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DRAFT - Hazardous Chemical  
Response Personnel  
Decontamination Line  
Standard Operating  
Procedure

December 8, 2021

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2 CMAD Hazardous Chemical Response Personnel Decon Line SOP

3 Revision: 1

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## 63 **Acronyms and Abbreviations**

64	APR	Air-purifying respirator
65	ASTM	ASTM International (formerly American Society for Testing and Materials)
66	BMA	Blower motor assembly
67	CBRN	Chemical, biological, radiological, and nuclear
68	CDC	Centers for Disease Control and Prevention
69	CFR	Code of Federal Regulations
70	CMAD	Consequence Management Advisory Division
71	CRC	Contamination reduction corridor
72	CRZ	Contamination Reduction Zone
73	Decon	Decontamination
74	DHHS	Department of Health and Human Services
75	DL	Decontamination (decon) line
76	DLA	Decon Line Attendant
77	DLS	Decon Line Supervisor
78	DOT	Department of Transportation
79	EEC	Emergency egress corridor
80	EMS	Emergency Medical Services
81	EMT	Emergency medical technician
82	EPA	Environmental Protection Agency
83	EZ	Exclusion Zone
84	EZW	Exclusion Zone Worker
85	GFI	Ground fault interrupter
86	H&S	Health & safety
87	HASP	Health and Safety Plan
88	HEPA	High-efficiency particulate air
89	mil	millimeter
90	mm	millimeter
91	NAM	Negative air machine
92	NFPA	National Fire Protection Association
93	NIOSH	National Institute for Occupational Safety and Health
94	OSC	On-Scene Coordinator
95	OSHA	Occupational Safety and Health Administration
96	PAPR	Powered air-purifying respirator
97	PPE	Personal protective equipment
98	SOP	Standard operating procedure
99	SZ	Support Zone
100	TIC	Toxic industrial chemical

101



**DRAFT - Hazardous Chemical Response Personnel Decontamination Line Standard Operating Procedure (SOP)**

CMAD Hazardous Chemical Response Personnel Decon Line SOP

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102 **1. Purpose**

103 The purpose of this standard operating procedure (SOP) is to provide EPA staff and  
104 contractors with recommended protocols for personnel decontamination (decon) while  
105 operating in an environment contaminated with toxic industrial chemicals (TICs),  
106 including chemical warfare agents. EPA developed this SOP specifically for lewisite, sulfur  
107 mustards (H/HD and HT), VX, and the G-type nerve agents (Soman, Tabun, and Sarin). It should  
108 be followed when and where Level A, B, and/or C personal protective equipment (PPE) is worn  
109 (See Appendix II, Personal Protective Equipment for Exclusion Zone (EZ) Workers (EZWs).

110  
111 Primarily, this SOP uses a wipe, spray, and rinse decon line process. It can be used for Level A,  
112 B, C, and supplied airline respirator (SAR) work. Adherence to the procedures presented in this  
113 SOP is expected. However, the user may make modifications based on site-specific and/or  
114 situation-specific conditions and/or difficulties relevant to a particular response action. Before  
115 making any modifications to the SOP, consult a Health & Safety Officer (H&S Officer) and  
116 document any deviations and/or modifications made.

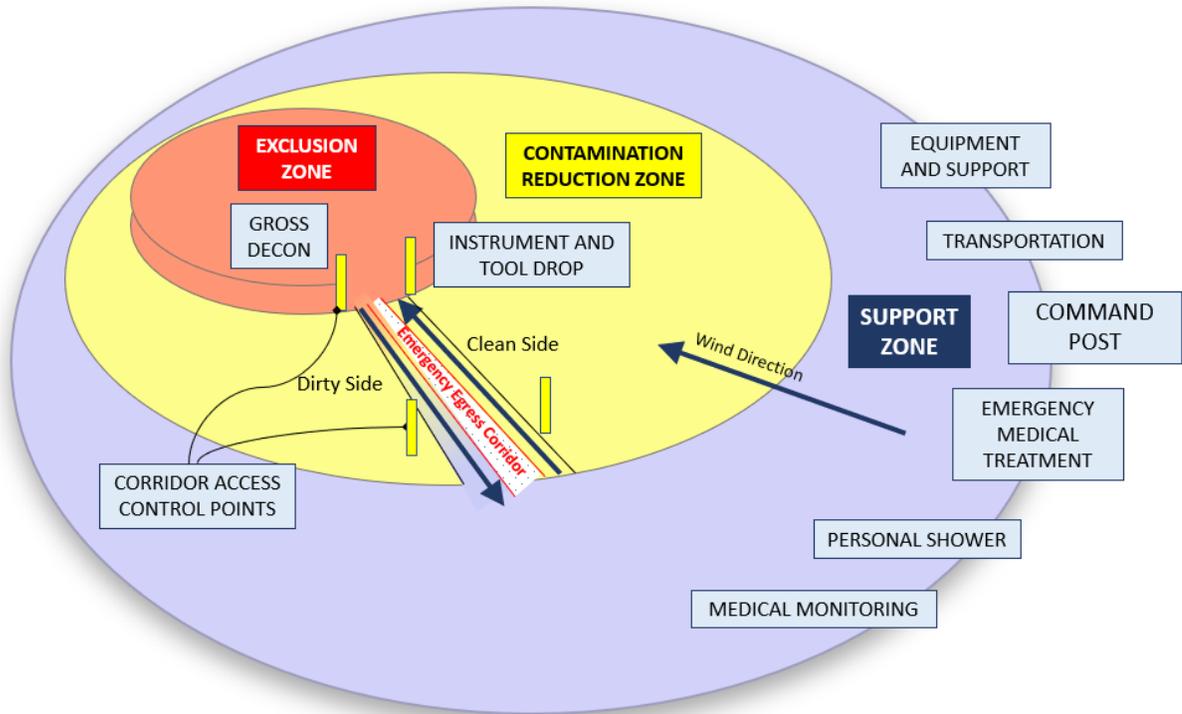
117  
118 Updates and revisions to this document will be made as information that could impact these  
119 procedures becomes available.

120  
121 Note: Appendices I, II, III, IV, and V at the end of this document contain instructions for general  
122 set up and take down of the decon line (DL), lists of basic materials for decon set up, and basic  
123 sample decontamination and handling.

124  
125 **2. Introduction**

126 Decontamination (“decon”) is the process of removing or neutralizing contaminants that have  
127 accumulated on personnel and equipment. Through a series of steps and stations, the DL  
128 moves the EZW from the EZ through the Contamination Reduction Zone (CRZ) to the Support  
129 Zone (SZ) (**Figure 1**). The decon process is critical to worker health and safety at hazardous  
130 waste sites. Decon procedures protect workers from hazardous substances that may  
131 contaminate and eventually permeate protective clothing, respiratory equipment, tools,  
132 vehicles, and other equipment used on site. The procedures accomplish the following  
133 objectives:

- 134 • Safely remove personnel from PPE without contaminating them
- 135 • Protect site personnel by reducing the spread of harmful materials into clean areas.
- 136 • Choose the appropriate decon solution for the contaminant of concern. See Appendix IV,
- 137 Attachment B for Chemical Agent decon solutions.
- 138 • Protect the community by preventing the uncontrolled transport of contaminants from the
- 139 site.
- 140



141  
142  
143 Figure 1. Site Zones and Key Locations  
144

### 145 3. Personnel Decontamination Line Plan

146 A Personnel Decontamination Line Plan (Decon Plan) should be developed as an appendix to  
147 the Site Health and Safety Plan (HASP) and prepared before any personnel or equipment may  
148 enter areas where the potential for exposure to hazardous substances exists.

149 The Decon Plan for the site should:

- 151 • Support the number of EZW on entry teams decontaminated at one time.
- 152 • Specify if the DL will be set up for short-term or long-term use.
- 153 • Establish the number and layout of decon stations.
- 154 • Identify the minimum number of DL Attendants (DLA) needed.
- 155 • Specify the decon equipment needed.

- 156 • Specify the appropriate decon method and solution(s).
- 157 • Establish procedures to prevent contamination of clean areas.
- 158 • Establish methods and procedures to minimize worker contact with contaminants
- 159 during the removal of PPE.
- 160 • Establish methods for disposing of clothing and equipment that is not completely
- 161 decontaminated.
- 162 • Ensure that the DL is upgradient and upwind" (based on prevailing winds and
- 163 topography)
- 164 • Ensure that the location is free of rocks and is on level ground.
- 165 • Specify methods to minimize the movement of the contaminants through the DL.
- 166 • Require periodic inspections of the DL area to determine that unexpected
- 167 contamination is not migrating from the EZ through the DL or from the DL into the SZ.
- 168 • Perform contaminant screening and monitoring of decon entrants to ensure the efficacy
- 169 of the decon process.
- 170

#### 171 4. Decontamination Team

172 At a minimum, the DL team will be staffed with four DLAs and the DL Supervisor (DLS). It does  
173 not have a backup team but utilizes a "next man over approach" to assist the DLAs in the decon  
174 line (e.g., Step 2 personnel help Step 1 personnel). Entry operations must be coordinated with  
175 the DLS to ensure decontamination of personnel is adequately supported during the EZ egress  
176 process. **The decon team will be dressed in the same level of PPE or one level below the entry**  
177 **team.** The DLS will be responsible for team communications and operations, including the  
178 proper setup of the CRZ, the emergency egress corridor (EEC), and the contamination reduction  
179 corridor (CRC).

180  
181 For more information, please see the [EPA Emergency Response H&S Manual](#).

#### 183 5. Backup Field Team

184 At a minimum, the backup field team will be staffed with two personnel. A backup field team  
185 will be waiting in the SZ to go into the EZ if an emergency occurs. **Typically, the backup team is**  
186 **partially dressed in the same level of PPE as the entry team, and they are in a ready state.**  
187 They are not on air or using respirators until activated. The backup field team may be used as a  
188 support team for an emergency in EZ or EEC to help the casualty/victim/worker through the DL.

#### 190 6. Decon Line Construction

191 The DL should be set up with enough space to perform each of the steps/processes and provide

192 flexibility to adapt. The DL should be constructed on flat ground free of rocks and other debris.  
193 The DL should be placed in a location that is upwind of the EZ and in an area with no overhead  
194 hazards, if practical. The DL should be constructed with durable materials to withstand  
195 continued use throughout the life of the response. If possible, decon tents or structures should  
196 be used. Tents, berms, and collection vessels should be used to contain aqueous waste and  
197 prevent its migration off site. It is important to note that this DL procedure may require  
198 augmentation based on the contaminants, the size and location of the DL, the site conditions,  
199 and the number of decon entrants (i.e., anyone who enters CRZ or EZ). The basic DL setup can  
200 be found in Appendix I; the description of PPE levels in Appendix II (NIOSH 2009); a list of  
201 materials and supplies in Appendix III, including PPE; and instructions for construction,  
202 disassembly, and sample decon in Appendix IV. Please refer to the health and safety plan for  
203 specific PPE requirements ([https://response.epa.gov/HealthSafetyManual/ppe-](https://response.epa.gov/HealthSafetyManual/ppe-ensemble.htm)  
204 [ensemble.htm](https://response.epa.gov/HealthSafetyManual/ppe-ensemble.htm)).  
205

206 A detailed Decon Plan should be developed before commencing any site work. Procedures  
207 should be in place to treat and replace contaminated materials used during the decon process  
208 and to replace necessary decon solutions. This type of robust decon setup may be appropriate  
209 if a prolonged decon process is anticipated (i.e., multiple days). Due to large volumes of  
210 aqueous decon waste collected during prolonged operation, additional measures should be  
211 considered to remove and temporarily store bulk amounts of aqueous decon waste for  
212 disposal. A detailed Site Waste Management Plan should be prepared before the DL is set up.  
213 This plan's procedures should include collecting and storing waste from the DL and waste  
214 characterization sampling for disposal facility acceptance.  
215

## 216 **7. Safety and Construction Considerations**

217 Decontamination protects all site personnel by preventing the spread of harmful materials from  
218 EZ. Before entering the EZ, all personnel must train, practice, and be proficient with the site-  
219 specific decon procedures. Considerations for safe operations may include:

- 221 • All personnel under the supervision of DLS (EZWs and DL support staff) must participate  
222 in an initial walk-through of the DL with the DLS before suiting up. The DLS should  
223 explain each step of the decontamination process and clarify any questions participants  
224 may have.
- 225 • Attempts should be made to prioritize personnel decon. Priority should be given to  
226 heavily contaminated personnel, those low on air, those with damaged or degraded  
227 PPE, and those experiencing heat stress, symptoms of chemical exposure, or other  
228 medical issues.

- 229 • DLAs should give clear, concise instructions to EZW entering the CRZ or DL, guiding them  
230 through each stage of the decon process (EZW personnel may not remember what to do  
231 or in what order). See Appendix VIII for instructional signs for each decon step.
- 232 • EZWs must follow DLA's instructions precisely.
- 233 • To minimize cross-contamination, DLAs should minimize physical contact with the EZWs  
234 until the suit removal process has begun.
- 235 • Communication may be difficult, and instructions should be kept simple. All  
236 communication should be verbal, hand signals, and/or taps on the shoulder.
- 237 • Efforts should be made to avoid over-spray of decon solutions and cross-contamination  
238 of other personnel and the CRC.
- 239 • Any items brought out of the EZ must be either decontaminated or packaged for off-site  
240 decon/disposal, including equipment, instruments, and samples.
- 241 • DLAs must also go through the decon process before exiting. DLA should begin their  
242 decon, starting from their station and moving toward the SZ.
- 243 • Making modifications for weather conditions, including adding heaters that do not  
244 generate carbon monoxide, or fans and/or portable air conditioners. In anticipation of  
245 wind or heavy rain, adding tie-downs and heavy-duty stakes to secure tents/structures.
- 246 • Using ground fault interrupters (GFI) for all electrical cords and connections.
- 247 • Being aware of potential slip, trip, and fall hazards in the DL. Identifying issues as they  
248 become apparent and working to eliminate them.
- 249 • Persons enter EZ and working on the DL must know and understand the site specific  
250 chemical hazards involved with their tasks, and recognize an incompatibilities and water  
251 reactive issues that may arise.
- 252 • Ensuring entry and exit points are conspicuously marked and that each step in the  
253 decontamination line is clearly identified.
- 254 • Providing adequate lighting in all areas of the line.
- 255 • Using heavy-duty, drainage, anti-slip mats in the Wet Operations area to prevent slips,  
256 trips, and falls. Adhesive anti-skid tape can also be added to areas that mats will not fit,  
257 or as needed.
- 258 • The optional setup of monitors to ensure adequate air monitoring based on  
259 contaminant and decon solution being used.
- 260 • Staging a fire extinguisher, first aid kit, and eye wash station near the DL.
- 261 • Keeping equipment (generators, running vehicles, heaters, etc.) that could generate  
262 carbon monoxide away from the DL.
- 263 • Consider setting up a carbon monoxide monitor if carbon monoxide could be present.
- 264 • Test decon solutions in the boot tubs and glove wash basins (Step 4 and 5) periodically  
265 to ensure that the decon solution remains effective throughout the decon process. For

266 example, chlorine concentrations can be checked with chlorine test strips at the  
267 direction of the Site H&S Officer or the DLS (see Appendix III, Table 1 for available  
268 product details).

- 269 • At a minimum of every four hours, change the decontamination solutions in the wash  
270 tubs and sprayers. It may be necessary to change it more frequently if the solution  
271 appears dirty, unfit for use, or the chlorine level, as seen on a test strip, drops to an  
272 insufficient level for use.
- 273 • Ensuring that the decon methods and operations adequately remove contaminants  
274 from PPE by conducting periodic wipe testing of decontaminated protective coveralls  
275 used by the EZWs and DLAs. The wipe samples can be sent to a laboratory to ensure  
276 decon procedures are effectively removing contaminants.
- 277 • Evaluating the safety of the DL during operations and routinely adding to this list of  
278 considerations for the DL. New considerations will be documented and addressed as  
279 determined by the Site H&S Officer and the DLS.

280

## 281 **8. Hazardous Chemical Decontamination Solutions**

282 For most circumstances and toxic industrial chemicals (TICs), the standard decon solution will  
283 be copious amounts of water or a detergent/water mix (i.e., Dawn Dish Detergent, Simple  
284 Green). Detergent and water will not destroy most TICs, but they will help to remove them  
285 from PPE and other surfaces. They will also dilute the material, reducing its toxicity. Using  
286 warm water will improve the effectiveness of water as a solvent.

287

288 For chemical agents, solutions that oxidize and/or hydrolyze can be used for decontamination.  
289 Most chemical agents (nerve, blister agents, etc.) contain either sulfur molecules that are  
290 reduced in oxidation reactions or phosphorus groups that can be hydrolyzed. Therefore, most  
291 chemical decontaminants are designed to either oxidize or hydrolyze. Oxidative chlorination is  
292 the general term for using active chlorine solutions, including hypochlorite solutions such as  
293 household bleach. A solution's pH is vital in determining the amount of active chlorine  
294 concentration, with an alkaline solution being the most effective. The standard decon solution  
295 for chemical agents is a 0.5% calcium hypochlorite solution or a 0.5% sodium hypochlorite  
296 solution (household bleach is usually 5% sodium hypochlorite). Alkaline chemical hydrolysis  
297 works by the (sodium) hydroxide ion reacting with phosphorus atoms; the hydrolysis rate is  
298 dependent on the chemical structure and reaction conditions such as pH and temperature. The  
299 rate of hydrolysis increases sharply at pH values higher than 8. Additional decontamination  
300 technologies can be reviewed in Appendix IV Table B.

