



## Standard Operating Procedures Personnel Decontamination Procedures for Level A, B and C

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### Purpose

The purpose of this standard operating procedure (SOP) is to provide protocols to EPA staff and contractors regarding decontamination (decon) of personnel operating in an environment contaminated with a chemical agent. EPA developed this SOP specifically for lewisite, sulfur mustards (H/HD and HT), VX, and the G-nerve agents (soman, tabun, and sarin). It should be utilized where Level A, B, and C Personal Protective Equipment (PPE) are worn (See Appendix I, PPE).

**NOTE: This document may be modified based on site/situation specific conditions and/or exigencies relevant to a particular response action. Responding personnel should attempt to comply with the strategies and tactics presented in this document. However, if it is necessary to modify the following protocols the intent of these protocols should be adhered to and deviations/modifications documented.**

### Introduction

Decontamination (“decon”) is the process of removing or neutralizing contaminants that have accumulated on personnel and equipment. The process is critical to worker health and safety at hazardous waste sites. Decon procedures protect workers from hazardous substances that may contaminate and eventually permeate protective clothing, respiratory equipment, tools, vehicles, and other equipment used on site. The procedures accomplish the following objectives:

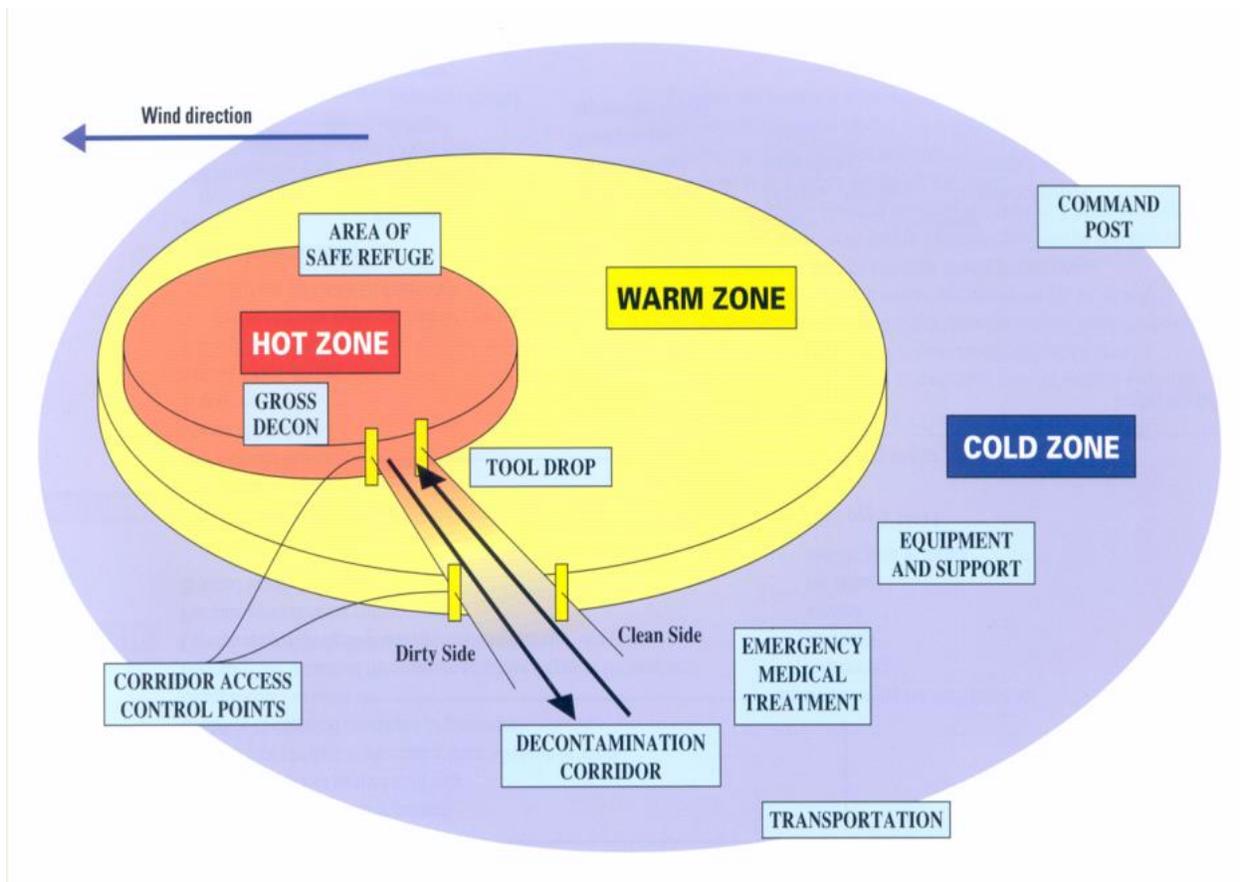
- Protect site personnel by reducing the transfer of harmful materials into clean areas
- Helps prevent mixing of incompatible chemicals
- Prevents uncontrolled transport of contaminants from the site

### Decontamination Plan

A decon plan should be developed as part of the Site Safety Plan and set up before any personnel or equipment may enter areas where the potential for exposure to hazardous substances exists.

The Decon Plan should:

- Determine the number and layout of decon stations.
- Determine the number of personnel needed at each station
- Determine the decon equipment needed.
- Determine appropriate decon method.
- Determine the appropriate decon solution
- Establish procedures to prevent contamination of clean areas.
- Establish methods and procedures to minimize worker contact with contaminants during removal of personal protective clothing and equipment (PPE).
- Establish methods for disposing of clothing and equipment that are not completely decontaminated.
- Establish the decon line uphill and upwind to the hot zone (or at higher pressure, if indoors). Minimize movement of the contaminant through the decon line. Conduct periodic surveys of the decon line area to verify that contamination is not migrating from the exclusion zone thru the decon line.



## Decontamination Team

At a minimum, the decon team will normally consist of four people. More persons will be needed if large numbers of people are conducting Exclusion Zone (EZ) entries. The decon team will normally be dressed in the same level of Personal Protective Equipment (PPE) as the Entry Team, or one level lower. The decon Team will have a Team Leader, who will be responsible for Team communications and operations, including proper set-up of the contaminant reduction zone (CRZ) and the contaminant reduction corridor (CRC).

