<tr>
<td>Hydrogen Chloride</td>
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</tr>
</tbody>
</table>
Gasoline and Diesel Fuel Spill Activity 5

Scenario 1

Members of your haz mat team have been assigned to seal a dome leak in a non-pressure tanker that has rolled over. The tanker contains 7,000 gallons of gasoline and is leaking from two dome covers at a combined rate of approximately 30 gallons/minute. It is a fall day with overcast skies and a temperature of 50°F.

You have been assigned as decon supervisor and must make the appropriate decisions.

Questions:

1. What is the appropriate level of protection for the entry and decon teams?

2. What type of decon is appropriate?

3. Considering the properties of gasoline, are there special considerations for the decon area?

4. Discuss with the class variations on this scenario, such as changes in quantity of product, weather conditions, etc.
Decontamination Procedures Activity 6

Early one Saturday afternoon, fire fighters respond to a report of a fire at a wood treatment facility. When they arrive they find that the fire is confined to a lumber pile next to a shed containing liquid chemicals. As fire fighters are controlling the blaze, two teenagers stumble out of the shed coughing. Apparently, they set the fire and had been vandalizing the building when fire fighters arrived. Their clothing is stained with a brownish, oily liquid that smells like tar. One of the teenagers complains of itching skin; the other is vomiting. They tell fire fighters that a third person is unconscious inside the shed.

As the fire is brought under control, the facility manager arrives. She explains that the building the teenagers were in is a storage shed for creosote oil. She gives the fire fighters the MSDS for creosote, which is duplicated on the following pages. Inside the shed, the haz mat entry team discovers an unconscious teenager and several 55-gallon drums containing the creosote—evidently the same liquid that contaminated the teenagers. Two of the drums have been badly damaged and are leaking.

Questions

1. Based on this scenario, should a decontamination setup be deployed? Why or why not?

2. Will removing the teenager’s clothing reduce contamination levels sufficiently? Why or why not?

3. What should you do with the victims’ contaminated clothing?

4. What type/level of decontamination is appropriate for the ambulatory victims?

5. What type/level of decontamination is appropriate for the unconscious victim?

6. What type of PPE should entry personnel and decontamination personnel wear?

7. How can you tell if equipment has been decontaminated?
TEILLY TAR & CHEMICAL — P1-P13 CREOSOTE OIL - WOOD PRESERVATIVE,CREOSOTE
MATERIAL SAFETY DATA SHEET
NSN: 6840002812019
Manufacturer’s CAGE: 77735
Part No. Indicator: A
Part Number/Trade Name: P1/P13 CREOSOTE OIL

General Information

Item Name: WOOD PRESERVATIVE,CREOSOTE
Company’s Name: TEILLY TAR & CHEMICAL CORP
Company’s Street: 1510 MARKET SQ CTR, 151 N DELAWARE ST
Company’s City: INDIANAPOLIS
Company’s State: IN
Company’s Country: US
Company’s Zip Code: 46204
Company’s Emerg Ph #: 317-247-8141
Company’s Info Ph #: 317-247-8141
Record No. For Safety Entry: 002
Tot Safety Entries This Stk#: 002
Status: SE
Date MSDS Prepared: 14NOV94
Safety Data Review Date: 08NOV96
Supply Item Manager: CX
MSDS Preparer’s Name: PAUL M. RIVERS,PHD
Preparer’s Company: DIR OF CORP ENVIRO AFFAIRS
MSDS Serial Number: CCBZQ
Specification Number: A-A-1893
Hazard Characteristic Code: T6
Unit Of Issue: CN
Unit Of Issue Container Qty: 5 GALLON
Type Of Container: CAN
Net Unit Weight: 43.8 LBS

Ingredients/Identity Information

Proprietary: NO
Ingredient: ACENAPHTHENE (CERCLA)
Ingredient Sequence Number: 01
Percent: 1-5
NIOSH (RTECS) Number: AB1000000
CAS Number: 83-32-9
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: ANTHRACENE (SARA 313) (CERCLA)
Ingredient Sequence Number: 02
Percent: 1-5
NIOSH (RTECS) Number: CA9350000
CAS Number: 120-12-7
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: METHYLNAPHTHALENE