301

302

303  
304  
305  
306

Table 1. Decontamination Solutions			
Type of Contamination	Decon Solution Used	Cautions	Special Modifications to Decon line
Most circumstances and most toxic industrial chemicals	Water; Water/Dawn Dish Detergent or Simple Green mixture	N/A	N/A
Chemical Agents	0.5% sodium hypochlorite; 0.5% calcium hypochlorite  (1:10 dilution of household bleach)	Caustic to suit and skin.	With recommended contact time of 5 minutes (McGuire et al. 2001).
Water-Reactive Chemicals	Dry methods such as wiping or HEPA vacuum, or large amounts of water to quickly dilute chemical	When using water, a reaction can produce a dangerous gas	If using water, decon should take place in a well-ventilated area. Air monitoring would be recommended during decon.

307 NOTE: See Appendix IV Attachment B for additional decontamination technology, contact times, and vendors.  
308 N/A = Not applicable; HEPA = high-efficiency particulate air  
309

## 310 9. Personal Protective Equipment

311 The Site H&S Officer, DLAs, and DLS will be required to don **Level A, modified Level B, Level B,**  
312 **or Level C PPE as specified in the site HASP or the Site H&S Officer.** DLS and DLAs will either  
313 don the same level of protection as the EZW or one level lower. Before donning PPE, workers  
314 should inspect their PPE for damage or flaws, including respiratory protection equipment. All  
315 DLAs, DLSs, and EZWs who enter the EZ or work on the DL should write their names on any  
316 durable PPE (e.g., respirators, rubber boots, etc.) that the site H&S Officer allows returned after  
317 decontamination. Workers should also deliver a change of clothing to the SZ to change into  
318 after decon. A description of the different levels of PPE can be found in Appendix II, and a table  
319 of PPE selected for possible use in this decon procedure can be found in Appendix III, Table 2,  
320 including the manufacturer, coverall material type, standard compliance, and model numbers.  
321 Chemical permeation information can be found for suit materials on the manufacturer's  
322 websites ([DuPont™ Tychem® and Tyvek® products](#) and [Kappler® Zytron® and Frontline®](#))

323 [products](#)). Specific PPE selections are made based on site conditions, contaminants, and  
324 decisions by the Site H&S Officer and are found in the Site HASP.

325  
326 The outer coveralls considered for use in this DL must meet the requirements of OSHA's  
327 Hazardous Waste Operations and Emergency Response (HAZWOPER) standard, 29 Code of  
328 Federal Regulations (CFR) 1910.120 Subpart H App B. The National Institute for Occupational  
329 Safety and Health (NIOSH) has approved respirators specifically for CBRN exposures; they are  
330 specified in Appendix II. PPE options that the DLA and DLS may use can be found in Appendix III,  
331 Table 2, which includes the manufacturer, coverall material type, standard compliance, and  
332 model numbers. For this SOP, PPE is defined as the following:

333

### 334 **Level A PPE Ensemble**

---

335

#### 1. **Suits**

336

a. Outer suit – Level A suit – SCBA and full-facepiece, totally-encapsulating chemical-  
337 protective suit (e.g., DuPont™ Tychem® 10000 or Responder® CSM or Kappler®  
338 Zytron® 300 or 500). The suit will include an expanded back, storm flap, attached  
339 dual-layer gloves, sock boots with cuffs, and a zipper in the front or back.

340

b. Optional inner suit – Tyvek® or equivalent with integral booties (socks), one or two  
341 sizes larger than typically worn to allow easy removal without cross-contamination.

342

#### 2. **Gloves** (three required pairs; one optional pair)

343

a. Inner protective gloves – Thin (~4 millimeters [mil]) surgical nitrile, with long wrist  
344 gauntlets (mid-arm, or a few inches beyond the wrist), worn under the inner Tyvek®  
345 suit and not taped.

346

b. Suit gloves – The gloves that are attached to the Level A suit.

347

c. Outer protective gloves – Worn over the Level A suit's attached gloves and made  
348 from an appropriate material for the chemical contaminants as specified in the site  
349 HASP.

350

d. Work gloves (optional) – Any gloves worn over the three protective layers are  
351 considered task-specific work gloves and are selected based on the EZW or DLA's  
352 tasks.

353

i. For EZWs, thicker or specialty gloves for equipment handling or rough work  
354 should be worn and then doffed and discarded in the EZ before entering the DL.

355

ii. For DLAs, additional layers of nitrile gloves will be donned and doffed, as  
356 required, to prevent cross-contamination during DL work.

357

#### 3. **Outer Boots** – Chemical resistant and waterproof outer boots with steel toe and shank 358 (e.g., Tingley® or Bata) boots, one or two sizes larger than usual, to accommodate suit 359 socks. Do not use leather safety shoes or boots with mud covers.

360

#### 4. **Disposable rubber booties**. Optional. Chemical-resistant and waterproof latex booties

- 361 that slip over the inner boot. Typically worn one or two sizes larger depending on the  
362 inner boot.
- 363 5. **Chemical Resistant Tape** – Use Kappler® ChemTape® or equivalent tape.
- 364 6. **Masks and Respirators** – Full-face, NIOSH CBRN-approved positive pressure SCBA or  
365 positive pressure supplied-air respirator with escape SCBA.
- 366 a. The entrant’s eyeglass inserts, if required.
- 367 b. Facepieces should have voice amplifiers attached and turned on.
- 368 7. **Hard Hats** – If there are overhead hazards in the DL, a hard hat should be worn. If  
369 unable to secure the hard hat via ratchet strap, it should be secured with a chin strap.  
370 Otherwise, hard hats are optional.
- 371 8. **Clothing Worn Under Suit and a Change of Clothing** – EZWs, DLAs, and DLS will wear  
372 approved clothing (e.g., Tyvek® suit, coveralls, hospital scrubs, t-shirt, shorts, pants, etc.)  
373 under their PPE. The approved work clothing must be suitable for site conditions and  
374 comply with the Site HASP. If an optional shower is required (as a part of decon), EZWs,  
375 DLAs, and DLS will bag their clothing beforehand; therefore, they must bring additional  
376 clothing and shoes to change into after decon. Depending on the decontamination  
377 solution used on site, the used work clothing may be laundered on site, disposed of, or  
378 taken home according to the Site HASP. Contact lenses, rings, earrings, necklaces,  
379 piercings, or jewelry of any kind should not be worn into the EZ.

*Workers should write their names on all durable PPE they want returned to them.*

380  
381 **Level B PPE Ensemble**

---

- 382 1. **Suits**
- 383 a. Outer suit – Chemical resistant, encapsulating Level B with hood and face shield,  
384 such as Tychem® 10000 or Responder® CSM. The suit must have an expanded back or  
385 flat back if using supplied air, front or back entry, standard visor, one layer of 40 mil  
386 polyvinyl chloride (PVC). The suit should also have elastic wrists, attached socks with  
387 outer boot flaps, a double storm flap with a hook and loop closure, two exhaust  
388 vents, and taped/Velcro seams. A slightly larger size than usual (one size larger than  
389 typically worn) will aid in doffing PPE in the DL.
- 390 b. Inner suit – Tyvek® or equivalent with integral hood and booties (socks), one or two  
391 sizes larger than typically worn to allow easy removal without cross-contamination.
- 392 2. **Gloves** (two required pairs; one optional pair)
- 393 a. Inner protective gloves – Thin (~4 mil) surgical nitrile, with long wrist gauntlets (mid-  
394 arm, or a few inches beyond the wrist), worn under the inner suit and not taped.

- 395 b. Outer protective gloves – Of the appropriate material for chemical contaminants (see  
396 Site HASP), worn over the inner suit and taped.
- 397 c. Work gloves (optional) – Any gloves worn outside these two protective gloves are  
398 considered task-specific work gloves and should be selected based on the worker’s  
399 tasks.
- 400 i. For EZWs, thicker or specialty gloves for equipment handling or rough work  
401 should be donned, and then doffed and discarded in the EZ before entering  
402 decon.
- 403 ii. For DLAs, additional layers of nitrile gloves will be donned and doffed, as  
404 required, to prevent cross-contamination during DL work.
- 405 3. **Outer Boots** – Chemical resistant, waterproof outer boots with steel toe and shank, one  
406 or two sizes larger than usual to accommodate suit boots. Do not use leather safety  
407 shoes or boots with mud covers.
- 408 4. **Chemical Resistant Tape** – Use ChemTape® or an equivalent to tape the seams and cuffs  
409 (pant and arm) of Level B suits. No exposed skin should be present when raising the  
410 arms over their heads. Personnel should leave a tab at the end of the tape for easy  
411 removal. Check with the Site H&S Officer for procedures regarding taping suit/mask.  
412 Appendix III, Table 2 contains information on several brands of quality adhesive tape.
- 413 5. **Masks and Respirators**
- 414 a. Full-face, NIOSH approved, CBRN-rated positive pressure mask for use with SCBA, or  
415 a NIOSH approved positive pressure supplied-air respirator with escape SCBA.
- 416 b. The entrant’s eyeglass inserts if required.
- 417 c. Facepieces should have voice amplifiers attached and turned on.
- 418 6. **Hard Hats** – If there are overhead hazards in the DL, a hard hat should be worn. If  
419 unable to secure it via ratchet strap, it should be taped to the outer suit. Otherwise,  
420 hard hats are optional.
- 421 7. **Clothing Worn Under Suit and a Change of Clothing** – EZWs, DLAs, and DLS will wear  
422 approved clothing (Tyvek® suit, coveralls, hospital scrubs, t-shirts, shorts, pants, etc.)  
423 under their PPE. The approved work clothing must be suitable for site conditions and  
424 comply with the Site HASP. EZWs, DLAs, and DLS will bag their clothing before  
425 showering (as part of decon); therefore, all decon entrants must bring a change of  
426 clothing and shoes to don after decon. Depending on the decontamination solution  
427 used on site, the used work clothing may be laundered on site, or disposed of, or taken  
428 home according to the Site HASP. Contact lenses, rings, earrings, necklaces, piercings, or  
429 jewelry of any kind should not be worn into the EZ.

*Workers should ensure that no skin is exposed after donning PPE.*

430

431 **Level C PPE Ensemble**

---

432

1. **Suit**

433

a. Outer suit – Chemical resistant coverall that meets ASTM International (formerly American Society for Testing and Materials) Standards, such as Tychem® 6000/6000FR. The suit should have elastic wrists and attached socks with outer boot flaps. A slightly larger size than usual (one or two sizes larger than typically worn) will aid in doffing PPE in the DL.

434

435

436

437

438

b. Inner suit (optional) – Tyvek® or equivalent with integral hood and booties (socks), one or two sizes larger than typically worn to allow easy removal without cross-contamination.

439

440

441

2. **Gloves**

442

a. Inner protective gloves – Thin (~4 mil) surgical nitrile, with long wrist gauntlets (mid-arm, or a few inches beyond the wrist), worn under the inner suit and not taped.

443

444

b. Outer protective gloves – Of the appropriate material for chemical contaminants, worn over the inner suit and taped or just taped to the outer suit.

445

446

c. Work gloves (optional) – Any gloves worn outside these two protective gloves are considered task-specific work gloves and should be selected based on the EZW or DLA's tasks.

447

448

449

i. For EZWs, thicker or specialty gloves for equipment handling or rough work should be worn and then doffed and discarded in the EZ before entering the DL.

450

451

ii. For DLAs, additional layers of nitrile gloves will be donned and doffed, as required, to prevent cross-contamination during DL work.

452

453

3. **Outer Boots** – Chemical resistant, waterproof outer boots with steel toe and shank, one or two sizes larger than usual, to accommodate suit boots. Do not use leather safety shoes or boots with mud covers or galoshes.

454

455

456

4. **Chemical Resistant Tape** – ChemTape® or equivalent tape.

457

5. **Mask, Respirator, and Task-specific PPE**

458

a. A full-face, CBRN-rated positive pressure, APR or PAPR.

459

b. The entrant's eyeglass inserts if required.

460

c. A splash shield is an additional option if working with aqueous decon solutions.

461

d. Optional voice amplifiers may be used for communications.

462

6. **Hard Hats** – If there are overhead hazards in the DL, a hard hat should be worn. If

463 unable to secure it via ratchet strap, it should be taped to the outer suit. Otherwise,  
464 hard hats are optional.

465 7. **Clothing Worn Under Suit and a Change of Clothing** – EZWs, DLAs, and DLS will wear  
466 approved clothing (Tyvek® suit, coveralls, hospital scrubs, t-shirt, pants, shorts, etc.)  
467 under their PPE. The approved work clothing must be suitable for site conditions and  
468 comply with the Site HASP. EZWs, DLAs, and DLS will bag their clothing before  
469 showering (as part of decon); therefore, all decon entrants must bring an additional  
470 change of clothing to don after decon. Depending on the decontamination solution used  
471 on site, the used work clothing may be laundered on site, or disposed of, or taken home  
472 according to the Site HASP. Contact lenses, rings, earrings, necklaces, piercings, or  
473 jewelry of any kind should not be worn into the EZ.

474

#### 475 **Donning PPE**

---

- 476 1. Check-in at the medical monitoring station and record vitals before entering the CRZ or  
477 EZ. Refer to the Site HASP or Site H&S Officer for specific instructions.
- 478 2. Walk through the DL with the DLS before donning PPE.
- 479 3. Refer to Site HASP or Site H&S Officer for required PPE.
- 480 4. Before wearing a Level A suit, personnel should check the pressure records for that suit  
481 before wearing it. All National Fire Protection Association (NFPA) Level A suits should be  
482 tested according to ASTM F 1052, Standard Test Method for Pressure Testing Vapor  
483 Protective Ensembles, and 29 CFR 1910.120, Hazardous Waste Operations and  
484 Emergency Response (HAZWOPER), Determination of Leak tightness of Gas-tight Suits.
- 485 5. All personnel should perform a safety check of their PPE as described in the HASP.
- 486 6. Don PPE in a dry area of the SZ so that tape will adequately adhere to surfaces. Have a  
487 partner assist in donning PPE.
- 488 7. Recommended procedure:
  - 489 a. Put on inner gloves (no tape).
  - 490 b. If using an inner suit (Tyvek®), pull the inner suit's sleeves over the inner gloves and  
491 leave the hood off. Tape the inner suit to the inner gloves.
  - 492 c. Put on an outer suit (e.g., Tychem® 10000 or Responder® CSM Level A; Tychem®  
493 10000 or Responder® CSM modified Level B suit; Tychem® 6000/6000FR Level B and  
494 C suit). For Level A and modified Level B, it is recommended that you leave the hood  
495 off and your arms out of the suit sleeves until you are ready to go on air.
  - 496 d. Put on outer gloves for Levels B and C. Use ChemTape® to tape the gloves to the  
497 inner gloves/suit (if used).
  - 498 e. Sit on a bench and put on outer boots, using care not to break the seams near the  
499 feet on the inner (if used) and outer suits. Ask for assistance if needed. Some Level  
500 A suits will have a pant cuff that should be rolled up then pulled back down over the

- 501 top of the boot.
- 502 f. Use ChemTape® to tape the outer boots to the outer suit, ideally with at least one  
503 layer around each calf, leaving a tab for removal. Ask for assistance if needed.
- 504 g. For Level A or modified Level B, don the facepiece and SCBA, leaving the regulator  
505 unattached to the mask. For Level C, don an APR or PAPR.
- 506 h. Keep the outer gloves under the outer suit's sleeves for the Level B ensemble. Use  
507 ChemTape® to tape outer suit sleeves to outer gloves, ideally with at least one layer  
508 of tape around each wrist, leaving no gaps, with a tab for tape removal.
- 509 i. If necessary, don extra gloves (nitrile, latex, butyl, Silver Shield®, etc.) over the outer  
510 gloves, ensuring they are suitable for the contaminants on site and the tasks in the  
511 DL.
- 512 j. Have an assistant check all the taped areas of boots and gloves.
- 513 k. Have an assistant write the worker's last name on the front and back of the outer  
514 suit in large, legible letters. Designate DL workers clearly by writing "DECON" on  
515 their outer suits or using colored tape to help distinguish decon workers from entry  
516 personnel.
- 517 l. Once ready to enter the CRZ, turn on the air to the SCBA (with assistance), and  
518 connect the regulator to the mask or connect the supplied airline.
- 519 m. With assistance, pull on the outer suit's hood, positioning the edges of the hood by  
520 the facepiece. Zip up the Level A suit or close up the Level B encapsulating suit,  
521 ensuring complete closure. Have someone inspect the suit to ensure that the suit  
522 zipper or closure is up and correctly closed. Use ChemTape® to tape over the suit  
523 zipper or closure, with a tab for tape removal.

524

525 **Note:** Work or task-specific gloves may be worn over the outer gloves. Splash shields may also  
526 be worn by those DLAs involved with washing or rinsing EZWs.