## Decon Line Construction

The decon line should be constructed with materials durable enough to withstand continued use for the time necessary to complete the decon process. If possible, decon tent or structures should be utilized. Tents, berms, and collection vessels should be able to maintain wastewater in a contained and safe manner. Procedures should be in place to treat and replace contaminated materials used during the decon process as well as replace necessary chemicals and decon solutions. This type of robust decon set up may be appropriate if a prolonged decon process is anticipated (i.e., multiple days). Due to large liquid waste volumes collected during prolonged operation, additional measures to remove bulk amounts of grey water from the decon line should be considered. See Appendix II for examples of decon Lines

## Decon Solutions

For most circumstances, as well as for most toxic industrial chemicals (TICs), the standard decon solution will be copious amounts of water or a detergent/water mix (Dawn Dish Detergent, Simple Green). Detergent and water will not destroy most chemicals, but it will help to remove them from PPE and other surfaces. It also dilutes the

chemical, typically reducing its toxicity. Using warm water will improve the effectiveness of water as a solvent. Fresh water also has a limited capacity to remove chemical agents via hydrolysis.

For chemical agents, solutions using two main types of chemical mechanisms can be used for decon; oxidation and hydrolysis. Most chemical agents (nerve, blister agents, etc.) contain either sulfur molecules that are reduced in oxidation reactions, or contain phosphorus groups that can be hydrolyzed. Therefore, most chemical decontaminants are designed to either oxidize or hydrolyze. Oxidative chlorination is the general term for solutions containing active chlorine, including hypochlorite solutions such as household bleach. The pH of a solution is important in determining the amount of active chlorine concentration, with an alkaline solution being most effective. The standard decon solution for chemical agents is a 0.5% sodium hypochlorite solution (household bleach is usually 5% sodium hypochlorite) or 0.5% calcium hypochlorite solution. Alkaline chemical hydrolysis reaction works via the hydroxide ion reacting with phosphorus atoms; the hydrolysis rate is dependent on the chemical structure and reaction conditions such as pH and temperature. The rate increases sharply at pH values higher than 8. Due to the caustic nature of the solution (especially for PPE levels less than Level A), and due to the difficulty/impracticality in maintaining solution contact time, a standard detergent and water solution should be used on the Entry Team, with the hypochlorite solution added to decon line basins to neutralize/deactivate agents after their removal.

<b>Decontamination solutions</b>			
<b><i>Type of Contamination</i></b>	<b><i>Decon Solution Used</i></b>	<b><i>Cautions</i></b>	<b><i>Special Modifications to Decon line</i></b>
<b>Most circumstances and most toxic industrial chemicals</b>	Water; Water/Detergent mixture	N/A	N/A
<b>Chemical Agents</b>	0.5% Sodium Hypochlorite; 0.5% Calcium Hypochlorite	Caustic to suit and skin.	Due to difficulty/impracticality in maintaining solution contact time, standard water/detergent mix is used with hypochlorite solution added to decon line basins to neutralize agents after removal.
<b>Water-Reactive Chemicals</b>	Dry methods such as wiping or HEPA vacuum, or large amounts of water to quickly dilute chemical	When using water, reaction can off gas dangerous gases	When using water, decon should take place in a well-ventilated area. Air monitoring during decon would be important.

**NOTE: See Appendix III for addition decontamination technology, contact times and vendor.**

### General Considerations

Attempts should be made to prioritize personnel decon; heavily contaminated personnel, those low on air, those with damaged or degraded PPE, and those experiencing heat stress, chemical contamination symptoms, or other medical issues should have priority.

Decon personnel should give clear, concise instructions to Entry Team Member entering the CRC, guiding them through each stage of the process (Entry Team personnel may not remember what to do or in what order). To minimize cross-contamination, decon Team members should minimize physical contact with the Entry Team until de-suiting process has begun; all communication should be verbal and/or use hand signals and taps on the shoulder with long-handled brushes. Efforts should be made to avoid over-spray of decon solutions, and to avoid

cross-contamination of other personnel and the CRC area. Any items being brought out of the EZ must be either decontaminated or packaged for offsite decon/disposal. This includes equipment, instruments, and samples. Decon team members must also go through the decon process.

### Personnel Decon Procedure – Wet Process

The following is step-by-step descriptions of standard decon line stations. Depending on the response, some stations may be combined, eliminated, or modified to increase the effectiveness and efficiency of decon operations. An example decon line is presented in Appendix 1.

**NOTE: All personnel are required to train, practice, and be proficient with the site-specific decon procedures prior to entering the Hot Zone (HZ)/Exclusion Zone (EZ).**

**This includes an initial walk through of the decon line prior to entry into the HZ.**

**Step 1. Sample/Equipment/Instrument/Trash Drop:** Any trash should be disposed of in a designated receptacle. All equipment should be placed in a designated equipment drop area for subsequent decon. Position any equipment and/or instruments that are returning to the EZ so that subsequent Entry Teams can easily collect them prior to entry. Bagged samples should be placed into a sample decon container for subsequent decon, or be brought through decon by entry personnel. This step normally occurs outside of the entrance to the decon tent.

**Step 2. Gross Physical Removal:** Any gross contamination should be removed (if possible) while still in the EZ. Possible methods of removal include the use of paper towels, plastic bags, note paper, or any item that can be used to scrape/wipe unwanted materials from PPE. Any materials used during this step should be left, containerized in the EZ.

**Step 3. Glove Wash:** A glove wash using a decon solution should be used to prevent spreading contamination during decon. This step normally occurs outside of the entrance to the decon tent.

**Step 4. Boot wash:** A boot wash using a decon solution should be used to prevent spreading contamination during decon. This step normally occurs outside of the entrance to the decon tent.

**Step 5. External Glove and Bootie Removal (if needed):** Any external gloves or booties should be removed and placed in designated receptacle. These materials must be considered contaminated, and be handled and stored accordingly. This step normally occurs outside of the entrance to the decon tent.

**Step 6. Full PPE decon:** A thorough wash/scrubbing by decon Team member using decon solution sprayers and brushes. Hand pump sprayers may be used to apply decon solutions in addition to water sprayers. This step normally occurs inside of the decon tent.

**Step 7. Full PPE Rinse:** A tap water rinse by decon Team member should be used to remove decon solution and neutralized agent residues. This step normally occurs inside of the decon tent.