Ingredient Sequence Number: 03
Percent: 1-5
NIOSH (RTECS) Number: QJ9625000
CAS Number: 1321-94-4
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: NAPHTHALENE (SARA 313) (CERCLA)

Ingredient Sequence Number: 04
Percent: 5-7
NIOSH (RTECS) Number: QJ0525000
CAS Number: 91-20-3
OSHA PEL: 10 PPM
ACGIH TLV: 10 PPM/15 STEL; 9596
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: PHENANTHRENE (CERCLA)

Ingredient Sequence Number: 05
Percent: 7-13
NIOSH (RTECS) Number: SF7175000
CAS Number: 85-01-8
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: 1,2,4-TRIMETHYLBENZENE (SARA 313)

Ingredient Sequence Number: 06
Percent: 0.1-1.0
NIOSH (RTECS) Number: DC3325000
CAS Number: 95-63-6
OSHA PEL: 25 PPM
ACGIH TLV: 25 PPM; 9596
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: COAL TAR PITCH VOLATILES (BENZENE SOLUBLE FRACTION),
ANTHRACENE, BAP, PHENANTHRACENE, ACRIDINE, CHRYSENE, PYRENE.
Ingredient Sequence Number: 07
Percent: 98.5
NIOSH (RTECS) Number: GF8655000
CAS Number: 65996-93-2
OSHA PEL: 0.2 MG/M3
ACGIH TLV: 0.2 MG/M3, A1; 9596
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: DIBENZOFURAN (SARA 313) (CERCLA)
Ingredient Sequence Number: 08
Percent: 1-5
NIOSH (RTECS) Number: HP4430000
CAS Number: 132-64-9
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Physical/Chemical Characteristics

Appearance And Odor: LIQUID, BROWN TO BLACK OILY LIQUID W/AROMATIC
ODOR.
Boiling Point: >302F,>150C
Melting Point: NA
Vapor Pressure (MM Hg/70 F): 1.0
Specific Gravity: >1.05 @20C
Decomposition Temperature: NP
Evaporation Rate And Ref: N/AVAI
Solubility In Water: INSOL-SLTLY INSOL
Percent Volatiles By Volume: NP
Viscosity: NP
pH: N/AVAI
Corrosion Rate (IPY): NP
Autoignition Temperature: N/AVAI

Fire and Explosion Hazard Data

Flash Point: 211F,99C
Flash Point Method: TCC
Lower Explosive Limit: N/AVAI
Upper Explosive Limit: N/AVAI
Extinguishing Media: WATER FOG, FOAM, CARBON DIOXIDE, DRY CHEMICAL.
Special Fire Fighting Proc: FIREFIGHTERS SHOULD WEAR SELF-CONTAINED
BREATHING APPARATUS & FULL PROT EQPMT.NORMAL PROCEDURES MAY BE
USED.SKIN CONTACT &/OR BREATH OF VAP SHOULD BE AVOIDED.
Unusual Fire And Expl Hazrds: WATER SPRAY CAN CONTROL UNCONFINED TAR
FIRES, BUT MAY CAUSE FROTHING OR ERUPTION IN CLOSED TANKS.
Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: NONE KNOWN.
Hazardous Decomp Products: IRRITATING &/OR TOXIC FUMES MAY BE RE-
LEASED IF THIS MATL IS BURNED.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT APPLICABLE