527 **Note:** If there is an overhead hazard, a hard hat should be worn by those DLAs involved with  
528 washing or rinsing EZWs.

529 **Note:** Site personnel, including EZWs, DLAs, and DLS (referred to as decon entrants once in the  
530 DL), who have exited the EZ or the CRZ will be decontaminated as discussed in the Site HASP.

531

## 532 **10. Decon Line Setup**

533 The DLAs should set up the DL in a flat area free of rocks and debris (see basic instructions in  
534 Appendix IV), upwind of the EZ (to the extent possible, based on prevailing winds), and in an  
535 area with no overhead hazards, if practical. The DL should be constructed with durable  
536 materials to withstand continued use throughout the life of the response (see basic materials  
537 list in Appendix III, Table 1). If possible, tents or structures designed for decon should be used.

538 Tents, berms, and collection vessels should maintain any aqueous waste in a contained and safe  
539 manner. Procedures should be in place to treat and replace contaminated materials used  
540 during the decon process and replace necessary decontamination solutions. This type of robust  
541 decon setup may be appropriate if a prolonged decon process is anticipated (i.e., multiple  
542 days). Due to the large volume of aqueous waste collected during prolonged operation,  
543 additional measures to remove bulk amounts of aqueous-based decon solutions and spent  
544 decon solutions from the DL should be considered.

545

546 The Site H&S Officer should put in place, or the Site HASP should include procedures to treat,  
547 replace, and dispose of contaminated materials used during the decon process. Measures  
548 should be established to containerize, replace, and dispose of the spent decontamination  
549 solution and any other items needing disposal. A detailed Site Waste Management Plan should  
550 be prepared before the DL is set up; the plan should include the procedures for collecting and  
551 storing spent waste from the decon process, including sample collection for waste  
552 characterization and disposal facility acceptance.

553

554 A single DL team should consist of, at a minimum, four DLAs and a dedicated DLS. The higher  
555 the level of PPE required, the greater the number of DLAs will be needed. The DLAs will direct,  
556 assist, and conduct decon for exiting EZWs through each step of the decon line, plus perform  
557 decon of reusable, durable PPE as collected. The dedicated DLS will ensure that enough workers  
558 are on the DL and that DLAs comply with the DL procedures listed below. Additionally, the Site  
559 H&S Officer or Assistant H&S Officer will supervise the DL to provide an additional perspective  
560 and ensure compliance with the decon process. A list of critical reminders is included in this  
561 SOP for use by the DLS, as are lists of DL equipment.

562

### 563 **DL Supervisor Responsibilities**

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- 564 • Address relevant safety and construction considerations found in the DL Construction  
565 section of this SOP.
- 566 • Post signs and instructions at each decon station (Appendix VI).
- 567 • If the HASP or H&S Officer recommends an optional shower, DLS should ensure decon  
568 entrants have provided a change of clothing in the post-shower area before beginning  
569 work.
- 570 • Conduct a brief DL walk-through for all workers before they enter the EZ.
- 571 • Facilitate any emergency decon that may occur, ensuring that the DLAs prioritize the  
572 emergency and conduct a thorough decontamination before exiting the CRZ or EEC.
- 573 • Monitor radio communications of EZW to be alerted to the egress of EZWs from the EZ.
- 574 • Supervise all areas of the line.
- 575 • Ensure that all DL steps, procedures, and contact times are accurately followed.

- 576 • Control traffic within the DL area.
- 577 • Check that trash is routinely removed from the DL, and aqueous decon solutions are
- 578 often replaced.
- 579 • Ensure availability of supplies.
- 580 • Ensure proper disposal of waste.
- 581 • Ensure the proper level of DLA staffing for each station.
- 582 • Be prepared to suspend temporarily the DL for emergency or other critical reasons (e.g.,
- 583 lightning, wind, etc.).

584

#### 585 **DLA responsibilities**

---

- 586 • Follow instruct of DLS.
- 587 • Set up the decon line according to the Site H&SO instructions and the Decon Line SOP.
- 588 • Participate in decon line walk-thru; maintain the contact time for decon entrants.
- 589 • Follow all instructions precisely at each station.
- 590 • Assist as directed by the DLS, man the ECC as directed by the DLS.
- 591 • Notify the DLS regarding breached PPE in EZW.
- 592 • Replace the decon wash solutions as directed by DLA.
- 593 • Ensure each step of the decon process has been completed.

594

#### 595 **Disposal of Decon Waste**

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596 An appropriate disposal facility should be identified (as well as all applicable Department of  
597 Transportation (DOT) packaging criteria) for receiving the waste before producing any decon  
598 solid (i.e., PPE) and/or aqueous wastes. All efforts should be taken to minimize the production  
599 of aqueous waste. Any aqueous waste generated must be transferred into containers  
600 acceptable for transportation (e.g., that comply with DOT requirements according to the  
601 disposal facility's arrangements). Personnel should consider using a submersible or transfer  
602 pump(s) to transfer liquids to drums or totes from the decon pools. It may be appropriate to  
603 treat aqueous waste with bleach (i.e., "shock").

604

## 605 **11. Chemical Decon Line Steps**

606 The Chemical Decon Line SOP consists of 15 steps. Depending on the level of PPE, the Chemical  
607 Decon Line SOP may be adjusted slightly to fit the site activities. Steps 1 and 2 will be conducted  
608 at the beginning of the DL in the EZ. Steps 3 through 13 will occur at stations in the CRZ. Steps  
609 14 and 15 will occur in the SZ.

610

611 The first and most effective decontamination method is the timely physical removal of the  
612 chemical agent. Responders should not wait until they reach the entry of the decon line to

613 remove gross contamination physically. Gross contamination should be removed as soon as  
614 possible using wipes or by removing the heavily contaminated PPE (e.g., changing gloves or  
615 contaminated rubber booties). Suppose heavy grime/gross contamination is observed on an  
616 EZW in the EZ before entering the DL. In that case, the EZW should use wipes wetted with  
617 decon solution (e.g., Dispatch wipes, bleach wipes, DF200, etc.) (See Table 2) to conduct gross  
618 decon to remove as much grime as possible before Step 1. The used wipes are placed into a  
619 bag-lined trash can for disposal. EZWs can also use a boot brush to remove as much  
620 contamination from boots before entering the DL. An alternate approach is to incorporate  
621 disposable PPE/booties if heavy gross contamination is expected in the EZ. By removing the  
622 gross contamination before entering the DL, workers keep the gross contamination out of the  
623 DL area and reduce the chance of the contaminants reaching the suit's breakthrough time.  
624

625 **Note:** An EPA study has have shown that brushes tend to retain and spread contamination (U.S.  
626 EPA. [Decontamination Line Protocol Evaluation for Biological Contamination Incidents](#)  
627 [Assessment and Evaluation Report](#). U.S. Environmental Protection Agency, Washington, DC,  
628 EPA/600/R-14/476, 2015). Brushes should only be used in the exclusion zone, except for a  
629 submerged boot scraper limiting contamination spread. It's crucial EZWs remove as much gross  
630 contamination before entering the decon line by removing task-specific PPE (e.g., disposable  
631 latex booties, work gloves, nitrile gloves, etc.) or using wipes wetted with decon solution to  
632 remove any visual contamination (e.g., contaminated spot on the pant leg).  
633

#### 634 **Step 1: Tool and Instrument Drops - EZ**

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635 EZW will drop off any tools or instruments that will be reused in the EZ or decontaminated. Any  
636 tool not intended for reuse will be disposed of in a bag-lined trash can in the EZ. A separate  
637 drop area (a covered table or lined storage bin) is established for non-disposable tools and  
638 instruments. The tool and instrument drop areas will be in the EZ near the entrance to the CRZ.  
639

640 Worker exiting EZ:

- 641 • Before entering the DL, place all tools and/or instruments in the designated drop area  
642 (e.g., covered table or lined container).

644 DL Attendant:

- 645 • Establish communication with each exiting EZW, now referred to as a decon entrant. Ask  
646 how they are feeling, and if they have any issues or concerns, etc. Also, confirm the air  
647 level in their SCBA tank.
- 648 • Look for holes or tears in the decon entrant's outer PPE.
- 649 • Decontaminate with the appropriate decon solution or wipe if a breach is found. Dry  
650 with a paper towel, seal the breach with tape and report the issue to the DLS and Site

- 651 H&S Officer.
- 652 • Check the decon entrant for any signs or symptoms of exposure. Report any symptoms
- 653 to the DLS and Site H&S Officer.
- 654

### 655 **Step 2: Sample Drop - EZ**

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656 Samples coming from the EZ can be dropped off by the sample custodian at the sample drop-

657 off table for decon and processing by a DLA. Details of sample decon are provided in Appendix

658 IV of this document.

659

### 660 **Step 3: Doff Booties, Task/Work PPE and PPE Inspection - CRZ**

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661 At Step 3, the DLA will inspect their PPE for any breaches and identify any remaining gross

662 contamination. The decon entrant will remove work- or task-specific PPE. Rubber booties, if

663 worn, should be cut off using medical scissors before moving to the next step (Step 4).

664

665 Worker exiting EZ:

- 666 • Follow DLA's instructions precisely.
- 667 • Doff task-specific PPE such as work gloves, heavy-duty nitrile outer gloves, splash
- 668 shields, aprons, etc. Place disposable items in a bag-lined trash can and reusable items
- 669 (e.g., hard hat, unsoiled leather work gloves, splash shield) in designated bins.
- 670 • When instructed by DLA, make quarter turns in front of them while they inspect PPE for
- 671 any breaches and any remaining gross contamination. DLA will inform the DLS and H&S
- 672 Officer if a breach is found. The DLA will use tape to repair the breach by making a
- 673 watertight seal/repair before sending the decon entrant through the DL.
- 674 • If disposable rubber booties are used, sit on a stool/bench, and doff booties. Carefully
- 675 use medical scissors to cut off the booties.
- 676 • Place any used bleach wipes and rubber booties into a bag-lined trash can.
- 677

678 DL Attendant:

- 679 • Establish communication with the decon entrant. Ask them how they are feeling, and if
- 680 they have any issues or concerns, etc. Look for signs of illness or distress and attend to
- 681 them as needed.
- 682 • Instruct the decon entrant to make quarter turns to inspect PPE for any breaches and
- 683 any remaining gross contamination, as well as any holes or tears in their outer PPE.
- 684 • If a breach is found, decontaminate with an appropriate decon solution (0.5% sodium
- 685 hypochlorite) or bleach wipe, dry the area with a paper towel, seal the breach with tape,
- 686 and report the issue to the DLS and Site H&S Officer.
- 687 • If necessary, assist the decon entrant in removing any observable gross contamination
- 688 with wipes wetted with decon solution or bleach wipes.

- 689 • Assist decon entrant, as necessary, with removing the rubber booties, tape, etc.
- 690 • Place any used bleach wipes and rubber booties into a bag-lined trash can.

691

#### 692 **Step 4: Initial Boot and Glove Wash 1 - CRZ**

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693 The purpose of this step is to remove contamination, such as dirt or grime, from boots and  
694 gloves, and begin contact time for the suit wash. EZW will need to use a localized airline or  
695 switch to their escape bottle if supplied-air respirators are utilized. **Note:** Task-specific work  
696 gloves and PPE and rubber booties should already have been discarded into the proper storage  
697 or waste container in the previous step (Step 3). Step 4 includes removing any remaining gross  
698 contamination and washing the boots and gloves in the first wash step.

699

700 Worker exiting EZ:

- 701 • Follow DLA's instructions precisely.
- 702 • When directed by the DLA, step into the 1<sup>st</sup> Wash tub filled with the designated  
703 decontamination solution<sup>1</sup> (see Table 2 for additional options) and wash the boots. Use  
704 the boot scraper/brush pad submerged in the tub to wash the bottom and sides of the  
705 boots. Do not use handled brushes to wash boots to prevent unnecessary spray and  
706 dispersion of contamination in the decon area.
- 707 • While still standing in the 1<sup>st</sup> Wash tub, wash your hands in the basin of  
708 decontamination solution on the table. Clean gross contamination off outer gloves by  
709 using a hand-washing movement.
- 710 • When directed by the DLA, step from Step 4 into the 2<sup>nd</sup> Wash tub in Step 5.

711

712 DL Attendant:

- 713 • Instruct the decon entrant to step into the 1<sup>st</sup> Wash tub. Instruct them to use the boot  
714 scraper/brush pad submerged in the tub to scrub the bottoms and sides of their boots  
715 vigorously. Inspect the bottom and sides of their boots as well as the sides of their suit  
716 to ensure they are clean. If not, request the entrant to continue to scrub their boots  
717 and/or to use the proper decon solution to wipe any visible contamination off their suit.
- 718 • While the decon entrant is still in the 1<sup>st</sup> Wash tub, direct them to wash their hands in  
719 the basin of decontamination solution on the table. Inspect their gloves to ensure no  
720 contamination remains.
- 721 • Instruct the decon entrant to step from Step 4 into the 2<sup>nd</sup> Wash tub in Step 5.

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<sup>1</sup> Designated decontamination solution may be diluted household bleach (1:10 dilution of bleach containing 5.25 to 6.15% sodium hypochlorite; thus, a 1:10 dilution of household bleach provides about 5,250 to 6,150 ppm available chlorine (McGuire et. al. 2001; CDC 2008). The compatibility of the decontaminant with the PPE material should also be considered when selecting PPE and the designated solution. See additional information in Appendix IV, Attachment A.

- 722 • Change the decontamination solution in the 1st Wash tub at a minimum of every four  
723 hours. It may be necessary to change it more frequently if the solution appears unfit for  
724 use, fails testing, and/or at the direction of the DLS. Personnel should consider using a  
725 submersible or transfer pump(s) to transfer liquids to drums or totes from the decon  
726 pools.
- 727 • Replace any sorbent pads on the floor of this area if they become soiled.

728

729 DL Supervisor:

- 730 • Keep track of when the decon solutions were prepared and added to the gross decon  
731 tubs on the Bleach Batch Tracking Form found in Appendix VII. Watch the appearance of  
732 the decon solution; if the decon solution appears unfit for use or fails testing, designate  
733 a DLA to change the solution.
- 734 • If personnel are backing up in the DL, direct the DLA to add additional Outer Glove and  
735 Boot Wash stations. The DLA should place the additional stations at the front of the DL.

736

### 737 **Step 5: Wet Operations - 2nd Gross Decon and Initial Suit Spray - CRZ**

---

738 Step 5 includes washing the boots and gloves in the 2nd Gross Decon and spraying the outside  
739 of the suit to begin the contact time for the decontamination solution in the 2nd Gross Decon.

740

741 Worker Exiting EZ:

- 742 • Step into the 2<sup>nd</sup> Wash tub and rewash the boots using the designated decontamination  
743 solution. Use the boot scraper/brush pad submerged in the tub to wash the bottom and  
744 sides of the boots. If necessary, use stability items (e.g., large traffic cone, foldable  
745 walker, foldable chair, foldable sawhorse, etc.) to aid people in standing up.
- 746 • Remain in the 2<sup>nd</sup> Wash tub while the DLA sprays decontamination solution over your  
747 gloves. The DLA should use care not to create overspray. Use a hand-washing  
748 movement to clean any remaining contamination off the outer gloves.
- 749 • If wearing Level C PPE, carefully follow the DLA's instructions regarding how to handle  
750 your powered air-purifying respirator (PAPR) belt and blower motor assembly (BMA)  
751 during suit decon.
- 752 • Follow the DLA's instructions precisely to ensure that the spray reaches all suit surfaces  
753 to begin the contact time during the suit spray.
- 754 • The DLA will record the decon entrant's name on the Decon Contact Time Tracking Form  
755 (see Appendix VI) and the start of the contact time as taken from a clock or timer. As an  
756 option, the decon entrant can simultaneously track their own time by noting the time  
757 on a clock on the wall at this station.
- 758 • When directed by the DLA, move to Step 6 to continue the decontamination.

759

760 DL Attendant:

- 761 • Direct the decon entrant to use the boot scraper/brush pad submerged in the 2<sup>nd</sup> Wash
- 762 tub to scrub the bottoms and sides of their boots vigorously.
- 763 • While the decon entrant remains in the 2<sup>nd</sup> Wash tub, spray decontamination solution
- 764 over their outer gloves, and direct them to use a hand-washing movement to clean any
- 765 remaining contamination off the gloves.
- 766 • Spray all surfaces of the decon entrant with the decontamination solution. Direct the
- 767 entrant to make quarter turns, raise each arm one at a time, lift each foot, and stand
- 768 with legs spread. Be sure that the decon spray reaches all surfaces of the decon entrant.
- 769 • **Note:** Use fine mist tips on the sprayers; this gives better misting coverage and prevents
- 770 cross-contamination.
- 771 • **Note:** If the decon entrant is in Level C PPE, instruct them to unfasten the PAPR belt,
- 772 hold the PAPR belt/BMA in one hand, turn off the blower, and keep the mask on their
- 773 face. Have them cover the PAPR cartridges with a gloved hand or piece of tape to keep
- 774 them dry during spraying. Once done spraying the BMA, instruct the decon entrant to
- 775 turn the blower back on and hold the PAPR belt/BMA in one hand or hang it on the coat
- 776 rack. Proceed with decon of the suit.
- 777 • Thoroughly inspect the decon entrant to ensure all steps are completed before they exit
- 778 Step 5 and enter the Step 6 - Full Decon area. Inspect their hands, the bottoms of the
- 779 boots, and the suit to ensure that all contamination has been removed.
- 780 • Instruct the decon entrant to pick up the BMA (if using one) and move to Step 6.
- 781 • Record the name of the decon entrant, the time the decontamination solution was fully
- 782 applied to their PPE, and the time the contact time was reached on the Contact Time
- 783 Tracking Form (see Appendix VI).
- 784 • As an option, let the decon entrant know that they can note the time on the clock at this
- 785 station once the decon solution is fully applied to monitor their own contact time.
- 786 • Change the decontamination solution in the 2<sup>nd</sup> Wash tub at a minimum of every four
- 787 hours. It may be necessary to change it more frequently if the solution appears unfit for
- 788 use, fails testing, and/or at the direction of the DLS. Personnel should consider using a
- 789 submersible or transfer pump(s) to transfer liquids to drums or totes from the decon
- 790 pools.
- 791 • Replace any sorbent pads on the floor of this area if they become soiled.