**Step 8. Monitoring Station:** Following decon, PPE, samples, and equipment exiting the decon line will be monitored by decon Team member for contaminants of concern. Depending on EZ location, wind direction, and contaminants of concern, the monitoring station should be located to ensure that fugitive emissions from the decon line are not affecting monitoring results. This step normally occurs inside of the decon tent in order to isolate the person being monitored and to concentrate any vapors or gases. Note that for some contaminants, direct reading instrument

monitoring may not be feasible. Use of test strips (pH, cyanide, etc.) or the collection of wipe samples for subsequent analysis may also be used to monitor for the effectiveness of decon.

**Step 9. PPE Boot Removal:** Remove decontaminated boots. Depending on EZ location, wind direction and contaminants of concern, PPE removal area should be sufficiently removed from the monitoring station to ensure that no fugitive emissions from the EZ or decon line are impacting the PPE removal area. The PPE removal area may be outdoors, or may be under an open-sided shelter in adverse weather conditions, but should not be outside the CRZ.

**Step 10. PPE Suit Doffing:** Entry Team personnel should remain on air through this step. The decon Team member will assist in doffing of the suit. The suit should be unzipped, and carefully rolled outward and downward from the zipper opening. Care should be taken to ensure that no external surface of the suit touches any portion of the wearer or their clothes during de-suiting. A designated area should be established for isolation and storage of suits prior to final disposition or disposal.

**Step 11. SCBA Removal:** The Entry Team member should go off air and remove the SCBA, leaving their face mask on until the SCBA is fully removed. A designated area should be established for SCBA staging pending air cylinder change-out and reuse.

**Step 12. Inner Glove Removal/Wash:** The Entry Team member should remove their inner gloves and place in an appropriate non-hazardous trash receptacle. They should remove their SCBA face piece after inner gloves are removed or washed. At the Inner Glove Removal station, persons exiting the decon line should be provided with their eyeglasses as needed, their shoes/boots (or other appropriate footwear), and any other clothing items necessitated by weather conditions.

**Step 13. Field Wash:** Facilities should be provided for a hand and face wash, or in some cases full shower capability as needed after exiting the CRC. Facilities should also be provided for mask sanitizing and decon prior to reuse.

**Step 14. Medical Monitoring Station:** Medical monitoring should take place once personnel have exited the CRC.

**Step 15. Rest and Rehabilitation Station:** The rest and rehabilitation station is an area for response personnel to rest, re-hydrate, and is observed for any latent exposure symptoms.

## Sample Decontamination

All samples leaving an exclusion zone must be decontaminated to remove any harmful chemicals that may have adhered to them. One member of the decon Team should act as a sample custodian and have all samples in their direct control/observation at all times. Once the samples have passed through the decon line, and custody of the samples may be relinquished to another person. Samples coming out of the exclusion zone will be containerized in a primary sample container, and usually in at least one plastic baggie. The inner plastic bag may have been decontaminated while in the EZ and placed in an outer plastic baggie. Alternatively, the sample may simply consist of just the baggie and container. Standard protocol is to decon the outside surface of the outermost plastic bag, but to not decon the primary sample container (except a wipe-down with tap or deionized water (DI) water to remove gross contamination).

For limited numbers of samples, the bagged samples may be carried through the decon line by Entry Team members, and be decontaminated simultaneously with the Entry Team members. For larger amounts of samples, the samples will be brought out of the EZ and placed in a sample decon container, normally containing the appropriate decon solution. After all entry team personnel are deconned, decon team members will retrieve samples from the sample decon container and complete sample decon. Decon of samples will consist of a

wash/wipe using the decon solution, followed by water rinse, and drying with a paper towel. The sample may then be placed in an outer plastic bag (if not already double-bagged), and delivered to the designated sample custodian, who will assume custody of the sample.

### Emergency Egress Corridor:

An emergency egress line must be established. This line will be used to quickly decon personnel who have medical emergencies while in the HZ. Personnel must be decontaminated prior to receiving treatment from emergency medical technicians or transported to a hospital. Garbing of the person being transported will be in compliance with the ambulance/EMT requirements. Back-up entry teams should plan to respond to calls for assistance in bringing injured or incapacitated HZ workers thru the emergency egress corridor, while performing/assisting the DL attendants with decon on the incapacitated worker.

Items needed for Emergency egress corridor:

- 1) Surgical scissors or other safety cutter for removing PPE;
- 2) Litter or other suitable carrier for incapacitated workers;
- 3) Blanket or tarp for covering the litter;
- 4) Recommended decon procedure for incapacitated workers:
- 5) When the emergency egress corridor is going to be used to expedite decon and egress, it must be cleared of any other personnel; anyone in the corridor should exit toward either the front or rear, depending on their level of possible contamination. Anyone in the corridor who has a possibility of being contaminated must exit toward the hot zone, before the injured worker enters it.
- 6) Assuming the incapacitated worker is at the decon line, perhaps brought by other workers, the decon line supervisor should notify at least 2 back-up team members to come to the front of the decon line (thru the emergency egress (EE) corridor), with the litter / stretcher, covered by one tarp. Place the incapacitated worker onto the tarp on the litter, face-up. Any HZ workers escorting the incapacitated worker can then return to work or exit thru the decon line as usual.
- 7) Supervisor should ensure 9-1-1 has been called or call if no one has done so already, informing the medical responders that the patient is being deconned and will arrive at the support zone in just a couple minutes. Ask if they want the patient wrapped or if they prefer to perform those themselves. Ensure other Incident Command staff is notified immediately about the situation, once 9-1-1 is notified.
- 8) The back-up team members will carry the worker on the litter thru the EE corridor.
- 9) The outer suit will be misted or it can be wiped thoroughly with Hype-wipe. Alternatively, a car-wash mitt dipped in decon solution can be used to wipe the outer suit.
- 10) Outer suit may be cut off depending on the injury. Cut the outer suit only away from the worker's body and making a long incision with medical scissors from the neck to below the waist, and an incision from below the waist down each leg to the heel. Use caution when removing the outer suit particularly the hood, being careful not to disturb the mask seal on the face.