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: VAP IRRIT SKIN/EYE/RESP TRACT.SKIN:
BURNING, ITCHING,CHANGES PIGMENTATION,SKIN
ERUPTIONS,EYE:INFLAMM,DISCOMFORT, CONJUNCTIVITIS,ABRASIONS OF
CORNEA,ACUTE ORAL TOXICITY CONSIDERED TO BE MODERATE BUT INGEST
NOT LIKELY TO PRIMARY EXPO ROUTE. MINOR SKIN IRRIT. CAUSES PHOTOSEN-
SITIZATION. DERM,POOR HYG PRAC SKIN CANCER.
Carcinogenicity - NTP: YES
Carcinogenicity - IARC: YES
Carcinogenicity - OSHA: YES
Explanation Carcinogenicity: PER MSDS:CARCINOGEN.COAL TAR PITCH
VOLATILES,SOOTS,TARS,OILS LISTED AS CARC BY OSHA/NTP/IARC.CA PROP
65.
Signs/Symptoms Of Overexp: SYMPTOMS OF SYSTEMIC POISONING AFT
INGESTION:SALIVATION, VOMITING, RESP DIFFICULTIES, DIZZINESS, HEAD-
ACHE, LOSS OF PUPILLARY REFLEXES, CYANOSIS, HYPOTHERMIA, MILD CON-
VULSIONS.
Med Cond Aggravated By Exp: PERSONS W/PRE-EXISTING SKIN DISORDERS
MAY BE AT INCREASED RISK FROM OVEREXPOSURE. EXPOSURE TO VAPORS
MAY AGGRAVATE PRE-EXISTING LUNG CONDITIONS.
Emergency/First Aid Proc: SKIN:WASH 2X W/WATERLESS HAND CLNSR,SOAP/
WATER/MILD DETERGENT.DON'T USE SOLVENTS-PROMOTE ABSORPTION OF
MATL.IRRIT/PAIN PERSISTS EXAM BY MED PERSONNEL.EYE:FLUSH IMMEW/
LG AMTS OF WATER @LEAST 15MINS,OPEN EYES.GET MED
ATTN.INHAL:REMOVE TO FRESH AIR.STOP BREATH GIVE ART RESP;RESP
SHALLOW GIVE OXY.GET MED ATTN.INGEST:CONSC INDUCE VOMIT
PREVENT ABSORPTION.GET MED ATTN.DON'T GIVE ANYTHING BY MOUTH(SUP)
Precautions for Safe Handling and Use

Steps If Matl Released/Spill: REMOVE ALL IGN SOURCES. VENTILATE AREA. SM: USE SUITABLE ABSORBENT AMTL. COLLECT FOR LATER DISPO. LG: MAY REQUIRE DIKE TO CONTAIN. MATL CAN BE COLLECTED FOR LATER DISPO. WEAR PROTECTIVE EQPMT DURING CLEANUP. AFT COLLECTION OF MATL FLUSH AREA W/WATER.

Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPO OF MATL IAW STD PRACTICE FOR DISPO OF POTENTIALLY HAZ MATLS AS REQUIRED BY APPLICABLE FED/STATE/LOC LAWS. WEAR PROT EQPMT AS NECESSARY.

Precautions-Handling/Storing: DON’T SMOKE/EAT IN AREAS WHERE MATL HNDLD. WASH HANDS THOROUGHLY BEF EAT/SMOKE. COMPLETE SOAP/WATER SHOWER SHOULD BE TAKEN @ END OF EA WORK DAY.
Other Precautions: ALL OPERATION SHOULD BE CONDUCTED IN WELL-VENTI CONDITIONS. WEAR PROT EQPMT WHEN PERFORM MAINTENANCE ON CONTAMIN EQPMT. PROTECT AGAINST PHYS DMG. OUTSIDE/DETACH STORAGE PREFER. INSIDE STORAGE SHOULD BE STD FLAMM LIQ STORAGE RM/CAB IF FLAMM/COMB

Control Measures

Respiratory Protection: NIOSH APPROVED HALF-FACE PIECE OR FULL-FACE PIECE FIL/CHEM CARTRIDGE RESP OR FULL-FACE PIECE CONTINOUS FLOW, POSITIVE PRESSURE AIR SUPPLIED RESP AS NECESSARY FOR PROTECTION FORM COAL TAR PITCH VOLATILES.

Ventilation: LOCAL EXHAUST VENTILATION SHOULD BE PROVIDED.

Protective Gloves: IMPERVIOUS RUBBER.

Eye Protection: CHEM GOGGLES, FACE SHIELD.

Other Protective Equipment: DECONTAMIN: EMERG SHOWER IF AVAIL. IMPERVIOUS BOOTS/SUITS. CONTACT LENSES SHOULDN’T BE WORN HNDLG MATL.

Work Hygienic Practices: REMOVE ALL CONTAMIN CLOTH; WASH 2X W/ SOAP/WATER.

LEATHER SHOES THAT HAVE BEEN SATURATED SHOULD BE DISCARDED.

Suppl. Safety & Health Data: 1ST AID: IF UNCONSC.