792

### 793 **Step 6: Wet Operations - Full Decon of All Surfaces (Gloves, Boots, and Outer Suit) - CRZ**

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794 The purpose of Step 6 is to provide full decon of all surfaces. In this step, personnel reapplies  
795 the decon solution to ensure everything is wetted and the proper contact time is maintained  
796 for the decontamination solution.

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Worker exiting EZ:

- Follow the DLA’s instructions precisely.
- When directed by the DLA, step into the large tub for full decon of the suit, boots, and gloves. Complete all actions as directed by the DLA.
- **Note:** If in Level C PPE, follow the DLA’s instructions to cover the cartridges of the PAPR or the APR with your gloved hands to keep the cartridges dry during spraying.
- The decon entrant can continue to monitor the clock or timer to ensure that the contact time is reached on all surfaces to which the decon solution was applied.
- Move to Step 7a when instructed to by the DLA.

DL Attendant:

- While decon entrants are standing in the large tub, begin by decontaminating their boots. Spray the decon solution on the bottom and sides of the boots. Make sure to prevent over-spray from wetting areas outside the tub. Instruct the decon entrant to use the submerged boot scraper/brush pad to scrub the sides and bottom of their boots.
- Next, spray the decon solution over the entrant’s gloved hands while they use a hand-washing movement to clean their hands.
- **Note:** If the decon entrant is using a PAPR, instruct them to keep holding the PAPR belt/BMA in one hand or hang it on a coat rack. Turn the blower off, then turn it around so the DLA can decon the back of the BMA. Keep the cartridges covered with a gloved or a piece of tape (provided by DLA).
- Once done spraying the BMA, instruct the decon entrant to turn the blower back on and proceed with the decon of the suit.
- For APRs, instruct the decon entrant to cover the filters with their gloved hand while the front is misted. Instruct the worker to turn the PAPR back on and hang it on a hook.
- **Note:** Use fine mist tips on the sprayers; this gives better misting coverage and prevents cross-contamination.
- **Note:** Exercise caution not to generate excess sprayer pressure that could cause the liquid to enter the worker’s suit(s).
- For all levels of PPE, starting at the hood and working down to the boots, mist the outer surfaces of the decon entrant, including the mask. Achieve a uniform spray to ensure complete coverage, rather than a wet washdown. Have the decon entrant make quarter turns to ensure comprehensive coverage.
- Have the decon entrant stand with their arms out and their legs spread so that all surfaces can be sprayed. Pay careful attention to the area around the zipper, arms, and

- 834 front torso.
- 835 • Maintain a wetted surface for the required contact time. If the entrant is using a PAPR,
- 836 instruct them to pick up the BMA from the rack and proceed to Step 7a after the contact
- 837 time has been reached.
- 838 • Record when the contact time has been reached on the Contact Time Tracking Form.
- 839 • Aqueous waste will be collected periodically and bulk containerized on site for later
- 840 disposal. Personnel should consider using a submersible or transfer pump(s) to transfer
- 841 liquids to drums or totes from the decon pools.
- 842 • Note: Studies have shown that brushes tend to retain and spread contamination,
- 843 especially if they aren't switched out regularly. We're trying to eliminate any gross
- 844 contamination before entering the decon line. We do recognize that you may not get all
- 845 of the contamination, so we're suggesting a submerged boot scraper/brush pad in this
- 846 step. A submerged boot scraper helps a) prevent contaminant overspray and b)
- 847 increases the contact time with the decon solution.
- 848

*Exercise caution not to generate excess pressure in the spray that could potentially cause liquid to enter the suit(s).*

849  
850

### 851 **Step 7a and 7b: Wet Operations – PPE Rinse and Dry - CRZ**

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852 Worker exiting EZ:

- 853 • Follow DLA's instructions precisely.
- 854 • Proceed from Step 6 into a large tub in Step 7a, where a DLA will rinse your suit, boots,
- 855 and gloves. Complete actions as directed by DLA.
- 856 • Once directed by DLA, move to Step 7b (Dry PPE) by stepping out of the rinse tub into
- 857 Step 7b.
- 858 • In Step 7b, the DLA will dry your suit by wiping it down with disposable towels.
- 859

860 DL Attendant:

- 861 • In Step 7a, make sure to prevent over-spray from wetting areas outside the tub.
- 862 • Next, spray the rinse water over each of the worker's gloved hands, from top to bottom.
- 863 • If the decon entrant is in Level C PPE, instruct them to cover the filters of the APR while
- 864 the front is misted using a pressurized spray mist with rinse water.
- 865 • If the decon entrant is using a PAPR, instruct them to turn the BMA off then turn it
- 866 around so the DLA can rinse the back of the BMA.
- 867 • Instruct the decon entrant to turn the PAPR back on and hang it on the hook.
- 868 • For all levels of protection, start at the top of the hood and work down to the boots,

- 869 misting all outer surfaces of the worker, including the mask. Achieve a uniform spray  
870 mist to ensure a proper rinse. Have the worker make quarter turns and move arms and  
871 legs to ensure that all areas and surfaces are rinsed with the spray.
- 872 • If the decon entrant is using a PAPR, instruct them to pick up the PAPR, step out of the  
873 rinse tub, and proceed to Step 7b. Dry the decon entrant with paper towels. Place spent  
874 paper towels in a lined trash can.
  - 875 • Contain the water used for rinsing in Step 7a. Aqueous waste will be collected at a  
876 minimum every 4 hours and bulk containerized on site for later disposal. Personnel  
877 should consider using a submersible or transfer pump(s) to transfer liquids to drums or  
878 totes from the decon pools.
  - 879 • Instruct the decon entrant to move to Step 8 for chemical screening.

880

### 881 **Step 8: Contaminant Screening and Monitoring - CRZ**

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882 Contaminant screening should be conducted in the CRZ but away from Wet Operations.  
883 Workers should use a separate tent or designated area well away from any spraying or water.  
884 The area will be closed off to minimize interference from vapors, wind, and moisture/humidity  
885 from operations. The critical point is to ensure that screening is not affected by other activities  
886 in the DL. The selected screening method must detect the chemical(s) of concern, and the DLA  
887 should understand and consider that some instruments have a delay in detection.

888

889 Worker exiting EZ:

- 890 • Step into the contained screening area for evaluation.
- 891 • Complete actions precisely as directed by the DLA.

892

893 DL Attendant:

- 894 • Use a screening instrument/device appropriate to the site contaminants. Begin by  
895 screening the front of the decon entrant's head and mask, working down the suit to the  
896 gloves and then the boots. Use a slow, systematic approach such as clockwise or in  
897 quadrants.
- 898 • Repeat the screening for the back of the worker's suit, from the head to the boots.
- 899 • If screening indicates that the worker is contaminated, notify the DL Supervisor and the  
900 Site H&S Officer. Spot clean the EZW with a wipe and the proper decon solution if it's a  
901 small area. If it's a large area, have the EZW return to Step 6 for additional  
902 decontamination. Afterward, rescreen them until the results are negative.
- 903 • If screening or rescreening results are negative, instruct the decon entrant to Step 9.

904

905 DL Supervisor:

- 906 • Evaluate the pace through the DL for decon entrants and adjust the number of DLAs to

- 907 keep pace with personnel.
- 908 • Reassess the decontamination process to identify any steps in the DL that need to be
- 909 adjusted to prevent any contamination from reaching this step.
- 910

### 911 **Step 9: Wet Operations - Remove Outer Boots - CRZ**

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912 Worker exiting EZ:

- 913 • Follow the instructions of the DLA precisely.
- 914 • At DLA's direction, sit on the stool or bench. This bench may straddle or be near the
- 915 berm between the wet and dry operations.
- 916

917 **Note:** The decon entrant must ensure they keep their feet in the Wet Operations side of the

918 berm until their boots are removed or until instructed by the DLA to swing their legs over to Dry

919 Operations.

920

921 DL Attendant:

- 922 • Place a disposable absorbent pad (hospital chux) on the bench or stool.
- 923 • Place an open drum liner or large trash bag on the wet side of the bench or stool. Have
- 924 the worker step into the bag/liner.
- 925 • Instruct the worker to sit on the bench or stool.
- 926 • Remove the outer boots from the worker's feet, following the procedure below. Leave
- 927 the boots in the bag. A boot jack may be used to assist if needed.
- 928 • Remove the decon entrant's first boot, then instruct them to swing that leg over the
- 929 bench into Step 10 in the Dry Operations side. The decon entrant will now have one foot
- 930 in Dry Operations and one foot in Wet Operations; they will be straddling the bench.
- 931 After removing the second boot, instruct the decon entrant to swing that leg over the
- 932 bench. Both legs will now be in Step 10 in the Dry Operations area.
- 933 • Have the worker stand up in Step 10.
- 934

935 **Note:** The decon entrant will still be wearing their suit booties.

936

- 937 • Remove the boots from the bag and place them into a boot bin if they will be reused. If
- 938 the boots will be disposed of, place them into a bag-lined trash can. Dispose of the bag
- 939 in the trash can.
- 940 • Remove the dirty hospital chux from the bench and place it in a bag-lined trash can.
- 941 • Spray the bench with the decontamination solution, change gloves, and lay out a new
- 942 hospital chux for the next decon entrant.
- 943

944 **Note:** The DLA working in Wet Operations will not enter Dry Operations.

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DL Supervisor:

- Ensure that DLAs working in Wet Operations do not enter Dry Operations.

### Step 10: Dry Operations - Doff Outer Gloves & Suit and SCBA - CRZ

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Worker exiting EZ:

- Follow the instructions of the DLA precisely.
- The DLA will assist you in removing outer gloves and unzipping and removing your outer suit.
- Optional: Don disposable Tyvek® slippers.

**Note:** The DL Attendant should change gloves between each worker.

DL Attendant:

- In Level A or modified Level B, remove the outer gloves and dispose of them in a lined trash can.
- Unzip or open the decon entrant's Level A/Level B encapsulated suit or outer suit if in Level B or C.
- Standing behind the worker, carefully peel the top of the outer suit downward past the waist, removing arms from the suit and rolling the suit inside out. Ensure that the outside of the Level A or B encapsulated suit does not contact the decon entrant. Also, it's essential that the inside of the suit, especially the hood, does not touch any part of the outside of the suit during this process.
- Instruct the decon entrant to sit on the bench.
- For Level B and C, remove outer gloves and dispose of them in a lined trash can.
- If in Level A or B, the SCBA air bottle will be uncovered. Once the suit has been unzipped, instruct the decon entrant to detach the SCBA regulator from their mask and turn off the airflow, allowing fresh air into the mask. Decon entrants in Level C will keep their filter cartridges, mask on, and PAPR BMA running. All decon entrants will still be wearing their masks, inner suits, and clean inner gloves.
- Continue to remove the outer suit by rolling it down and away from the lower body. Direct the decon entrant to remove their feet from the suit's attached boots and offer them Tyvek slippers (optional).

**Note:** The DLA should change their outer gloves at this point to prevent contamination.

- If in Level A or B, direct the decon entrant to turn off the air at the SCBA cylinder, detach the air hose from the cylinder, and keep wearing their mask. If in Level C, keep the mask

- 983 on. Lastly, if in a PAPR, carry the belt/BMA.
- 984
- 985 • Loosen the tank harness and remove the SCBA cylinder.
  - 986 • Cap the spent cylinder to protect it from damage and contamination. Place the used cylinder in a storage bin for refilling.
  - 987 • Remove the SCBA harness assembly from the decon entrant, leaving the mask in place.
  - 988 Place in a storage bin for later reuse.
  - 989 • Instruct the decon entrant to move to Step 11.
  - 990 • For Level A suits that will be reused, place them in a bin for cleaning, inspection, and
  - 991 pressure testing. Place suits that will be disposed of into a bag/drum liner and use a
  - 992 broom handle or stick to compact the trash.
  - 993 • Spray any surfaces touched, occupied, or vacated by the worker (e.g., stool, bench,
  - 994 tabletop, etc.) and the drum liner with the designated decon solution as each worker
  - 995 moves through the DL and before the next worker.
- 996

### 997 **Step 11: Dry Operations - Inner Suit Removal - CRZ**

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998 Step 11 is for workers wearing an inner protective suit (e.g., Tyvek® coverall). If the decon  
999 entrant is not wearing an inner suit, they will proceed to Step 12.

1000

1001 Worker exiting EZ:

- 1002
- 1003 • Follow the DLA's instructions precisely.
  - 1004 • The DLA will assist you in unzipping and removing the suit.
  - 1005 • Optional: Don disposable Tyvek® slippers.

1005

1006 DL Attendant:

- 1007
- 1008 • Unzip the decon entrant's inner suit.
  - 1009 • From behind the standing decon entrant, peel the top of the outer suit downward past
  - 1010 the waist, rolling the suit inside out. Continue down to the feet. Direct the decon
  - 1011 entrant to step out of the suit. Offer the decon entrant disposable Tyvek® slippers as an
  - 1012 option.
  - 1013 • Instruct the decon entrant to move to Step 12.

1013

1014 **Note:** The decon entrant will still be wearing their mask.

1015 **Note:** The DL Attendant should change gloves between each worker.

1016

- 1017 • Place the inner suit in the bag-lined trash can and use a broom handle or stick to
- 1018 compact the trash.

1019

1020 **Step 12: Dry Operations - Inner Glove Wash and Rinse and Mask Removal - CRZ**

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1021 Inner gloves will be washed, rinsed, and dried before the decon entrant removes their  
1022 respirator mask.

1023  
1024 Worker exiting EZ:

- 1025 • Wash gloved hands at the hand wash station using running potable water and liquid  
1026 soap. Rinse gloves thoroughly and dry with a paper towel. Dispose of the paper towel in  
1027 the bag-lined trash can.
- 1028 • Do not remove the inner gloves at this step; gloves will be removed at Step 13.
- 1029 • Upon completing the glove wash, decon entrants should rinse and dry their gloves  
1030 before removing the mask.
- 1031 • While still wearing inner gloves, doff your mask by looking downward and pulling the  
1032 mask down from the top of your head and away from the chin.
- 1033 • If in Level C, have the DLA place tape over the filter cartridges after removing the mask.  
1034 Remove the filter cartridges and place them in a trash can.
- 1035 • Put the mask into the designated container for cleaning.

1036  
1037 **Note:** The hand wash station should provide clean running potable water and individual-use  
1038 liquid soap. Do not use shared-use basins filled with water. Hand wash stations can be rented  
1039 or purchased.

1040  
1041 DL Attendant:

- 1042 • Instruct the decon entrant to move to Step 13.
- 1043 • Clean each mask before it returns to service, following the manufacturer's guidelines or  
1044 as specified by the Site H&S Officer or HASP.
- 1045 • After decontamination, labeled masks will be returned to the decon entrant.

1046  
1047 **Note:** A dedicated DL Attendant for this DL station is recommended due to the possible high  
1048 volume of mask facepieces to be cleaned.

1049  
1050 **Step 13: Dry Operations - Inner Glove Removal, Hand and Face Wash - CRZ**

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1051  
1052 Worker exiting EZ:

- 1053 • Remove inner gloves by touching only the outside of the first glove and then only the  
1054 inside of the second glove.
- 1055 • Place gloves into the designated trash receptacle.
- 1056 • Remove slippers and place them in a trash can.

- 1057 • Wash hands and face with soap and potable water. Dry face and hands with a  
1058 disposable towel or paper towel. Place used paper towel in a lined trash can.

1059

---

1060 **Note:** The hand and face wash station should provide clean running potable water and  
1061 individual-use liquid or bar soap. Do not use shared-used containers or basins. Hand and face  
1062 wash stations can be rented or purchased.

1063

1064 Worker exiting EZ:

- 1065 • Wash hands and then face thoroughly with soap and warm potable water after all PPE  
1066 has been doffed.
- 1067 • Dry face and hands with a disposable towel or paper towel.
- 1068 • Put soap and paper towels in a designated trash receptacle.
- 1069 • Move out of the CRZ into the SZ and Step 14.

1070

1071 **Step 14: Support Zone - Recommended: Personal Shower - SZ**

---

1072 It's recommended, but not required, that decon entrants take a shower as soon as possible.  
1073 Preferably, it should be done on site. **Note:** This step may be modified depending upon the site-  
1074 specific operational period.