### CRZ Breakdown

The Decon Line Supervisor will be responsible for watching the DL Attendants break down of the CRZ. The direction of breakdown starts at the HZ and works towards the SZ. All solid waste (e.g. used PPE, poly sheeting, etc.) will be collected, consolidated and appropriately sealed in accordance with packaging requirements. Items that require decon during this process include, stools, wash basins, and any other items that will be reused. All liquid waste shall be collected. Liquid waste will be collected and transferred into the minimum number of

appropriate containers (e.g. drums, totes, etc.) and will be disposed of in accordance with the local, state, and federal regulations and applicable requirements.

### Deconning the Decon Line Supervisor and Attendants

After the decon line is secured, the DL Attendants shall doff their PPE following Steps 2-9 above, whereby the most contaminated Decon Line Attendant (typically the individual closest to the EZ) becomes the “Worker” and the other Attendants move forward one place closer towards the EZ until all Attendants have become “Workers” (for the purpose conducting decon in this Decon Line SOP). The last Attendant will need to perform their own decon from start to finish.

Since the EPA OSCs are responsible for monitoring the successful decon of all personnel, the Decon Line Supervisor should be the last person through the decon line. If that is not feasible, then another EPA OSC in the SZ should monitor the final decon phases from the SZ.

### Disassembly of Decon Line

A final doffing station must first be established by placing a sheet of heavy duty (e.g., 2 mil) plastic on the ground just outside of the CRZ in the Support Zone with a hand-wash station (see below). Breaking down the decon line may be conducted in Modified Level D (i.e., Tyvek™, nitrile gloves and boot covers). Caution must be exercised to minimize cross-contamination of any residual viruses that may be on the decon line structures. All disposable items will be double-bagged and packaged to comply with the transportation and disposal requirements. Liquid and solid waste should be kept separate. After completion of disassembly of the decon line, these personnel will move onto the final doffing station, doff their PPE, containerize as appropriate, wash their hands and faces and comply with HASP requirements. A final inspection should be conducted to determine if the decon pad area needs to be sprayed down after disassembly.

The last 3 sections can be summarized as:

- 1) DL workers drum all wastes and liquids (**except for what they need to clean themselves**), once HZ workers have all exited thru decon. Dry floor on wet side.
- 2) Clean (wipe or spray) and push out (thru support zone) all unneeded containers, seats, tools and instruments from drop area. Leave large tubs and berms in place.
- 3) DL workers pair up and proceed thru all DL stations (2<sup>nd</sup> gross decon thru hand/face wash and exit). Last pair sets up sump or contains any liquids as they leave wet ops, using extra gloves as needed, before proceeding to dry side of decon.

Follow-up level D (no breathing zone protection needed, no liquids) team can complete removal of berms and large tubs, and lastly perform final tent collapse when dry.

## References

EPA NHSRC (2015), Decontamination Line Protocol Evaluation for Biological Contamination Incidents, Assessment and Evaluation Report, EPA/600/R-14/476, 2015

CDC (2008). Guidance on Emergency Responder Personal Protective Equipment (PPE) for Response to CBRN Terrorism Incidents. DHHS, NIOSH.

NIOSH (1985). Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH, OSHA, USCG. EPA.

NIOSH (2009). "Recommendations for the Selection and Use of Respirators and Protective Clothing for Protection against Biological Agents" NIOSH Publication Number. 2009-132 29 CFR, Part 1910, Section 134, Respiratory Protection.

EPA Emergency Responder Health and Safety Manual.

Sandia, (2006). Decontamination Technologies for Building Restoration SAND2006-6580

## **Appendix I – Personal Protective Equipment**

## Level A Responses

Select when the greatest level of skin, respiratory, and eye protection is required. This is the maximum protection for responders in danger of exposure to both absorption and respiratory hazards, unknown chemicals, or levels above the IDLH or greater than the AEGL-2. Assure that appropriate decon operations are established before entry.

### Recommended Ensemble

NOTE: Specifics of the incident may alter the suit ensemble or dress out procedures. If chemicals are known, ensure ensemble chemical compatibility.

- Tychem TK/Responder Level A suit
- Integral Silver Shield inner gloves
- Butyl rubber outer gloves
- Cut Resistant Gloves over the integral butyl rubber gloves
- Use CHEM tape to seal all potential penetrations
- Nitrile exam inner gloves
- SCOTT SCBA ensemble
- Tingly HAZPROOF boots
- Communication equipment

Optional equipment to consider based on site conditions include supplied air cart, hardhats, hearing protection, towel and/or anti-fog to clear condensation, trauma shears or knife inside the suit for emergencies, cut-resistant over gloves, and additional CHEM or duct tape, among others

### Procedural Steps for Level A

- 1) Remove jewelry, belts, and all items from pockets and place in a labeled baggie. Consider removing “street clothes” and wearing coveralls.
- 2) Inspect mask and apply anti-fog to inside and outside of lens (put in spectacle kit if needed).
- 3) Inspect SCBA.
- 4) Inspect both inner suit and Level A suit (apply anti-fog to inside lens of Level A suit if needed).
- 5) Remove personal boots or shoes.
- 6) Don a pair of Nitrile exam gloves.
- 7) Put on and zip up inner suit.
- 8) Put on Level A suit up to waist.
- 9) Put on outer steel toe/steel shank, chemical protective boots. Pull gauntlet down over boots. Consider chemical protective booties over the HAZPROOF boots.
- 10) Put on one pair of Nitrile exam gloves. Secure outer gloves to inner suit with CHEM tape.
- 11) Pull up inner hood and put on SCBA unit (if applicable). Open valve on bottle all the way. Connect SCBA to suit SAR connection.
- 12) Attach Radio and Communications Unit. Turn on, select proper channel and perform test.
- 13) Tuck a towel into SCBA Strap to be used during entry to periodically wipe condensation from face mask of Level A suit.
- 14) Tape Trauma Shears or other self-cutout tool to leg or other secure location.
- 15) Pull back inner hood and put on SCBA mask. Perform positive and negative-pressure fit check.
- 16) Pull up inner hood over mask harness. Tape to SCBA mask, as necessary
- 17) Put on hardhat and add any additional equipment and supplies as necessary.
- 18) Connect regulator to SCBA mask. **SCBA is now fully-operational.**
- 19) Pull up and zip Level A suit. Consider cut-resistant over-gloves if work may compromise glove integrity.
- 20) Perform final inspection.