Transportation Data

Trans Data Review Date:  96313
DOT PSN Code: FST
DOT Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.
O.S.
DOT Class: 9
DOT ID Number: UN3082
DOT Pack Group: III
DOT Label: CLASS 9
IMO PSN Code: GMW
IMO Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.
O.S. o *
IMO Regulations Page Number: 9028
IMO UN Number: 3082
IMO UN Class: 9 *
IMO Subsidiary Risk Label: -
IATA PSN Code: KTV
IATA UN ID Number: 3082
IATA Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.
O.S. *
IATA UN Class: 9
IATA Label: MISCELLANEOUS
AFI PSN Code: KTV
AFI Prop. Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S.
AFI Class: 9
AFI ID Number: UN3082
AFI Pack Group: III
AFI Label: CLASS 9
AFI Special Prov: 8
AFI Basic Pac Ref: A13.4
N.O.S. Shipping Name: COAT TAR OIL CREOSOTE.
Additional Trans Data: PER MSDS:DOT/IMO #:UN3082

Disposal Data

Label Data

Label Required: NO
Technical Review Date: 08NOV96
Label Date: UNDATED
Label Status: X

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Sodium Hydroxide Activity 7

Discuss decontamination for sodium hydroxide with the students. Have them look up the product properties and discuss the differences between dry product and “wet” product.

Questions

1. In what form is sodium hydroxide usually found?

2. What are the hazards of this product?

3. What decontamination procedures would you follow?
Chlorine Gas Activity 8

Discuss decontamination for a chlorine release with the students. List the activities an entry team might undertake in mitigating a release of chlorine gas. Also, have them look up the product properties and discuss the hazards.

Questions

1. What decontamination procedures would you follow at an incident that involves a chlorine release?

2. Discuss other gases or vapors with the students (e.g., ammonia, methane, propane), noting each product’s properties and the effects on decon.
Appendix B

Other Decontamination Information
**Decontamination Solutions**

Remember that each chemical and incident is different so no single decontamination solution is always appropriate. Risk/hazard assessment must always be completed.

The EPA has previously released decontamination solutions for various chemical hazards. Over the past few years most hazmat teams have returned to either dry decon (remove and dispose) or a plain wash and rinse decontamination, using soap and water.

**For washing CPC:** Mild soap (dish or laundry) mixed with water to make soapy mixture

**For washing skin:** Copious amounts of water (soap could cause additional injury in some cases)

**For bio-hazards:** 1 part household bleach (sodium hypochlorite) to 10 parts water. Soak for 10 minutes. *This mixture should not be used on skin.* Use on chemical protective clothing may cause damage to CPC.

Available departmental decontamination solutions:

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________
Generic Decontamination Procedure Check List

Victims (non-CPC)
• Personnel properly dressed & deployed
  ____ On-Air  ____ At Stations
• Contaminated items removed
  ____ Isolated  ____ Protection provided
• Contaminated areas flushed
  ____ Reduced/no pressure water  ____ Contain runoff
• Protect victim-deliver to EMS
  ____ Clean sheets  ____ Protective clothing

Entry Team
• Personnel properly dressed & deployed
  ____ On-Air  ____ At Stations
• Entry member #1 told to enter First Station
  ____ Monitor progress  ____ All areas of CPC flushed
• Entry member #1 told to leave First Station
• Appropriate over garments removed
  ____ Over boots, Over gloves  ____ Items placed into containment bins
• Entry member #2 told to enter First Station
  ____ Monitor progress  ____ All areas of CPC flushed
• Appropriate over garments removed
  ____ Over boots, Over gloves  ____ Items placed into containment bins
• Entry members #1 and #2 proceed to successive stations: At each station
  ____ Solution applied  ____ Member scrubbed  ____ Member rinsed
• Monitor decon team work
  ____ Adequate solution  ____ Adequate wash  ____ Adequate rinse
• Appropriate over garments removed at each station
  ____ Over boots, Over gloves  ____ Items placed into containment bins
• Decon personnel do not “travel” decon line
• Watch for overspray - proper pressure
• Observe all members for signs of heat/cold stress
  ____ Entry team  ____ Decon team
• As each entry member completed:
  ____ Deliver to doffing group  ____ Notify branch officer

Equipment Decontamination
• Equipment (except meters) is removed by member at First Station
• Equipment rinsed in Gross wash
• Equipment PASSED down the line to next station and washed/rinsed