1075

1076 All decon entrants, including DLAs:

- 1077 • Disrobe, bag clothing worn under PPE, tie the bag closed, and bring it with you through  
1078 the shower tent.
- 1079 • Shower using copious amounts of potable water for a minimum of five minutes, washing  
1080 the entire body with soap, including hair.
- 1081 • Remain inside the shower and use a disposable towel to dry off.
- 1082 • Dispose of the towel in a trash receptacle.
- 1083 • Change into the clean clothing you previously placed in the shower/changing area.<sup>2</sup>
- 1084 • Move to Step 15 for medical monitoring.

1085

1086 **Note:** Individual-use soaps and shampoos will be available in the showers. Dispose of the soap,  
1087 shampoo, and used towel in a lined trash can.

1088

1089 **Step 15: Support Zone - Medical Monitoring - SZ**

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1090

1091 All decon entrants, including DLAs:

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<sup>2</sup> The pre-deployment equipment list should include a clean change of clothing for all workers.

- 1092 • Report to the medical monitoring station for post-entry monitoring and meet with  
1093 appropriate personnel for debriefing.
- 1094 • Comply with the monitoring and reporting requirements in the Site HASP (e.g.,  
1095 monitoring for temperature, blood pressure, pulse, etc.).
- 1096 • Take a rest break and drink fluids.

## 1097 12. Emergency Egress Corridor

1098  
1099 An EEC must be established. This line will be used to quickly decontaminate personnel who  
1100 experience medical emergencies while in the EZ or CRZ. The EEC should remain clear when not  
1101 in use for an emergency. In an emergency, anyone not assisting with the emergency should exit  
1102 immediately. Preplan transport of contaminated patients to the hospital in advance of site  
1103 work. If possible, involve hospital and Emergency Medical Services (EMS) agencies early in the  
1104 incident, so they are prepared for the possibility of contaminated patients. Personnel will need  
1105 to be decontaminated before receiving treatment from EMS or the emergency medical  
1106 technicians (EMT) before being transported to a hospital.

1107  
1108 The clothing of the person being transported will comply with the ambulance/EMT  
1109 requirements. Backup entry teams should plan to respond to calls for assistance in bringing  
1110 injured or incapacitated EZWs through the EEC. They should practice beforehand as a team  
1111 performing decon or assisting the DLA with the decon of the incapacitated worker.

1112  
1113 **Note: In the event of an emergency requiring use of the EEC, all work in the EZ must come to**  
1114 **a stop until the EEC is clear.**

1115  
1116 In the event of an emergency requiring the use of the EEC, all work on the DL stops. The DLS will  
1117 direct the DLAs to decon the incapacitated worker. The backup entry teams should plan to  
1118 respond to calls for assistance from the DLS. The assistance may include bringing injured or  
1119 incapacitated EZWs through the EEC or from the ECC to the ambulance. The backup team  
1120 should be trained in performing decon or assisting the DLAs with the decon of the incapacitated  
1121 worker. Following an emergency incident, the EEC must be decontaminated and reassembled.  
1122 The DLS will assign DLAs to carry out this operation. All DLAs, other personnel, and equipment  
1123 used to decon the incapacitated worker must be decontaminated before returning to service in  
1124 the DL. Any workers who may have crossed into different zones (i.e., CRZ to EZ) will need to go  
1125 through the DL.

1126  
1127 **Note: Work will resume in the EZ and the DL when the DLS declares that the EEC is all clear.**  
1128

1129 Items needed for EEC:

- 1130 • Surgical scissors or other safety cutters for removing PPE from an affected worker.
- 1131 • ChemTape®, decon solution with disposable towels, bleach wipes, paper towels, and a
- 1132 bag-lined trash can.
- 1133 • Extra Tyvek® coveralls and a body bag with side handles or a piece of visqueen
- 1134 (polyethylene sheeting) large enough to wrap a worker.
- 1135 • A stretcher or another suitable litter for transporting incapacitated workers.
- 1136 • Blanket or tarp for covering the litter.

1137

1138 Recommended decon procedure for incapacitated workers:

- 1139 • The EEC should remain clear of personnel unless it is being used. When the EEC is being
- 1140 used to expedite the decon and egress of a patient, it must be cleared of any other
- 1141 personnel. Anyone in the corridor not assigned to be there by the DLS should exit
- 1142 immediately.

1143

1144 **Note:** Decon entrants in the DL who may be contaminated must exit back through the DL

1145 towards the EZ before an injured worker enters the EEC.

1146

- 1147 • The DLS ensures that 9-1-1, the local hospital, and EMS have been called, confirms that
- 1148 each entity understands the nature of the emergency, and implements the plan
- 1149 (previously developed with EMS) to transport a patient. **Note:** The plan is prepared
- 1150 before starting work on the site. In speaking with emergency services, the DLS reiterates
- 1151 the contaminants on site and describes the steps that have been taken on site to
- 1152 decontaminate the patient before transport. They will confirm that EMS is on the way.
- 1153 The DLS ensures that EMS and the hospital medical team understand that the patient is
- 1154 being deconned and will arrive at the on-site support zone in a few minutes. When EMS
- 1155 arrives on site, the DLS confirms with ambulance staff that they understand the nature
- 1156 of the emergency, the contaminants on site, and the decon measures that have already
- 1157 been taken.
- 1158 • The DLA should inform EMS and the hospital medical team how the patient will be
- 1159 wrapped and ascertain whether EMS prefers to perform the wrapping themselves. Once
- 1160 9-1-1 is notified, the DLS will ensure other Incident Command staff have been notified of
- 1161 the situation.
- 1162 • Assuming that the incapacitated worker is in the DL, the DLS notifies at least two backup
- 1163 team members to bring a litter/stretchers to the front of the DL. The backup team enters
- 1164 through the EEC and brings a litter/stretchers covered by one tarp or a body bag (with
- 1165 handles). With the incapacitated worker's mask in place, the backup team places the
- 1166 incapacitated worker face up on the bag or the plastic-lined litter. Any EZWs who

- 1167 escorted the incapacitated worker can return to the EZ or go to the beginning of the DL.
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- The backup team members carry the worker on the litter through the EEC.
  - The incapacitated worker will need to be decontaminated before handover to EMS to allow them to be safely transported to the hospital. DLAs or the backup team will remove any visible gross contamination on the outer surfaces of the worker's PPE using a clean towel wetted with fresh decontamination solution (e.g., a Clorox® Dispatch® wipe). Alternatively, they can mist the worker, then use a car washing mitt dipped in clean, unused decon solution to wipe the incapacitated worker's PPE, including the backside of their body, boots, outer gloves, and respiratory gear. The decon contact time does not need to be achieved.
  - As necessary, conduct monitoring using the instruments or other (etc., M8-M9 paper)
  - Following decontamination, if possible, the DLAs remove the worker's boots and outer gloves and dispose of them in the appropriate container. They carefully wipe the inner gloves with a towel wetted with clean decon solution or a Clorox® Dispatch® wipe.
  - Using safety scissors, a DLA cuts only the outer suit away from the worker's body by making a long cut from the neck to below the waist. They continue to cut the suit from below the waist down each leg to the foot. The DLA must use caution when removing the outer suit, particularly the hood, and take care not to disturb the facepiece's seal. The DLA rolls the suit away from the worker, ensuring that the suit's outer surface does not touch any body part. The DLA conducts spot decon, if necessary, on the worker, the litter, or both. If possible, the DLA safely removes the worker's outer suit, sliding it away from the worker and out from under the worker's body, and disposes of the suit in a trash can. If the suit cannot be removed safely, the DLA leaves it on the worker until further directed by EMS or the DLS. The DLA either re-dresses the worker in a clean Tyvek® suit or slides an opened-up emergency transport body bag or a large piece of visqueen under the worker to minimize any potential remaining contamination. The DLA zips up the bottom portion of the bag or wraps the worker with visqueen, leaving the worker's head and shoulders out of the bag or sheeting. DLA will conduct air monitoring of the deconned worker to ensure contamination has been removed. The DLA will hand the incapacitated worker to a second backup team standing ready in the SZ.
- Note:** The SCBA, APR, or PAPR respirator is still operating and providing clean air to the worker. EMS will determine if the SCBA, PAPR, and mask should be removed.
- The backup team will transfer the incapacitated worker to EMS for transport to the hospital.
  - Once the emergency decon is complete, the DLS ensures all contamination has been removed from the DL, and all wastes have been appropriately containerized, including any aqueous wastes. The DL should be returned to ready status. The DLS will inspect the EEC for readiness to accept any other incapacitated workers. All DLAs who require any

1205 decon should go through the EEC to Wet Operations to be deconned and then return to  
1206 the location assigned by the DLS.  
1207 • The DL can resume deconning workers after the EEC has been reset, DLAs are back in  
1208 their positions on the DL, and the DLS has approved the reset of the EEC and has  
1209 authorized restart of the DL.  
1210

### 1211 **13. Decon Line Breakdown**

1212 The DLS is responsible for observing the DLAs breaking down the DL. Breakdown starts at the  
1213 EZ, moves through the CRZ, and works towards the SZ. All solid waste (e.g., used PPE, poly  
1214 sheeting, etc.) is collected, consolidated, and appropriately sealed per DOT packaging  
1215 requirements. Items that require decontamination during this process include stools,  
1216 washbasins, and any other items that will be reused. Aqueous waste is collected and bulked  
1217 into the appropriate containers (e.g., drums, totes, etc.). The waste will be disposed of under  
1218 applicable local, state, and federal requirements. **Note:** Directions for the breakdown of the DL  
1219 are in Appendix IV.  
1220

1221 After the DL is broken down and removed, the DLA and DLS will doff their PPE following Steps 3  
1222 -13 of this SOP. The most contaminated DLA (typically the individual closest to the EZ) becomes  
1223 the decon entrant, and the other DLAs move forward one place toward the EZ until all DLAs  
1224 have become decon entrants (conduct decontamination according to this Decon Line SOP). The  
1225 DLS will be the last through the line and will conduct self-decontamination from start to finish.  
1226 Lastly, they will follow up with Steps 14 and 15, an optional shower, and medical monitoring in  
1227 the SZ.  
1228

1229 **Note:** The DLS should be the last person through the DL. It is recommended that the DLS be an  
1230 EPA OSC because OSCs are responsible for monitoring all personnel's successful  
1231 decontamination. If that is not feasible, then another EPA OSC in the SZ should monitor the  
1232 DLS's final decon phases.  
1233

### 1234 **Disassembly of Decon Line**

1235 A final doffing station with a hand washing station is established outside the CRZ in the support  
1236 zone (see below). The doffing station is constructed on the ground by using heavy-duty plastic  
1237 sheeting (e.g., 2-mil) with strips of anti-skid tape to prevent slips. The DLAs will break down the  
1238 DL in Level C PPE (i.e., Tyvek® coverall, nitrile gloves, and boot covers). Caution must be  
1239 exercised to minimize cross-contamination of any residual chemical material on the DL  
1240 structures. All disposable items are double-bagged and packaged and must comply with all  
1241 state and local transportation and disposal requirements. Aqueous and solid waste should be

1242 kept separate. After completing DL disassembly, the DLAs will move to the final doffing station,  
1243 doff their PPE, and containerize it as appropriate. They must wash their hands and faces and  
1244 comply with Site HASP requirements. The DLS conducts a final inspection to determine if the  
1245 decon pad area needs additional cleaning after disassembly.

1246

1247 The last three tasks can be summarized as:

- 1248 1. Once all EZWs have exited through the DL, DLAs place all solid and aqueous wastes  
1249 (except for what they need to clean themselves) in drums. They dry the floor on the  
1250 Wet Operations side of the DL.
- 1251 2. DLAs decon (wipe or spray) and push out all unneeded containers, seats, tools, and  
1252 instruments through the Support Zone. They leave large tubs and berms in place.
- 1253 3. DLAs pair up and proceed through all DL stations (from second gross decon through  
1254 hand/face wash and exit). The last pair sets up the sump or contains any liquids as they  
1255 leave Wet Operations, using extra gloves as needed, before proceeding to the Dry  
1256 Operations side of the DL.

1257

1258

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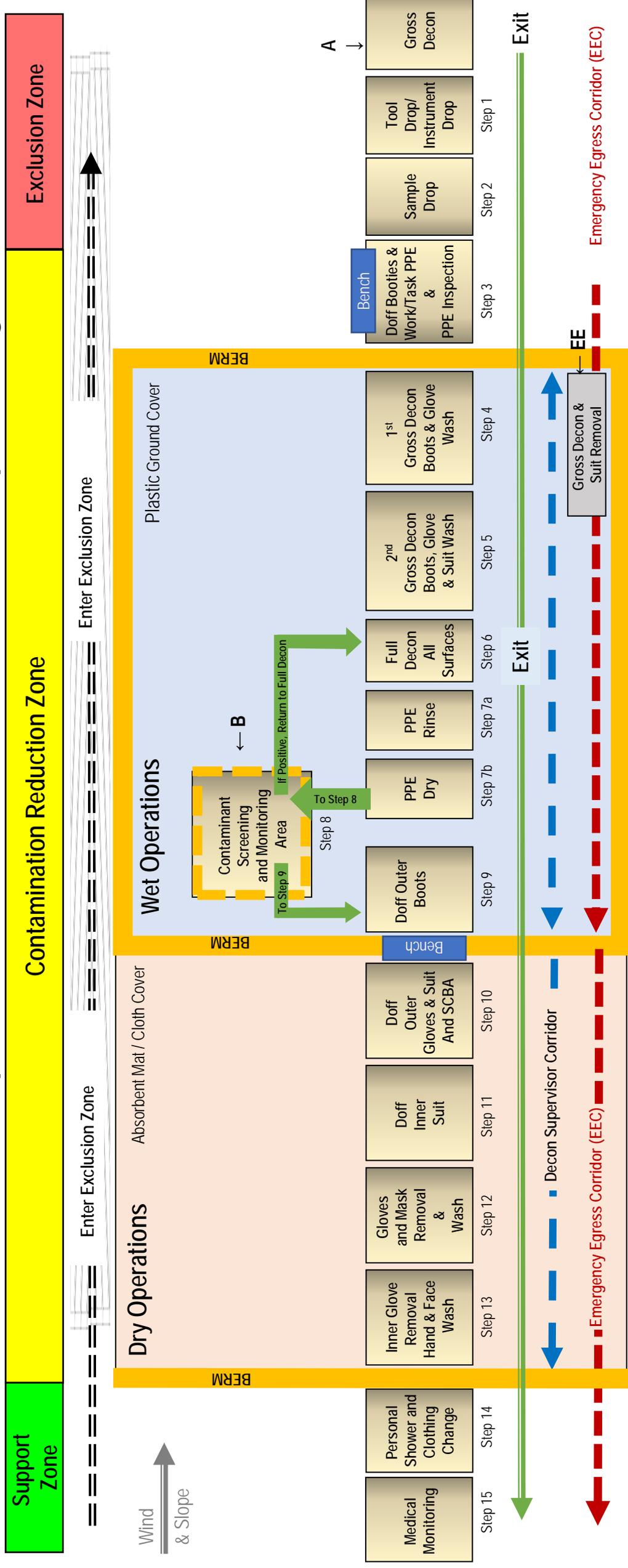
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**Appendix I: Decon Line for Hazardous Chemicals and Chemical Agents**