## Level B Responses

Select when the highest level of respiratory protection is necessary, but a lesser level of skin protection is required. This is the minimum protection for responders in danger of exposure to unknown chemical hazards or levels above the IDLH or greater than AEGL-2. Assure that appropriate decon operations are established before entry.

### Recommended Ensemble for Level B

NOTE: Specifics of the incident may alter the suit ensemble or dress out procedures. If chemicals are known, ensure ensemble chemical compatibility.

- Saranex outer suit. An inner suit is not always warranted. The need for an inner suit and the specific material is based on the specifics of the incident.
  - Integral Booties
  - Elastic Wrists
  - Use chemical tape to seal all potential penetrations
- Nitrile exam inner gloves
- Silver Shield gloves
- Appropriate outer gloves
- Steel Toe/Steel Shank boots with chemical protective booties or Steel Toe/Steel Shank chemical protective (HAZPROOF) boots
- SCOTT SCBA ensemble
- Communication equipment

Optional equipment to consider based on site conditions include supplied air cart, hardhats, hearing protection, trauma shears or knife for emergencies, cut-resistant over gloves, and additional chemical or duct tape, among others

### Procedural Steps for Level B

- 1) Remove jewelry, belts, and all items from pockets and place in a labeled baggie. Consider removing “street clothes” and wearing coveralls.
- 2) Inspect mask and apply anti-fog to inside and outside of lens (put in spectacle kit if needed).
- 3) Inspect SCBA.
- 4) Remove personal boots or shoes.
- 5) Inspect both inner and outer suit.
- 6) Don a pair of Nitrile exam gloves.
- 7) Put on and zip-up inner suit.
- 8) Put on one pair of Nitrile exam gloves. Secure gloves to inner suit with CHEM tape.
- 9) Put on and zip-up outer suit.
- 10) Put on outer steel toe/steel shank, chemical protective boots. Consider chemical protective booties over the HAZPROOF boots. Secure boots over suit with CHEM tape.
- 11) Put on SCBA unit and open valve on bottle all the way.
- 12) Pull back both inner and outer hoods.
- 13) Put on mask and perform positive- and negative-pressure fit test.
- 14) Attach Radio and Communications unit. Turn on, select proper channel and perform test.
- 15) Pull up both inner and outer hoods over mask harness. Seal SCBA MASK to hood with CHEM tape.
- 16) Put on hardhat and add any additional equipment and supplies as necessary.
- 17) **If required**, put on 4-H/Silver Shield gloves. Secure gloves to sleeves with CHEM tape
- 18) Put on outer gloves. Secure sleeves over gloves with CHEM tape. Consider cut-resistant over-gloves if work may compromise glove integrity.
- 19) Connect regulator to mask. **SCBA is now fully-operational.**
- 20) Perform final inspection.

## Level C Response

Select when the contaminant and concentration, along with acceptable oxygen concentrations, are known and the respiratory protection criteria factors for using Air Purifying Respirators (APR) or Powered Air Purifying Respirators (PAPR) are met. Assure that appropriate decon operations are established before entry.

### Recommended Ensemble for Level C

NOTE: Specifics of the incident may alter the suit ensemble or dress out procedures. Verify ensemble compatibility with site contaminants.

- Saranex, PE Tyvek or Paper Tyvek outer suit based on the specifics of the incident
  - Integral Booties
  - Integral Hood
  - Elastic Wrists
- Nitrile exam inner gloves
- Silver Shield gloves, as needed based on the specifics of the incident
- Appropriate outer gloves
- Steel Toe/Steel Shank boots with chemical protective booties or Steel Toe/Steel Shank chemical protective (HAZPROOF) boots
- Chemical protective booties
- SCOTT Face Piece, T-Bar, appropriate cartridges or SCOTT PAPR unit (NOTE: Check and assure that cartridges are appropriate and protective for the response. Check the batteries is using PAPR)
- Optional equipment to consider based on site conditions include class 2 or better high-visibility safety vest, hardhats, hearing protection, trauma shears or knife for emergencies, cut-resistant over gloves, and additional chemical or duct tape, among others

### Procedural Steps for Level C

- 1) Remove jewelry, belts, and all items from pockets and place in a labeled baggie. Consider removing “street clothes” and wearing coveralls.
- 2) Install T-Bar and Cartridges. Inspect mask and apply anti-fog to inside and outside of lens (put in spectacle kit if needed).
- 3) Inspect outer and inner suit.
- 4) Remove personal boots or shoes if using chemical protective boots.
- 5) Don inner gloves.
- 6) Put on inner suit and zip-up. Don another pair of nitrile exam gloves and tape to inner suit.
- 7) Put on outer suit up to waist. Consider using a piece of CHEM tape to extend zipper pull.
- 8) Don chemical protective booties over steel toe/steel shank boots or don steel toe/steel shank chemical protective booties. Consider chemical protective booties over the HAZPROOF boots. Secure boots with CHEM tape, as needed.
- 9) Pull-up and zip outer suit.
- 10) Put on PAPR unit if using.
- 11) Pull back inner and outer hoods, as necessary.
- 12) Put on mask and negative-pressure fit test.
- 13) Attach Radio and Communications unit.
- 14) Pull-up inner and outer hoods over mask harness. Tape to mask.
- 15) Put on hardhat. Put on High-Vis Vest (as appropriate)
- 16) **If required**, put on 4-H/Silver Shield gloves. Secure gloves to sleeves with CHEM tape.
- 17) Put on outer gloves. Secure sleeves over gloves with CHEM tape. Consider cut-resistant over-gloves if work may compromise glove integrity.
- 18) Turn on PAPR and attach regulator to mask if using PAPR.
- 19) Perform final inspection.