Decontamination Team
• Each decon team member decontaminated by remaining members
  ____ Determine station to start at  ____ May be reduced level from entry team
• Additional decon personnel enter decon, one by one
• Last decon member decontaminates self - Supervise closely
• As decon team exits - report to doffing group - Branch notified
DECONTAMINATION SECTOR SAFETY SHEET

**LOCATION:**

**DATE:**

**CHEMICALS INVOLVED:**

<table>
<thead>
<tr>
<th>DECON TEAM MEMBER</th>
<th>PROTECTIVE EQUIPMENT NUMBERS</th>
<th>TIME ON/OFF AIR SUPPLY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Suit</td>
<td>Gloves</td>
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</tbody>
</table>

**Decon Solution Used:** □ Soap □ TSP □ Bleach □ Other:

**Equipment Contaminated:** (D = Decontaminated; E = Expendable)

**Equipment Discarded:**

**Remarks:**

**DECON OFFICER (print)**

**SIGNATURE**

**RANK**

**DEPARTMENT**

---

Module 8: Decontamination

**Student Text**

IAFF Training for Hazardous Materials: Technician©
Generic Decontamination Officer Check Sheet

Preparation
• Confirm site for decon (confer with Entry and Branch officers)
  ____ Adequate manpower  ____ Uphill/upwind of Hot Zone  ____ Sheltered
  ____ Space for EMS
• Confirm type and level of decon necessary
  ____ Solution  ____ Amount of product  ____ Hazards
• Confirm water supply
  ____ Hydrant to manifold  ____ Engine to manifold  ____ Tanker to manifold
• Locate and remove decon equipment
  ____ SCBA for decon personnel  ____ Adequate CPC  ____ Decon equipment
• Mark boundaries of decon corridor
  ____ Base tarp  ____ Road cones  ____ Banner tape
• Set up Base Tarp for containment
  ____ Hose with water/air  ____ Set up equipment drop

Deploy Equipment
• Assemble Equipment
  ____ Showers  ____ Pools  ____ Sprayers
• Prepare decon solution - fill and mix with appropriate solution
• Deploy stations
  ____ Gross wash  ____ Pools for each station
• Deploy wash and rinse items
  ____ Decon solution  ____ Brushes  ____ Rinse wands
• Deploy “steps” into pools
• Deploy “stabilization” devices at each station
  ____ Hospital walkers  ____ Chairs  ____ Saw horses
• Deploy containment devices to each station
  ____ All containers lined with bags  ____ Separate drops for disposable/re-usable
• Supply appropriate water to each station
  ____ Garden hose  ____ Make connections
• Flow water to each item to bleed hoses
  ____ Adjust pressures  ____ Check/repair leaks

Decontamination Team
• Confirm Level of Protection for decontamination team
• Decon team medically evaluated
  ____ Hydrated  ____ Inclusion criteria
• Decon team dressed to “stand-by” (off air)
• Team briefed on activities/product/hazards and checked
• Branch notified  
  ____ Adequate wash  ____ Adequate rinse  
• Appropriate over garments removed at each station  
  ____ Over boots, Over gloves  ____ Items placed into containment bins  
• Decon personnel do not “travel” decon line  
• Watch for overspray - proper pressure  
• Observe all members for signs of heat/cold stress  
  ____ Entry team  ____ Decon team  
• As each entry member completed:  
  ____ Deliver to doffing group  ____ Notify branch officer  

**Equipment Decontamination**  
• Equipment (except meters) is removed by member at First Station  
• Equipment rinsed in gross wash  
• Equipment PASSED down the line to next station and washed/rinsed  

**Decontamination Team**  
• Each decon team member decontaminated by remaining members  
  ____ Determine station to start at  ____ May be reduced level from entry team  
• Additional decon personnel enter decon, one by one  
• Last decon member decontaminates self - **Supervise closely**  
• As decon team exits - report to doffing group - Branch notified
Maximum Measures for Ensembles

Vapor-Protective Suits

- **Equipment Drop**: Deposit equipment used on-site on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross-contamination.

- **Suit, Boot Cover, and Outer Glove Wash**: Scrub suit, outer boot covers (if worn), and gloves with decontamination solution or detergent and water.

- **Suit, Boot Cover, and Outer Glove Rinse**: Rinse off decontamination solution using adequate amounts of water.