# Level A/Level B Encapsulated – Chem Decon Line

## Overview Graphic of General Decon Processes – Steps through 15

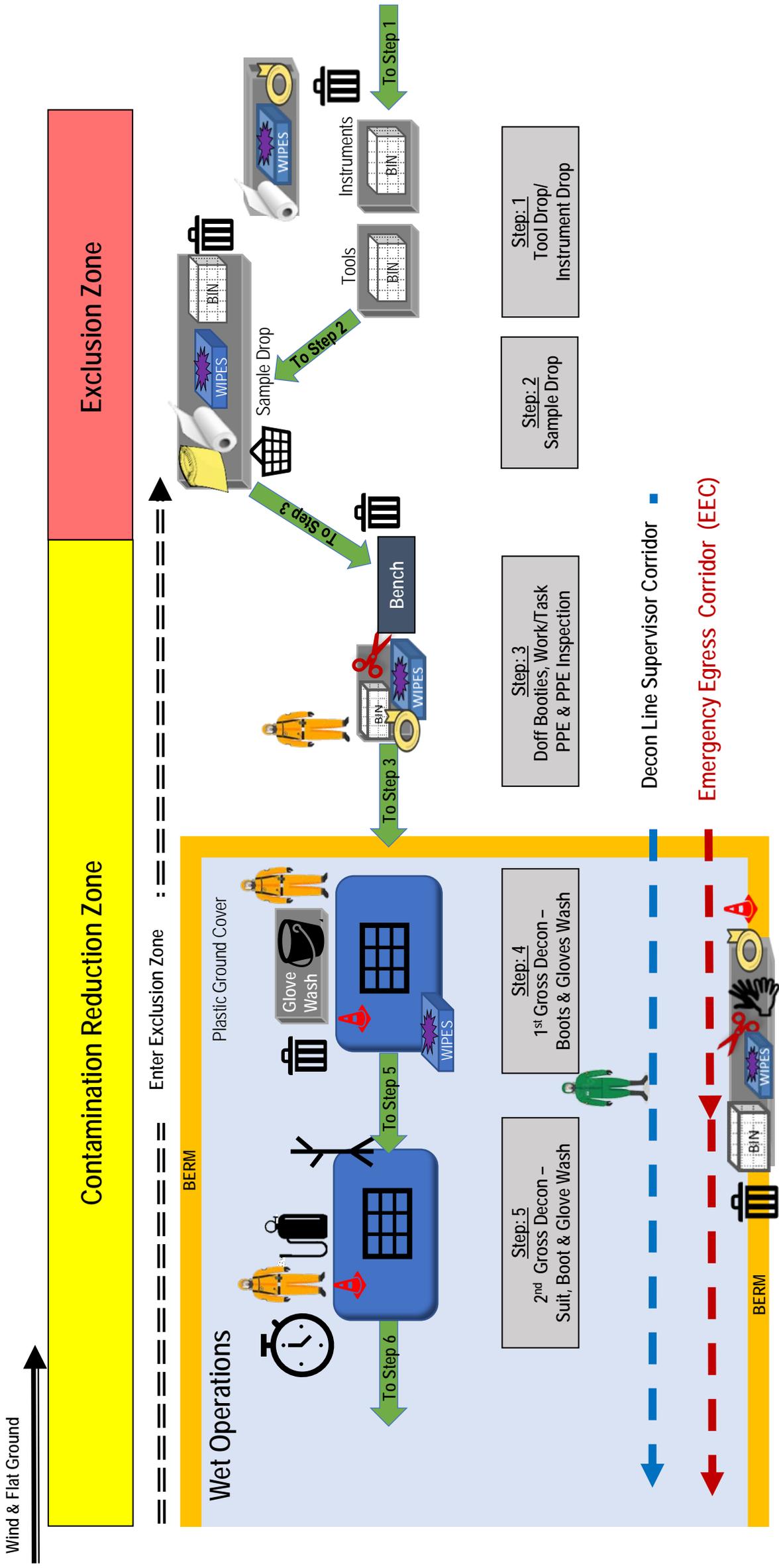


### NOTES :

- A. Gross decon with wetted or bleach wipes and/or paper towels
- B. Enclosed Screening Area
- EE. Emergency Egress Corridor, Gross Decon and Suit Removal
- 1. Tool and Instrument Drops
- 2. Sample Drop
- 3. Remove outer booties, task PPE and inspect PPE
- 4. Remove any visible gross contamination, 1<sup>st</sup> glove and boot wash
- 5. 2<sup>nd</sup> glove and boot wash. Spray decon solution on suit
- 5. Suit wash. Use low pressure spray to reduce overspray
- 6. Complete full decon and contact time before moving on 7a&b Rinse PPE then dry in preparation for screening.
- 7. Screen with air monitoring equipment in separate screened area.
- 8. Remove outer boots
- 9. Remove outer gloves & suit and SCBA
- 10. Remove outer gloves & suit and SCBA
- 11. Remove Inner Suit
- 12. Change gloves & remove mask for cleaning.
- 13. Remove inner gloves. Wash hands then face
- 14. Enter SZ for personal shower
- 15. Medical Monitoring

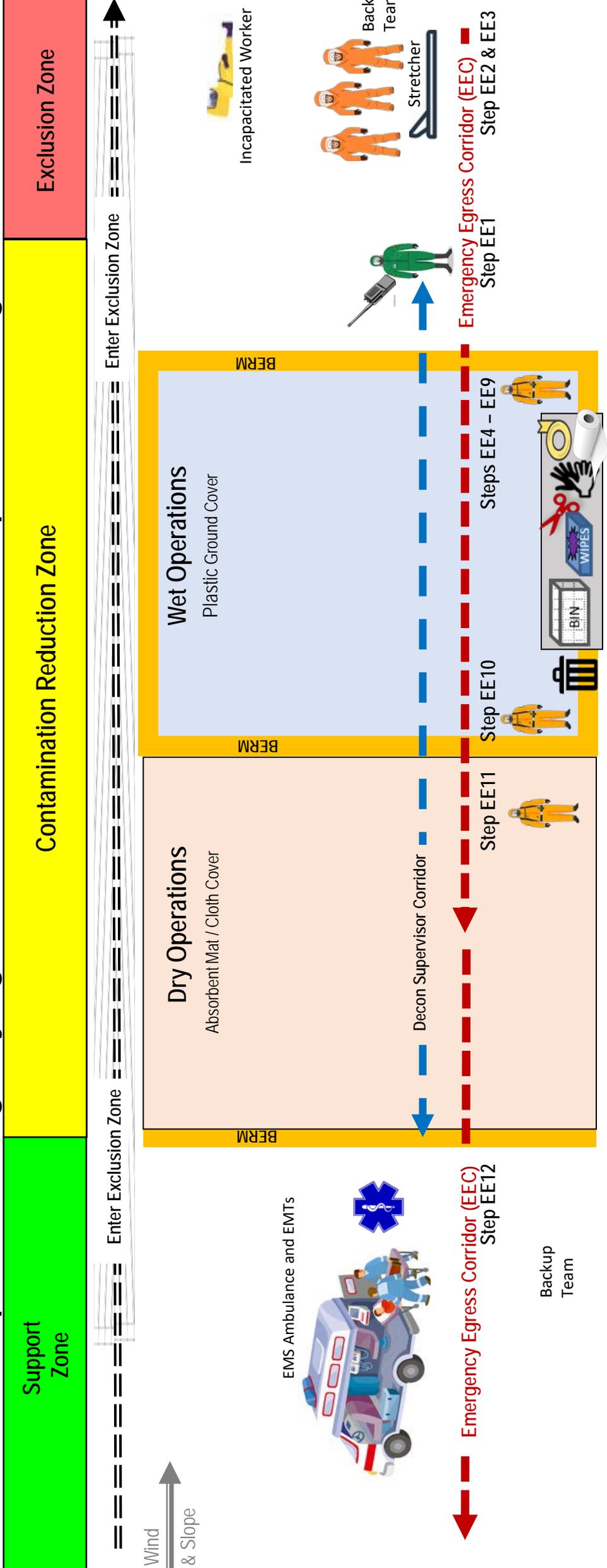
# Chem Decon Line: Steps 1 through 5

## Contamination Reduction Zone and Hot Zone



# Level A/Level B Encapsulated – Chem Decon Line

## Graphic of Emergency Egress Decon Processes – Steps EE1 through EE12



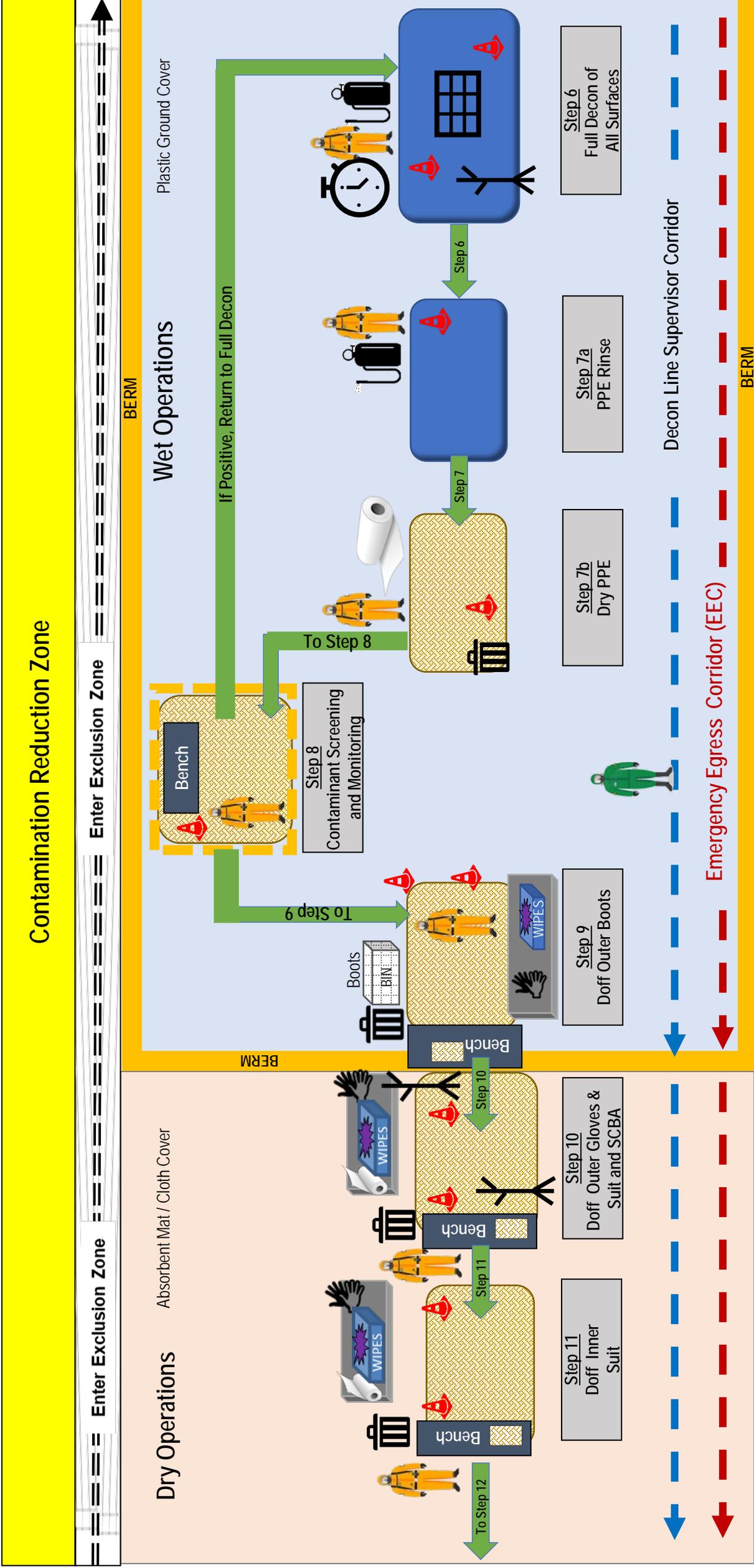
### EMERGENCY EGRESS CORRIDOR (EEC) DECON PROCESSES:

- |  |   |  |
|--|---|--|
| EE1. Dial 911 and Hospital                             | EE5. DLA Removes Outer Boots and Gloves         | EE9. DLA Wraps Incapacitated Worker with Visqueen Wrapping |
| EE2. Send in Backup Team                               | EE6. DLA Wipes Inner Gloves with Decon Solution | EE10. DLA Screens Victim with Air Monitoring Equipment.    |
| EE3. Backup Retrieves Incapacitated Worker             | EE7. DLA Cuts Outer Suit from Body and Remove   | EE11. Dry Operations Personnel Carry Victim to Edge of CRZ |
| EE4. DLA Worker in Wet Operations Performs Gross Decon | EE8. DLA Spot Decon Incapacitated Worker's Body | EE12. Second Backup Team in SZ Carries Victim to EMS       |

# Chem Decon Line: Steps 6 through 11

## Contamination Reduction Zone – Wet and Dry Operations

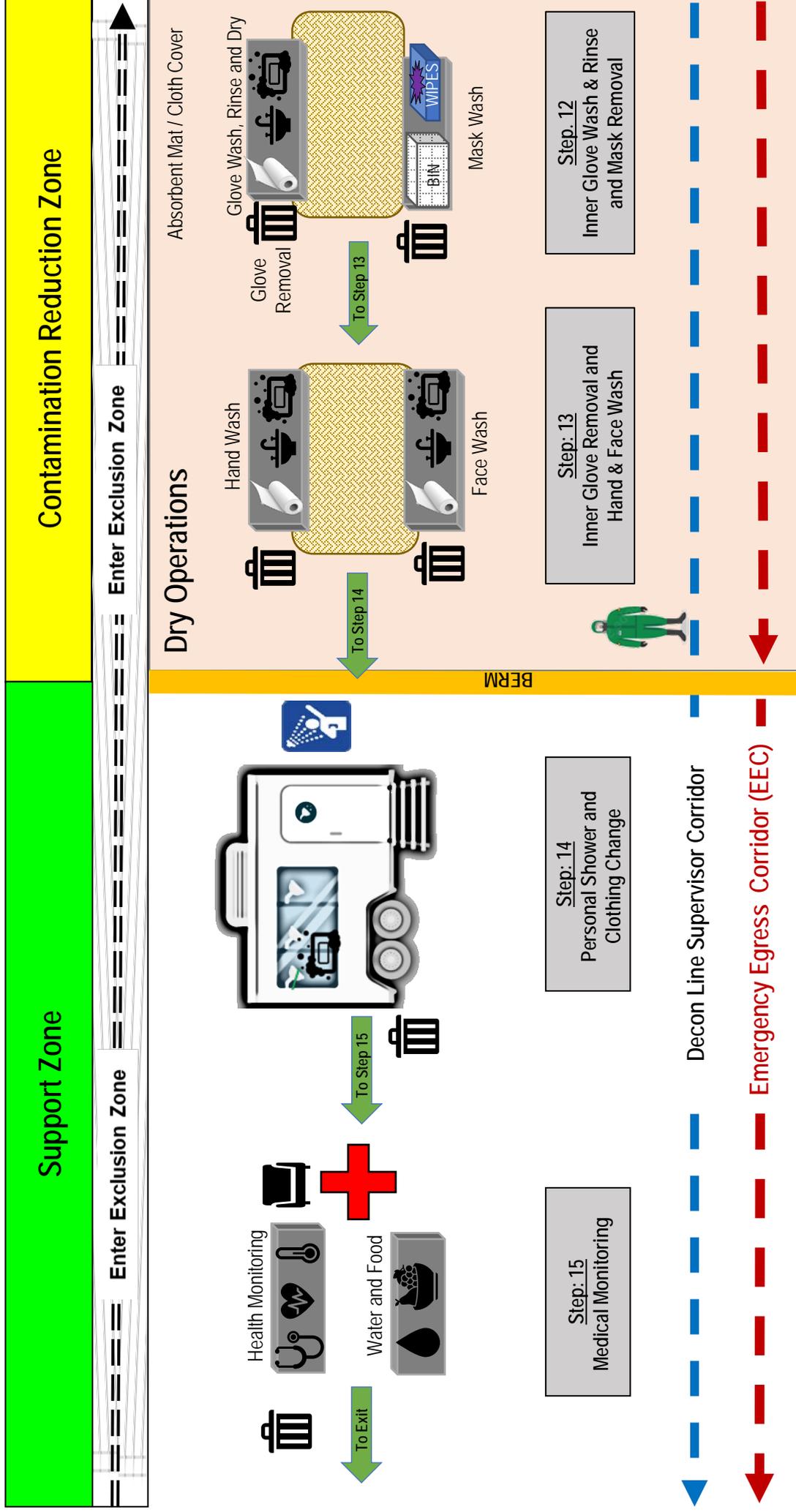
Wind & Flat Ground



# Chem Decon Line: Steps 12 through 15

## Contamination Reduction Zone and Support Zone

Wind & Flat Ground 



# Legend

	Decon Line Attendant		Wipes for Decontamination		Non-Slip Floor Cover / Cloth Cover		Decontamination Tub
	Decon Line Supervisor		Boot Scrubber Plate		Plastic Ground Cover		Table
	Chemical Resistant Tape		Clock/Stopwatch		Containment Berm		Hand & Face Wash
	Trash Can		Bucket/Basin		Ingress / Egress Corridor		Soap
	Plastic Storage Bin		1-gal Zippered Bags		Floor Mat/Absorbent Pad		Personal Shower
	Safety Cone		85 Gallon Trash Bags		Vapor Control Screen / Tent		Medical Monitoring /First Aid
	Safety Scissors		Paper Towels		Emergency Egress Corridor (EEC)		Sample Container
	Bench		Low Flow Pressure Sprayer		Vapor Control Demarcation Line		Gloves
	Coat Rack		Blood Pressure		Heart Rate		Temperature
	Chair		Walkie Talkie / Radio		Water and Food		Back Up Team
	Incapacitated Worker				Stretcher / Litter		Emergency Services(EMS)

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## **Appendix II: Basic Levels of Personal Protective Equipment**

1332 **Levels of Personal Protective Equipment**

1333 Personal protective equipment (PPE) levels for an emergency response to a suspected  
1334 hazardous chemical or chemical agent incident are based on scenario risks from highest to  
1335 lowest level of protection:

- 1336  
1337 • **LEVEL A:** NIOSH-approved chemical, biological, radiological, and nuclear (CBRN) full-  
1338 facepiece self-contained breathing apparatus (SCBA) operated in pressure-demand  
1339 mode, a totally encapsulating chemical protective (TECP) suit that provides protection  
1340 against CBRN agents, chemical-resistant gloves (inner and outer), and chemical-resistant  
1341 boots. This level is appropriate when: a) the event is uncharacterized and/or  
1342 uncontrolled, b) the type(s) of agent is unknown, c) the dissemination method is  
1343 unknown, d) dissemination via an aerosol-generating device is still occurring, or e)  
1344 decontaminating workers in TECP suits (because of potential for re-aerosolization). Per  
1345 National Institute of Occupational Safety and Health (NIOSH) guidance, Level A provides  
1346 the greatest level of skin (TECP), respiratory (SCBA), and eye protection when the agent  
1347 identity or concentration is unknown.
- 1348 • **LEVEL B:** NIOSH-approved CBRN or non-CBRN full-facepiece SCBA operated in pressure-  
1349 demand mode, a hooded chemical-resistant suit that provides protection against CBRN  
1350 agents, chemical-resistant gloves (inner and outer), and chemical-resistant boots. This  
1351 level is appropriate when: a) aerosol is no longer being generated or b) other conditions  
1352 may present additional hazards, such as a splash hazard. Per NIOSH guidance, Level B  
1353 provides the highest level of respiratory protection (SCBA) when a lesser level of skin  
1354 protection is required. Level B differs from Level A in that it typically incorporates a non-  
1355 encapsulating, splash-protective, chemical-resistant outer suit that provides protection  
1356 against most liquids but is not vapor tight.
- 1357 • **MODIFIED LEVEL B:** NIOSH-approved CBRN or non-CBRN full-facepiece SCBA operated in  
1358 pressure-demand mode, an encapsulated (not total) Level B suit that provides  
1359 protection against CBRN agents, chemical-resistant gloves (inner and outer), and  
1360 chemical-resistant boots. This level is appropriate when: a) aerosol is no longer being  
1361 generated or b) other conditions may present additional hazards, such as a high  
1362 possibility of a splash hazard. Per NIOSH guidance, Level B provides the highest level of  
1363 respiratory protection (SCBA) when a lesser level of skin protection is required. Level B  
1364 differs from Level A in that it typically incorporates a non-encapsulating, splash-  
1365 protective, chemical-resistant outer suit that provides protection against most liquids  
1366 but is not vapor tight.
- 1367 • **LEVEL C:** NIOSH-approved CBRN or non-CBRN, tight-fitting air-purifying respirator (APR),  
1368 a hooded chemical-resistant suit that protects against CBRN agents, chemical-resistant  
1369 gloves (inner and outer), and chemical-resistant boots. This level is appropriate when: a)

1370 the aerosol is no longer being generated, b) the agent and hazard level has been  
1371 defined, or c) small item that can be easily bagged. Per NIOSH guidance, Level C can be  
1372 selected when the agent identity and concentration are known and the respiratory  
1373 protection criteria factors for the use of APR or PAPR (i.e., warning properties) are met.