## SCBA and Chemical Protective Clothing Inspections

### SCBA Inspection

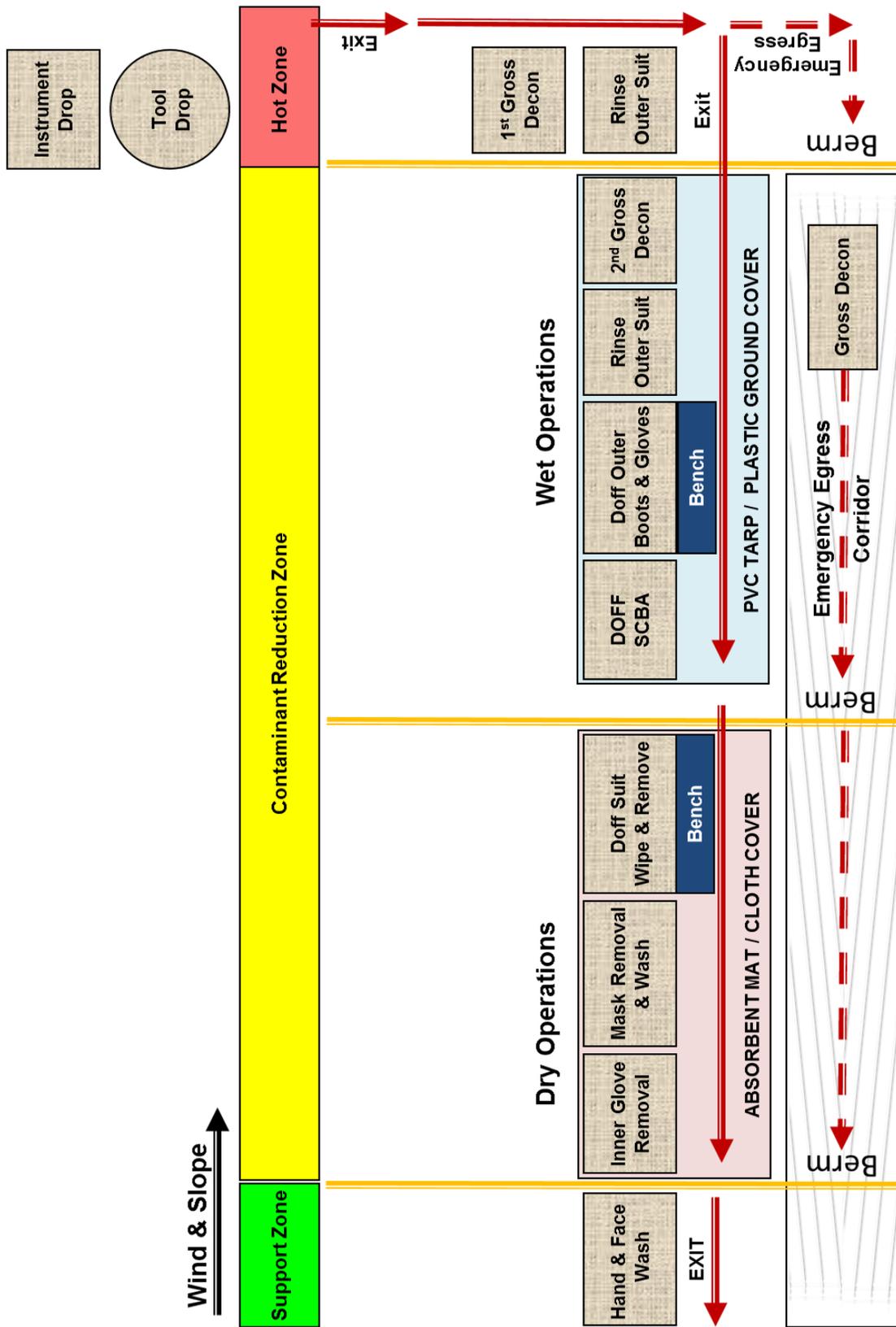
1. Remove SCBA from case and place on a table or bench.
2. Examine overall condition of SCBA and note any damage.
3. Remove the cylinder from the harness and check hydrostatic test date. Cylinder must be hydrostatically test every 5 years.
4. Check cylinder for damage and wear.
5. Make sure cylinder has >3500 psi. Replace with full cylinder if necessary.
6. Inspect shoulder straps and waist belt for damage or wear.
7. Check all buckles and fasteners and assure proper operation.
8. Examine the backpack for damage, cracks, or rust.
9. Make sure all connections points between the cylinder and the SCBA harness operate properly and are free of damage or corrosion.
10. Check O-Ring for damage.
11. Re-install cylinder and reattach to the harness.
12. Check all hoses and connection points for wear, cuts or damage
13. Activate cylinder valve and compare cylinder pressure gauge and pack pressure gauge. Make sure values are the same.
14. Inspect face piece for wear, damage, cracks. Inspect face piece harness for wear.
15. Attach face piece and check regulator for proper operation.
16. Close cylinder valve and open by-pass valve to bleed pressure slowly. Check to assure heads-up display indicators tracks properly with the decreasing pressure. Replace battery if low battery light is illuminated.
  - Full Cylinder – Two Green Lights
  - ¾ Cylinder – Single Green Light
  - ½ Cylinder – One Flashing Yellow Light
  - ¼ Cylinder – One Flashing Red Light
17. Assure that “Vibra-alert” activates at 1000psi.
18. Tag and remove from service if SCBA fails inspection.