- **Tape Removal (if used)**: Remove tape from around boots and gloves (if used) and deposit in containers lined with plastic.

- **Boot Cover Removal**: Remove boot covers and deposit in container with plastic liner.

- **Outer Glove Removal**: Remove outer gloves and deposit in container with plastic liner.

- **Suit and Safety Boot Wash**: Wash encapsulating suit and boots using scrub brush and decontamination solution or detergent and water. Repeat as many times as necessary.

- **Suit and Safety Boot Rinse**: Rinse off decontamination solution using water. Repeat as many times as necessary.

- **Tank Change**: If an air tank change is desired, this is the last step in the decontamination procedure. The air tank is exchanged, new outer gloves and boot covers donned, and joints taped, if appropriate. Team Member returns to duty.

- **Safety Boot Removal**: Remove safety boots and deposit in container with plastic liner.

- **Fully-Encapsulating Suit and Hard Hat Removal**: Fully-encapsulating suit is removed with assistance and Hard Hat Removal of a helper and laid out on a drop cloth or hung up. Hard hat is removed. Hot weather rest stations may be set up within this area for personnel who are returning to the Hot Zone.

- **SCBA Backpack Removal**: With assistance, remove backpack and place on table or plastic sheet. Remove facepiece and proceed to next station.

- **Inner Glove Wash**: Wash with decontamination solution that will not harm the skin. Repeat as many times as necessary.

- **Inner Glove Rinse**: Rinse with water. Repeat as many times as necessary.

- **Inner Glove Removal**: Remove inner gloves and deposit in container with liner.

- **Inner Clothing Removal**: Remove inner clothing and place in lined container. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants were transferred while removing the fully-encapsulated suit.

- **Field Wash**: Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.

- **Redress**: Put on dry clean clothes.
Minimum Measures for Vapor-Protective Suit Ensemble

- **Equipment Drop**
  1. Deposit used equipment on plastic drop cloths.

- **Outer Garment, Boot Cover, and Glove Wash and Rinse**
  2. Scrub boot covers (if worn), outer gloves, and fully-encapsulating suit with decontamination solution or detergent and water. Rinse off using adequate amounts of water.

- **Boot Cover and Outer Glove Removal**
  3. Remove boot covers and gloves. Deposit in containers lined with plastic.

- **Tank Change**
  4. If an air tank change is desired, this is the last step in the decontamination procedure. Air tank is exchanged, new outer gloves and boot covers donned, joints taped (if appropriate), and Team Member returns to duty.

- **Safety Boot and Outer Garment Removal**
  5. Safety boots and fully-encapsulating suit are removed and deposited in separate containers lined with plastic.

- **SCBA Removal**
  6. SCBA backpack and facepiece are removed (avoid touching face with fingers). SCBA is deposited on table or plastic sheet.

- **Inner Glove Removal**
  7. Inner gloves are removed and deposited in separate container.

- **Field Wash**
  8. Wash hands and face thoroughly. Shower as soon as possible.

Maximum Measures for Ensembles Liquid Splash-Protective Suits

- **Equipment Drop**
  1. Deposit used equipment on plastic drop cloths or in separate containers with plastic liners. Segregation at this drop reduces the probability of cross-contamination.

- **Suit, Boot Cover, and Outer Glove Wash**
  2. Scrub outer boot covers (if used) and gloves with decontamination solution or detergent and water.

- **Suit, Boot Cover, and Outer Glove Rinse**
  3. Rinse off decontamination solution using adequate amounts of water.

- **Tape Removal**
  4. Remove tape from around boots and gloves and deposit in container with plastic liner.

- **Boot Cover Removal**
  5. Remove boot covers and deposit in container with plastic liner.

- **Outer Glove Removal**
  6. Remove outer gloves and deposit in container with plastic liner.

- **Suit and Safety Boot Wash**
  7. Wrap SCBA regulator (if belt mounted type) with plastic to keep water out. Wash backpack assembly with sponges or cloths. Wash chemical-resistant splash
suit, SCBA, gloves, and safety boots. Scrub with long-handle scrub brush and decontamination solution.

• Suit, SCBA, and Safety Boot Rinse 8. Rinse off decontamination solution using adequate amounts of water.