1374 • **MODIFIED LEVEL C:** NIOSH-approved CBRN or non-CBRN tight-fitting powered APR  
1375 (PAPR), a hooded chemical-resistant suit that protects against CBRN agents, chemical-  
1376 resistant gloves (inner and outer), and chemical-resistant boots. This modified level may  
1377 also include adhesive tape used to seal the neck area using a tape gaiter and seal the  
1378 hood to the mask. This level is a modification of Level C and is appropriate when: a) the  
1379 aerosol is no longer being generated, b) the agent and hazard level has been defined, or  
1380 c) small item that can be easily bagged. Per NIOSH guidance, Level C can be selected  
1381 when the agent identity and concentration are known and the respiratory protection  
1382 criteria factors for the use of APR or PAPR (i.e., warning properties) are met.

1383 **LEVEL D:** Level D protection can be selected when the minimum protection is required.  
1384 Level D protection may be sufficient when no contaminants are present, or work  
1385 operations preclude splashes, immersion, or the potential for unexpected inhalation or  
1386 contact with hazardous levels of chemicals. Level D should include work clothes, safety  
1387 glasses, and chemical-resistant, steel-toe boots or shoes. Optional equipment may  
1388 include disposable hooded coveralls (Tyvek®), gloves, hardhat, and protective foot  
1389 coverings.

1390  
1391 **Note:** Downgrading PPE levels may be considered only when the identity and concentration of  
1392 the chemical or agent is known, and the risks of re-aerosolization or dermal exposure are  
1393 known to be extremely low. Decisions regarding downgrading of PPE levels are only made at  
1394 the discretion of the Site Health & Safety Officer after conducting a risk assessment and must  
1395 be accompanied by on-site monitoring. PPE Levels for the Site can be found in the Site H&S  
1396 Plan. Lastly, personnel must ensure that proper decon operations are established before site  
1397 entry.

1398  
1399 For additional information, see:

1400  
1401 National Institute for Occupational Safety and Health (NIOSH). 2008. Guidance on Emergency  
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1406 NIOSH. 2009. Recommendations for the Selection and Use of Respirators and Protective  
1407 Clothing for Protection Against Biological Agents. DHHS (NIOSH) Publication Number

1408 2009-132. Accessed 04/21/2021 at: [https://www.cdc.gov/niosh/docs/2009-](https://www.cdc.gov/niosh/docs/2009-132/default.html)  
1409 [132/default.html](https://www.cdc.gov/niosh/docs/2009-132/default.html).

1410

## 1411 **Level A Response**

1412 Select when the greatest level of skin, respiratory, and eye protection is required. Level A offers  
1413 the maximum respiratory and skin protection for responders from absorption hazards,  
1414 respiratory hazards, unknown chemicals, or exposure to levels above the IDLH or greater than  
1415 the AEGL-2.

1416

### 1417 **Basic Ensemble for Level A Exclusion Zone Workers**

---

1418 NOTE: Specifics of the incident may alter the suit ensemble or dress out procedures. If  
1419 chemicals are known, ensure ensemble chemical compatibility.

- 1420 • DuPont™ Tychem® 10000 or a DuPont™ Tychem® Responder® CSM Level A suit
- 1421 • Integral Silver Shield® inner gloves
- 1422 • Butyl rubber outer gloves
- 1423 • Cut-resistant gloves over the integral butyl rubber gloves
- 1424 • ChemTape® to seal all potential penetrations
- 1425 • Nitrile exam inner gloves
- 1426 • 3M™ Scott™ SCBA ensemble
- 1427 • Tingley™ HazProof® boots
- 1428 • Communication equipment

1429 Based on site conditions, responders may consider other optional equipment: supplied-air cart,  
1430 hard hat, hearing protection, towel and/or anti-fog liquid to clear condensation, trauma shears  
1431 or knife inside the suit for emergencies, cut-resistant work gloves, ice vest, and additional  
1432 ChemTape® or comparable tape, among others.

1433

### 1434 **Procedural Steps for Level A Exclusion Zone Entrants**

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- 1435 1) Remove jewelry, belts, and all items from pockets and place them in a labeled bag.  
1436 Consider removing work clothes and wearing coveralls.
- 1437 2) Inspect the mask and apply an anti-fog liquid inside and outside the mask lens (insert  
1438 eyeglass kit if needed).
- 1439 3) Inspect SCBA (see SCBA and Chemical Protective Clothing Inspections below).
- 1440 4) Inspect both the inner suit and the Level A suit (apply an anti-fog liquid to the inside  
1441 face shield of the Level A suit if needed).
- 1442 5) Remove personal boots or shoes.
- 1443 6) Don a pair of nitrile exam gloves.
- 1444 7) Put on and zip up inner suit (optional).

- 1445 8) Put on the Level A suit up to the waist.
- 1446 9) Put on outer steel toe/steel shank, chemical protective boots. Pull the boot flaps down  
1447 over boots. Consider rubber booties over the HazProof® boots.
- 1448 10) Put on one pair of nitrile exam gloves—secure outer gloves to the inner suit with  
1449 ChemTape®.
- 1450 11) Pull up the inner hood and put on the SCBA unit (if applicable). Open the valve on the  
1451 bottle all the way. Connect SCBA to suit supplied-air respirator connection.
- 1452 12) Attach Radio and Communications Unit. Turn on, select the proper channel, and  
1453 perform a test.
- 1454 13) Tuck a towel into the SCBA strap to be used during entry to periodically wipe  
1455 condensation from the Level A suit’s face shield.
- 1456 14) Tape trauma shears or other self-cutout tools to your leg or other secure location.
- 1457 15) Pull back the inner hood and put on the SCBA mask. Perform positive and negative  
1458 pressure fit checks.
- 1459 16) Pull up inner hood over mask harness. Tape to SCBA mask, as necessary
- 1460 17) Put on a hard hat and add any additional equipment and supplies as necessary.
- 1461 18) Connect the regulator to the SCBA mask. **The SCBA is now fully operational.**
- 1462 19) Pull up and zip Level A suit. Consider cut-resistant work gloves if work may compromise  
1463 glove integrity.
- 1464 20) Perform final inspection.
- 1465

1466 **Level B Responses**

1467 Select when the highest level of respiratory protection is necessary, but a lesser level of skin  
1468 protection is required. Level B is the minimum protection for responders in danger of exposure  
1469 to unknown chemical hazards or levels above the IDLH or greater than AEGL-2. Ensure that  
1470 appropriate decon operations are established before entry.

1471

1472 **Basic Ensemble for Level B Exclusion Zone Entrants**

---

1473 NOTE: Specifics of the incident may alter the suit ensemble or dress out procedures. If  
1474 chemicals are known, ensure ensemble chemical compatibility.

- 1475 • DuPont™ Tychem® 6000 outer suit with a hood or DuPont™ Tychem® 10000  
1476 encapsulating Level B. An inner suit is not always warranted. The need for an inner  
1477 suit and the specific material is based on the specifics of the incident.
  - 1478 ○ Integral booties
  - 1479 ○ Elastic wrists
  - 1480 ○ Use ChemTape® to seal all potential penetration areas
- 1481 • Nitrile exam inner gloves
- 1482 • Silver Shield® gloves
- 1483 • Appropriate outer gloves
- 1484 • Steel toe/steel shank boots with chemical protective booties or steel toe/steel shank  
1485 chemical protective boots (e.g., Tingley™ HazProof®)
- 1486 • 3M™ Scott™ SCBA ensemble
- 1487 • Communication equipment

1488 Based on site conditions, optional equipment to consider includes supplied-air cart, hard hat,  
1489 hearing protection, towel and/or anti-fog liquid to clear condensation, trauma shears or knife  
1490 for emergencies to escape encapsulating suit, cut-resistant over-gloves, ice vest, and additional  
1491 chemical or duct tape.

1492

1493 **Procedural Steps for Level B Exclusion Zone Entrants**

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- 1494 1) Remove jewelry, belts, and all items from pockets and place them in a labeled bag.  
1495 Consider removing work clothes and wearing coveralls.
- 1496 2) Inspect the mask and apply an anti-fog liquid inside and outside the mask lens (insert  
1497 eyeglass kit if needed).
- 1498 3) Inspect SCBA (see SCBA and Chemical Protective Clothing Inspections below).
- 1499 4) Inspect both the inner suit and the Level B suit (apply an anti-fog liquid to the inside face  
1500 shield of the Level B encapsulating suit if used).
- 1501 5) Remove personal boots or shoes.
- 1502 6) Inspect both inner and outer suits.

- 1503 7) Don a pair of nitrile exam gloves.
- 1504 8) Put on and zip up inner suit.
- 1505 9) Put on one pair of nitrile exam gloves. Secure the gloves to the inner suit with
- 1506 ChemTape®.
- 1507 10) Put on and zip up the outer suit.
- 1508 11) Put on outer steel toe/steel shank, chemical protective boots. Consider chemical
- 1509 protective booties over the HazProof® boots. Secure the boots over the suit with
- 1510 ChemTape®.
- 1511 12) Put on the SCBA unit and open the valve on the bottle all the way.
- 1512 13) Pull back both inner and outer hoods.
- 1513 14) Put on a mask and perform positive- and negative-pressure fit tests.
- 1514 15) Attach the radio and communications unit. Turn it on, select the proper channel, and
- 1515 perform a test.
- 1516 16) Pull up both inner and outer hoods over the mask harness. Seal the SCBA mask to the
- 1517 hood with ChemTape®.
- 1518 17) Put on a hard hat and add any additional equipment and supplies as necessary.
- 1519 18) If required, put on 4-H/Silver Shield® gloves or other gloves, as specified in the Site HASP
- 1520 or required by Site H&S Officer. Secure the gloves to the sleeves with ChemTape® to the
- 1521 outer suit.
- 1522 19) Put on outer gloves and secure sleeves over gloves with ChemTape®. Consider cut-
- 1523 resistant work gloves if work may compromise glove integrity.
- 1524 20) Connect the regulator to the mask. The SCBA is now fully operational.
- 1525 21) Perform final inspection.

1526 **Level C Response**

1527 Select when the contaminant and concentration are known, along with acceptable oxygen  
1528 concentrations. Ensure that the respiratory protection criteria for using air-purifying respirators  
1529 (APR) or powered air-purifying respirators (PAPR) are met. Lastly, responders must confirm that  
1530 proper decon operations are established before entry.

1531  
1532 **Basic Ensemble for Level C**

---

1533 NOTE: Specifics of the incident may alter the suit ensemble or dress out procedures. Verify  
1534 ensemble compatibility with site contaminants.

- 1535 • DuPont™ Tychem® 4000/6000 outer suit with hood based on the specifics of the  
1536 incident and the Site HASP
  - 1537 ○ Integral booties
  - 1538 ○ Integral hood
  - 1539 ○ Elastic wrists
- 1540 • DuPont™ Tyvek® inner suit with integral booties, elastic wrists, and hood
- 1541 • Nitrile exam inner gloves
- 1542 • Silver Shield® gloves, as needed based on the specifics of the incident
- 1543 • Appropriate outer gloves
- 1544 • Steel toe/steel shank boots with chemical protective booties or steel toe/steel shank  
1545 chemical protective boots (e.g., Tingley™ HazProof®)
- 1546 • Chemical protective booties
- 1547 • 3M™ Scott™ APR mask, Bayonet adapter, or 3M™ Scott™ PAPR unit.

1548 **Note:** Check the Site HASP for filter cartridges specified for the response. If using a PAPR, also  
1549 check that the batteries are fully charged.

- 1550 • Optional equipment to consider based on site conditions includes Class 2 or better  
1551 high-visibility safety vest, hard hat, hearing protection, trauma shears or knife for  
1552 emergencies, cut-resistant over-gloves, ice vest, and additional chemical or duct  
1553 tape.

1554  
1555 **Procedural Steps for Level C**

---

- 1556 1. Remove jewelry, belts, and all items from pockets and place them in a labeled bag.  
1557 Consider removing street clothes and wearing coveralls.
- 1558 2. Install Bayonet adapter onto the mask and attach the filter cartridges. Inspect mask  
1559 and apply an anti-fog liquid to inside and outside of face lens (insert eyeglass kit if  
1560 needed). If using a PAPR, attach the filter cartridges to BMA.
- 1561 3. Inspect outer and inner suit.
- 1562 4. Remove personal boots or shoes if using chemical protective boots.

- 1563 5. Don inner gloves.
- 1564 6. Put on an inner suit (e.g., Tyvek®) and zip up. Don another pair of nitrile exam gloves  
1565 and tape to the inner suit.
- 1566 7. Put on an outer suit up to the waist. Consider using a piece of ChemTape® to extend  
1567 the zipper pull.
- 1568 8. Don chemical protective booties over steel toe/steel shank boots or don steel  
1569 toe/steel shank chemical protective booties. Consider chemical protective booties  
1570 over the HazProof® boots. Secure boots with ChemTape®, as needed.
- 1571 9. Pull up and zip outer suit.
- 1572 10. Put on PAPR unit if using.
- 1573 11. Pull back inner and outer hoods as necessary.
- 1574 12. Put on a mask and conduct a negative pressure fit test.
- 1575 13. Attach Radio and Communications unit.
- 1576 14. Pull up inner and outer hoods over the mask harness. Tape them to mask.
- 1577 15. Put on a hard hat. Put on a high-visibility vest (as appropriate)
- 1578 16. If required, put on 4-H/Silver Shield® gloves or other gloves specified in Site HASP or  
1579 required by Site H&S Officer. Secure gloves to sleeves with ChemTape® to outer suit.
- 1580 17. Put on outer gloves. Secure to sleeves with ChemTape®. Consider cut-resistant work  
1581 gloves if work may compromise glove integrity.
- 1582 18. Using ChemTape®, tape any seams around the facepiece and suit to ensure no visible  
1583 skin.
- 1584 19. If using PAPR, turn on the PAPR BMA and attach the mask.
- 1585 20. Perform final inspection.
- 1586

1587 **SCBA and Chemical Protective Clothing Inspections**

1588 **SCBA Inspection**

---

- 1589 1. Remove SCBA from the case and place it on a table or bench.
- 1590 2. Examine the overall condition of the SCBA and note any damage.
- 1591 3. Remove the cylinder from the harness and check the hydrostatic test date label. The
- 1592 cylinder must be hydrostatically tested every five years to maintain safety compliance.
- 1593 4. Check cylinder for damage and wear.
- 1594 5. Make sure the cylinder has >3500 psi. Replace with a full cylinder if necessary.
- 1595 6. Inspect shoulder straps and waist belts for damage or wear.
- 1596 7. Check all buckles and fasteners and assure proper operation.
- 1597 8. Examine the backpack for damage, cracks, or rust.
- 1598 9. Ensure all connection points between the cylinder and the SCBA harness operate
- 1599 correctly and are free of damage or corrosion.
- 1600 10. Check O-ring for damage.
- 1601 11. Re-install cylinder and reattach to the harness.
- 1602 12. Check all hoses and connection points for wear, cuts, or damage.
- 1603 13. Activate cylinder valve and compare cylinder pressure gauge and pack pressure gauge.
- 1604 Confirm that values are the same.
- 1605 14. Inspect facepiece for wear, damage, and cracks. Inspect facepiece harness for wear.
- 1606 15. Attach facepiece and check regulator for proper operation.
- 1607 16. Close the cylinder valve and open the bypass valve to bleed pressure slowly. Check to
- 1608 assure heads-up display indicators track appropriately with the decreasing pressure.
- 1609 Replace the battery if the low battery light is illuminated.
- 1610 • Full Cylinder – Two Green Lights
- 1611 • ¾ Cylinder – Single Green Light
- 1612 • ½ Cylinder – One Flashing Yellow Light
- 1613 • ¼ Cylinder – One Flashing Red Light
- 1614 17. Assure that “Vibra-alert” activates at 1000 psi.
- 1615 18. Tag and remove from service if SCBA fails inspection.
- 1616
- 1617