### Chemical Protective Clothing Inspection

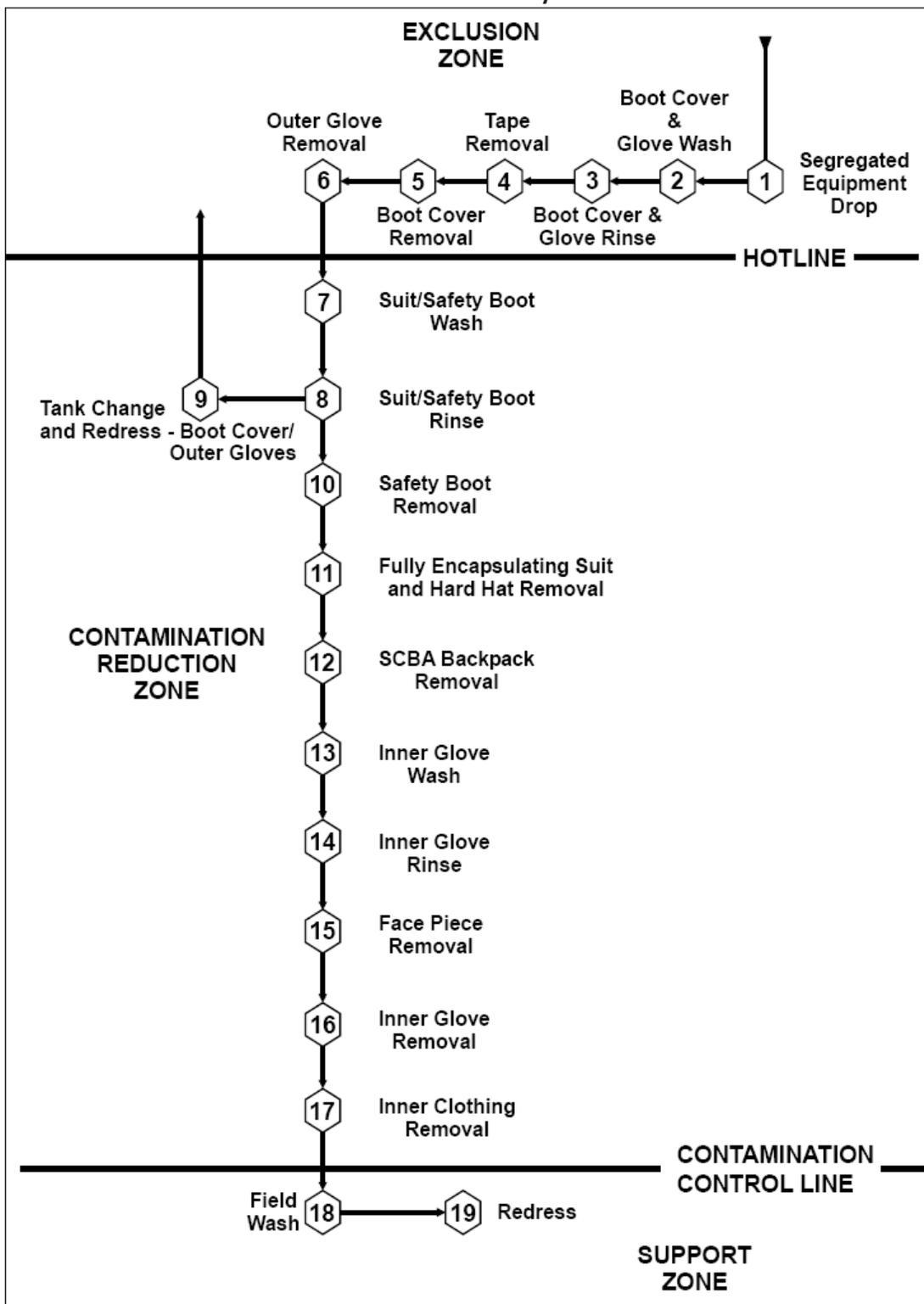
Visual Suit Check:					
<b>Inspected within Last Year (Level A)</b>	Yes	No	<b>Emergency Cutout Device (Level A)</b>	Yes	No
<b>No obvious damage to suit</b>	Yes	No	<b>SCBA SAR Line Connected (Level A)</b>	Yes	No
<b>Zipper Functions/Not Damaged</b>	Yes	No	<b>SCBA mask sealed/SCBA operating</b>	Yes	No
<b>Exhalation Valves Intact (Level A)</b>	Yes	No	<b>Final Communications Checked</b>	Yes	No
<b>Towel (Level A)</b>	Yes	No	<b>Zipper Fully Zipped</b>	Yes	No
Pre-Entry Checklist					
<b>Pre-hydration:</b>	Yes	No	<b>IAP / HASP Reviewed:</b>	Yes	No
<b>Aware of Signs and Symptoms of Specific Chemical Exposure:</b>	Yes	No	<b>Suit Ensemble Compatibility Researched and Checked:</b>	Yes	No
<b>Personal Effects Removed and Secured:</b>	Yes	No	<b>Radio Communications Checked:</b>	Yes	No