• Tank Change 9. If an air tank change is desired, this is the last step in the decontamination procedure. Tank is exchanged, new outer gloves and boot covers donned, and joints taped. Team Member returns to duty.

• Safety Boot Removal 10. Remove safety boots and deposit in container with plastic liner.

• SCBA Backpack Removal 11. While still wearing facepiece, remove SCBA backpack and place on table or plastic sheet.

• Splash Suit and SCBA Removal 12. With assistance from a helper, remove splash suit and deposit in container with plastic liner. Remove SCBA facepiece and place on table with backpack.

• Inner Glove Wash 13. Wash inner gloves with decontamination solution.

• Inner Glove Rinse 14. Rinse inner gloves with water.

• Inner Glove Removal 15. Remove inner gloves and deposit in container with liner.

• Inner Clothing Removal 16. Remove inner clothing. Place in container with liner. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants were transferred when removing the splash-protective suit.

• Field Wash 17. Shower if highly toxic, corrosive, or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.

• Redress 18. Put on clean clothes.
## Minimum Measures for Liquid Splash-Protective Suit Ensemble

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Equipment Drop: Deposit used equipment on plastic drop cloths.</td>
</tr>
<tr>
<td>2.</td>
<td>Outer Garment, Boot Cover, and Glove Wash and Rinse: Scrub boot covers, outer gloves, and chemical-resistant splash suit with decontamination solution or detergent and water. Rinse off using adequate amounts of water.</td>
</tr>
<tr>
<td>4.</td>
<td>Tank Change: If an air tank change is desired, this is the last step in the decontamination procedure. Air tank is exchanged, new outer gloves and boot covers donned, joints taped, and Team Member returns to duty.</td>
</tr>
<tr>
<td>5.</td>
<td>Safety Boot, Inner Glove, and Outer Garment Removal: Boots, chemical-resistant splash suit, and inner gloves are removed and deposited in separate containers lined with plastic.</td>
</tr>
<tr>
<td>6.</td>
<td>SCBA Removal: SCBA backpack and facepiece are removed. Avoid touching face with fingers. SCBA is deposited on table or plastic sheet.</td>
</tr>
<tr>
<td>7.</td>
<td>Field Wash: Wash hands and face thoroughly. Shower as soon as possible.</td>
</tr>
</tbody>
</table>
# Decontamination Corridor Tracking Form

- Decon tarp in place
- Roll edges for containment
- Assure water supply
- Establish entry corridor
- Consider emergency action plan

## Equipment Drop Area
- 55-gallon collection drum
- White boards and markers
- Table
- Monitoring/testing equipment
- Dry brush
- Swipe test equipment
- Stokes basket

## Gross Shower
- Water supply
- Collection pool
- Elevation platform
- 55-gallon collection drum
- Pump with hose
- Stokes basket

## Wash Station
- Water supply
- Elevation platform
- White boards and markers
- 2 five-gallon buckets w/solution
- Garden hose with wand
- Two brushes

## Hand and Feet Wash
- Water supply
- Folding chair
- 5-gallon bucket with solution
- Garden hose with wand
- Brush
- Spare BA bottles

## Glove and Boot Removal Suit Removal
- 55-gallon collection drum
- Two folding chairs
- Spare BA bottles
- Swipe test equipment

## Off Air/BA Removal
- 55-gallon collection drum

## Hand Wash
- 1 five-gallon bucket with soap and water
- 1 five-gallon bucket with light soap and water
- 1 five-gallon bucket with water

## Face Mask Off
- 55-gallon bucket
- Swipe test equipment
Wet Decontamination Set-Up

From: Hot Zone

Entry

- Equipment Drop Area
- Gross Shower
- Wash Station
  - Two Personnel
- Hand & Feet Wash
  - Two Personnel
- Glove & Boot Removal
  - Suit Removal
  - Four Personnel
- Off Air and BA Removal
- Hand Wash
- Face Mask Off

To Rehab and Medical:
Dry Decontamination Set-Up

From: Hot Zone

- Equipment Drop Area
- Glove & Boot Removal
  - Suit Removal
- Off Air and BA Removal
- Hand Wash
- Face Mask Off

ENTRY

Four Personnel

To: Rehab and Medical
Appendix C

Slide Script

(for Instructors)