## Appendix II – Example Decon Layouts

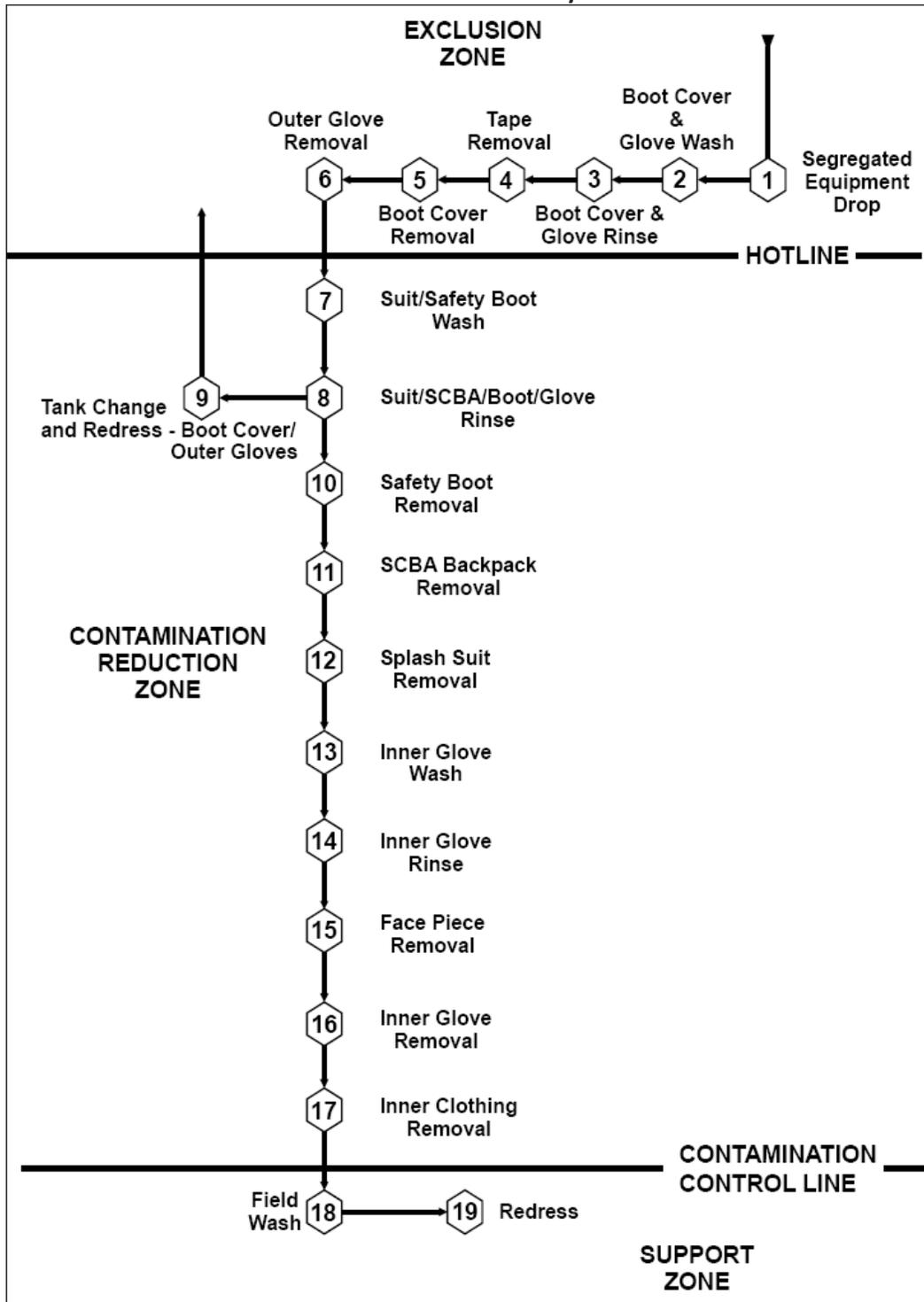
Example – Chemical Agent Decon



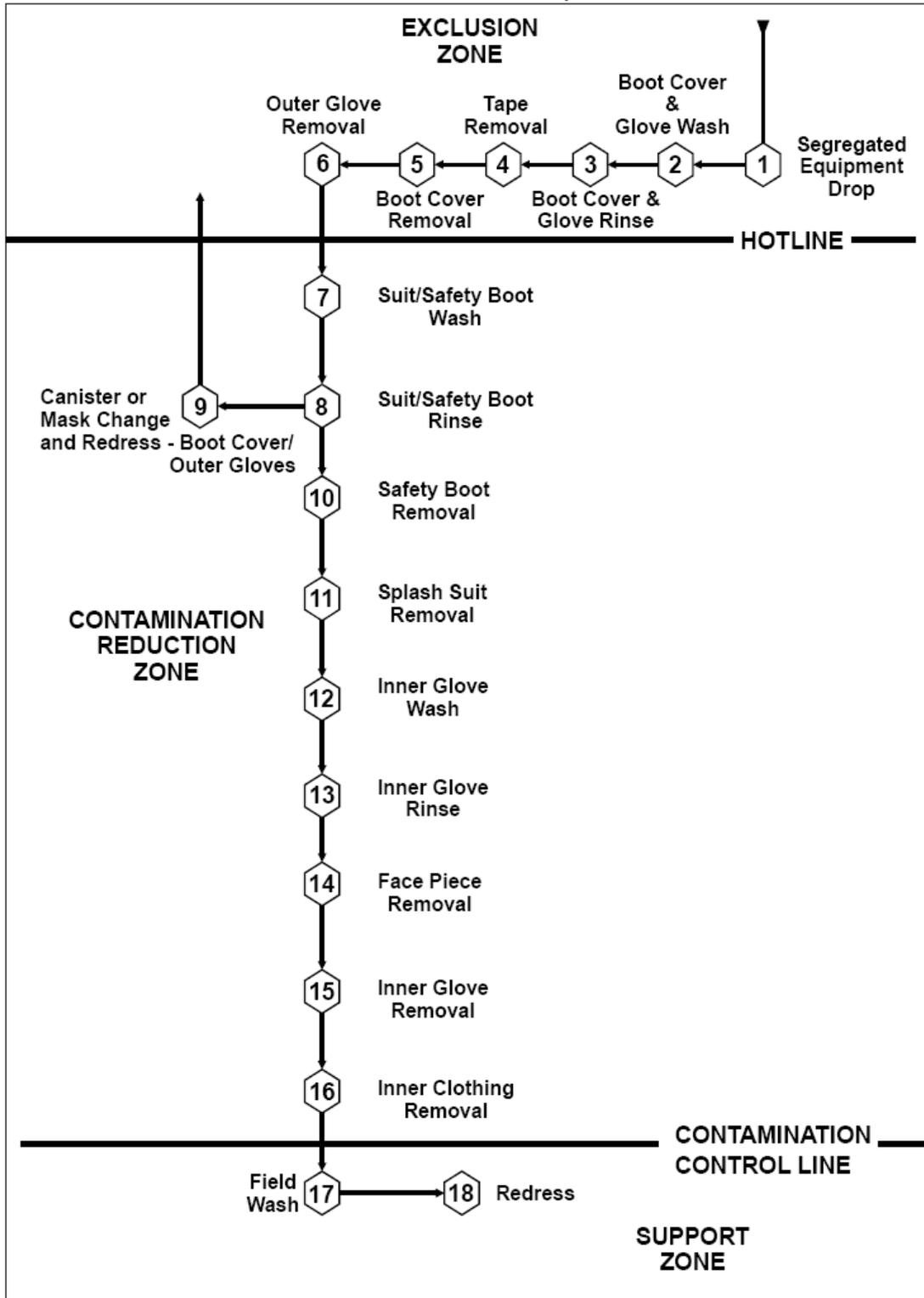
Level A - Decon Layout



Level B - Full Decon Layout



Level C – Full Decon Layout



## Appendix III – Decontamination Technologies

**Decontamination Technologies and their Efficacy**

Decon Technology	HD		VX		G Agents		Corrosiveness	Toxicity	Source
	Contact Time	Efficacy	Contact Time	Efficacy	Contact Time	Efficacy			
DF-200	30 min	>99.8%	30 min	>99.8%	30 min	>99.9%	L	L	Proprietary Modec, Inc., EnviroFoam Technologies Inc.
HTH	5 min	✓	5 min	✓	5 min	✓	H	H	Nonproprietary  Easily formulated
Bleach	5 min	✓	5 min	✓	5 min	✓	H	H	Nonproprietary Widely available
CASCAD	5 min	>99.95%	5 min	✓	5 min	>99%	L	L	Proprietary  Allen- Vanguard
GDS 2000	1 min	>99.8%	1 min	>99.8%	1 min	>99.8%	—	—	Proprietary Kärcher Futuretech
	3 hrs.	99.87%	3 hrs.	99.97%	3 hrs.	99.95%			
Decon Green	20 min	99.9%	20 min	>99.9%	20 min	>99.9%	H	H	Proprietary Strategic Technologies Enterprises
	15 min	99%	15 min	96%	15 min	90%			