Table 1. Chemical Protective Clothing Inspection

<b>Visual Suit Check:</b>					
1. Level A Suit inspected within last year	Yes	No	6. Emergency cutout device (Level A)	Yes	No
2. No apparent damage to the suit	Yes	No	7. SCBA/SAR line connected (Levels A and B)	Yes	No
3. Zipper functions/not damaged	Yes	No	8. SCBA mask sealed/SCBA operating	Yes	No
4. Suit Pirelli/exhaust valve intact (Level A)	Yes	No	9. Final communications checked	Yes	No
5. Towel (Level A)	Yes	No	10. Zipper fully zipped	Yes	No
<b>Pre-Entry Checklist</b>					
1. Pre-hydration	Yes	No	4. IAP / HASP reviewed	Yes	No
2. Aware of signs and symptoms of specific chemical exposure	Yes	No	5. Suit ensemble compatibility researched and checked	Yes	No
3. Personal effects removed and secured	Yes	No	6. Radio communications checked	Yes	No

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**Appendix III: Chemical Decon Line Construction, Equipment and  
Supplies List**

1635 **Table 1. Suggested Decon Line Equipment and Supply Checklist**

<b>Suggested Decon Line Equipment and Supply Checklist</b>		
<b>Check</b>	<b>Number</b>	<b>Item and Volume</b>
<b>Exclusion Zone (Steps 1 and 2)</b>		
	2	Folding table (2' by 4')
	2	Portable emergency eyewash and shower
	3	Fire extinguisher (ABC type)
	2	Large trash can
	6	Clorox® Dispatch® bleach wipes or similar
	2	Multi-seat bench or stool
	4	Surgical scissors
	2	Rolls of ChemTape®
	6	Rolls of Paper Towels
	2	Portable light
	6	Zippered gallon-sized plastic bags (boxes or 100)
	3	Bins
	1	Box of trash bags
	1	Eyewash station
<b>Contamination Reduction Zone (Steps 3 through 13)</b>		
	1	Large tent (for Wet Operations), approx. 24' by 60'
	1	Medium tent (Dry Operations), approx. 24' by 30'
	1	24' by 60' tarp/visqueen sheet
	1	24' by 30' tarp
	2 to 4	Portable light
	8	30' berm (for containing Wet and Dry Operations areas)
	2	Enclosed tent for Screening Area
	12	3' by 3' tub
	4	Boot plate to remove boots
	8	Boot scraper/brush board
	16	Stability items to aid standing (e.g., large traffic cone; foldable walker, chair, sawhorse, etc.)
	12	18" by 24" bin for collecting masks, PAPR BMAs, boots, etc.
	8	Folding table (approx. 2' by 6')
	4	Portable hand and face washing station with potable water
	8	Car washing mitt
	6	Garden sprayer or Hudson sprayer (labeled with contents)

### Suggested Decon Line Equipment and Supply Checklist

Check	Number	Item and Volume
	6	55-gal drum (for trash)
	1	Drum dolly for moving aqueous waste drums
	6	Multi-seat bench or stool
	1	Large inner containment basin (for first suit wash)
	1	Hat or coat stand/PAPR hanger/clothesline
	8	5-gal bucket
	16	8-ft anti-slip mat (perforated rubber)
	6	Roll of anti-skid tape
	8	Kitchen timer, for stay time/wet time
	2	Large clock displaying hours, minutes, and seconds
	6	Paramedic information sheets and clipboard
	1	Litter/stretchers (netted is preferred but not required)
	2	Emergency plastic zippered body bag with handles
	4	Roll of Visqueen
	8	Surgical scissors or safety suit cutter (bootie removal and EE corridor)
	1	8' by 10' tarps for patient wrap
	1	Eyewash station
	2	Chlorine monitor
	1	Carbon monoxide monitor
	2	Box of chlorine hydroxide test strips (Cole-Parmer AO-18105-01 High-Level Chlorine Test Strips, 0-10,000 ppm; 50/Pk)
<b>Support Zone (Steps 13 and 14)</b>		
	1	20' by 20' tent (for Medical Monitoring station)
	2	Folding table (2' by 10')
	12	Padded folding chairs
	2	Thermometer, blood pressure monitor, stethoscope
	1	First aid kit
	1	Shower trailer/system for eight personnel
	6	Porta potties or one bathroom trailer
	1	Small refrigerator for drinking water
	2	Fan
	20	Freezer vest and ice inserts
	40	Extra set of ice inserts for freezer vest
	1	Small freezer for ice inserts

### Suggested Decon Line Equipment and Supply Checklist

Check	Number	Item and Volume
	1	Electric washing machine
	1	Electric dryer
	2	Portable light
Expendables and Supplies for Decon Line		
	1	Large gasoline generator, gas can, and gas
	15	Electric extension cord with GFI
	1	100-gallon plastic tank (for mixing the decontamination liquid)
	1	Sump pump for the tank
	2	5' by 5' basin or large container (roll-off) for bagged trash (from decon line ops)
	200	65-gallon drum liner bag
	8	Bundle of hospital chux or absorbent pads
	2 cases	Disposable foot covers/slippers for exiting the CRZ to the shower
	48	1-gallon bottle of household bleach
	24	1-liter bottle of hand/body soap
	8 cases	Clorox® Dispatch® bleach wipes or similar
	1	200-gallon water tank and water
	2 cases	Paper towels (48 rolls/case)
	2 cases	Disposable towels, 48 boxes/case
	2 cases	Gallon-sized zippered bags
	48 pairs	Work gloves (canvas)
	8	Bottles of Anti-fog liquid
	4 cases	Disposable rubber booties – sizes XL to XXL, 100 pair/case
	12 boxes	Nitrile liner gloves with extra or extended cuff (12"), 50 pcs/box
	24 boxes	Nitrile glove liners/sample gloves, 100 pcs/box
	12 boxes	Nitrile outer gloves (green) – XL, 12 pair/box
	12 rolls	Duct tape
	144 pair	3M™ Scott™ OV/AG/P100 cartridges for AV-3000
	48	Splash shields for hard hats
	250	20" by 20" patient belongings bag
	50	Tychem® apron
	4	Boot scraper mat
	4	Boot jack
	10 cases	Hype-Wipe® towels, 24 rolls/packages per case
	2	Potable water truck
	10 cases	Respirator cleaning wipes (12 canisters/case)

### Suggested Decon Line Equipment and Supply Checklist

Check	Number	Item and Volume
	4 bottles	Respirator cleaner
	2 boxes	pH paper
	4	Large bucket for mask cleaning
	100	Drinking water, 48 per case
	50	Gatorade®, 24 per case
	5	Energy snacks
	12	Extra-wide black marker, e.g., Sharpie® Magnum

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**Table 2. Suggested Decon Line PPE Supplies Check List Options\***

<b>Suggested Decon Line PPE Supplies Checklist Options</b>					
<b>Inner and Outer Suits</b>					
<b>Check</b>	<b>Manufacturer</b>	<b>Material</b>	<b>Fabric</b>	<b>Item Number</b>	<b>Features</b>
	DuPont™	Tychem®	10000	TK554T LY	Level A, Exp Back, Frt Entry, Att. Dual-Layer Gloves, Socks w/ Outer Boot Flaps, Dble Strm Flap; Hook & Loop, Double Taped Seams
	DuPont™	Tychem®	Responder® CSM	RC550T TN	Level A, Exp Back, Frt Entry, Att. Gloves, Socks w/ Outer Boot Flaps, Dble Strm Flap; Hook & Loop, Double Taped Seams
	DuPont™	Tychem®	10000	TK527T LY	Modified Level B, Exp Back, Frt Entry, Elastic Wrists, Socks w/ Outer Boot Flaps, Dble Strm Flap; Hook & Loop, Taped Seams
	DuPont™	Tychem®	6000	TF199T GY	Level B or C, Coverall w/ Resp. Fit Hood, Attached Gloves, Attached Socks, Outer Boot Flaps, Storm Flap, Taped Seams
	DuPont™	Tyvek®	400	TY120S WH	Inner, Coverall w/ Collar, Open Wrists, Open Ankles, Serged Seams, Storm Flap
	DuPont™	Tyvek®	800	TJ198T WH	Inner, overall w/ Resp. Fit Hood, Elastic Wrists, Elastic Ankles, Tyvek® Self-adhesive storm flap, Serged and over-taped seams
	Kappler™	Zytron®	500	Z5H352	Level A, Vapor Total Encapsulating Suit. Must Specify Pass-Thru Option. Pricing includes Standard Pass-Thru 7H. Front Entry AquaSeal® Gas-Tight Zipper, Double Storm Flaps with Hook & Loop Closure, Expanded View AntiFog Visor System, Flat Back, Attached Field Replaceable Butyl Gloves, Attached Sock Booties with Splash Guards and 2 Exhaust Valves.
	Kappler™	Zytron®	500	Z5H426	Level B or C Coverall. Attached Hood with Elastic Face Opening, Front Entry Zipper with LongNeck™ Respirator-Fit Closure, Double Storm Flaps with Hook & Loop Closure, Elastic Wrists and Attached Sock Booties with Splash Guards
	Kappler™	ProVent®	10000	MSE36	Inner Suit, Zipper Closure with Storm Flaps, Attached Hood, Elastic Back Waist, Wrists and Face Opening, Attached Skid-Resistant Shoe/Boot Covers

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Suggested Decon Line PPE Supplies Checklist Options					
Inner and Outer Gloves					
Check	Manufacturer	Item	Material	Model & Item No.	Features
	Ansell	Inner Gloves	Nitrile	MICROFLEX® 93-243	Extra-long cuff
	Ansell	Outer Gloves	Nitrile	Ansell Solvex	Outer gloves
	Tronex	Inner Gloves	Nitrile	Tronex® 9010-20	Exam gloves
	Hourglass International	Inner Gloves	Nitrile	RoyalTouch300™	Exam gloves
	Halyard Health	Inner Gloves	Nitrile	LAVENDER®	Exam gloves
	Kimberly-Clark	Sample Gloves	Nitrile	Kimberly-Clark Purple	Exam gloves
	Honeywell North®	Outer Glove	Silver Shield®	16750	2.7 mil
	Ansell	Outer Glove	Viton Butyl	166377	12-mil, 12 inches

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Suggested Decon Line PPE Supplies Checklist Options					
Inner and Outer Boots and Foot Coverings					
Check	Manufacturer	Item	Material	Model	Website
	Tingley™	Outer Hazmat Boots	PVC	82330.12	<a href="https://www.globalindustrial.com/p/safety/foot-protection/boots-shoes/82330-hazproof-steel-toe-boots-orangecream-sure-grip-outsole-size-12?infoParam.campaignId=T9F&amp;gclid=Cj0KCQiAy579BRCPARIsAB6QoiZSHMWn0avL79Lzm1g0KpxD6ReYK9u-ialhOx_bSZTMLujGsvl4h9QaAI-5EALw_wcB">https://www.globalindustrial.com/p/safety/foot-protection/boots-shoes/82330-hazproof-steel-toe-boots-orangecream-sure-grip-outsole-size-12?infoParam.campaignId=T9F&amp;gclid=Cj0KCQiAy579BRCPARIsAB6QoiZSHMWn0avL79Lzm1g0KpxD6ReYK9u-ialhOx_bSZTMLujGsvl4h9QaAI-5EALw_wcB</a>
	Bata	Outer Hazmat Boots	PVC	Onguard Hazmax	<a href="https://www.amazon.com/Industries-Bata-Shoe-87012-Superpoly/dp/B01NC2TEO8">https://www.amazon.com/Industries-Bata-Shoe-87012-Superpoly/dp/B01NC2TEO8</a>
	OnGuard	Boot Covers or Booties	Latex	806808133472	<a href="https://www.safetycompany.com/foot-protection/shoes-and-boot-covers/onguard-97591-12-inch-yellow-latex-hazmat-boot-cover/">https://www.safetycompany.com/foot-protection/shoes-and-boot-covers/onguard-97591-12-inch-yellow-latex-hazmat-boot-cover/</a>

### Suggested Decon Line PPE Supplies Checklist Options

#### Inner and Outer Boots and Foot Coverings

Check	Manufacturer	Item	Material	Model	Website
	Dunlop	Boot Covers or Booties	Latex	97591 12	<a href="https://www.magidglove.com/Dunlop-Yellow-Latex-Hazmat-Boot-Cover-1-97591XXXL.aspx?utm_source=Google&amp;utm_medium=Merchant%20Center&amp;utm_campaign=Product%20Feed&amp;gclid=Cj0KCQiA2af-BRDzARIsAIVQUOeX0NhN1_dskDqC91HqRS5nRlbg7ZX6uY1mETCO_9e7yUDtAWeXLLIaAiaUEALw_wcB">https://www.magidglove.com/Dunlop-Yellow-Latex-Hazmat-Boot-Cover-1-97591XXXL.aspx?utm_source=Google&amp;utm_medium=Merchant%20Center&amp;utm_campaign=Product%20Feed&amp;gclid=Cj0KCQiA2af-BRDzARIsAIVQUOeX0NhN1_dskDqC91HqRS5nRlbg7ZX6uY1mETCO_9e7yUDtAWeXLLIaAiaUEALw_wcB</a>
	Disposable Slippers	Tyvek® foot covers	Tyvek®	PE440SBULG0200	<a href="https://www.discountssafetygear.com/duPont-tyvek-shoe-covers-100-pack.html">https://www.discountssafetygear.com/duPont-tyvek-shoe-covers-100-pack.html</a>

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### Suggested Decon Line PPE Supplies Checklist Options

#### Respiratory Protection

Check	Manufacturer	Item	Material	Model & Item No.	Notes
	3M™ Scott™	APR	rubber & rubber head harness	AV-3000 with SureSeal; B5005047143	
	3M™ Scott™	APR Bayonet Adapter		B5005285023	For use with cartridges
	3M™ Scott™	PAPR Plus	With AV-3000 mask with SureSeal	C420	APR with rubber head harness
	3M™ Scott™	SCBA	With AV-3000 mask with SureSeal	AirPak 3X Pro SCBA	APR with rubber head harness
	3M™ Scott™	SCBA air tank		60' carbon bottle	5500 psi gauge
	3M™ Scott™ -PAPR	40-mm Cartridges	Enforcement	045123	Pkg of 1
	3M™ Scott™ - APR	742 Cartridges	OV/AG/P100	7422-YD1	Pkg of 2
	3M™ Scott™ - APR	40-mm Cartridges	OV/AG/P100	804990	Pkg 1
	3M™ Scott™ - APR	742 Cartridges	AG/P100	7422-WB1	Pkg of 2
	3M™ Scott™ PAPR	40-mm Cartridges	MPC Plus	80555701	Pkg of 1
	3M™ Scott™ PAPR	40-mm Cartridges	CBRN Cap-1 Canister	045135	Pkg of 1
	3M™ Scott™ Communication	Comms system	EPIC 3 RDI		

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### Suggested Decon Line PPE Supplies Checklist Options

Miscellaneous					
Check	Manufacturer	Item	Material	Model & Item No.	Notes
	TECHNICHE™	Ice vest		6529-BLU EL	Sizes: L; XL; 2XL; 3XL
	TECHNICHE™	Extra ice packs			
	DuPont™	Disposable apron	Tyvek®		
	Kappler®	ChemTape®		99402 YW	Chemical resistant
	3M™ Scott™	Duct tape		Tape 3903	Chemical resistant
	DuPont™	Tychem 2000® Tape		QC0990YL000012NL	Chemical resistant

1642 \* Please check the HASP and your safety officer for the suggested PPE. Confirm capability with the site-specific chemical agent and decon  
 1643 reagents.

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**Appendix IV: Decon Line Procedures for Construction and Disassembly,  
and Sample Decon**

1657 **Decon Line Set-up and Construction**

1658 The most critical element of the decontamination (decon) line (DL) is that it must be flexible to  
1659 meet the situation’s requirements. The procedures for setting up the decontamination line  
1660 must be tailored to site-specific hazards and will vary in complexity, depending on the chemical  
1661 agent(s) or hazardous chemicals, the items being decontaminated, the number of workers,  
1662 equipment and/or samples to be decontaminated, and site and prevailing environmental  
1663 conditions (e.g., wind, temperature, precipitation). The equipment used to set up the decon  
1664 line may vary by availability, inventory, cost, and preference of the entity charged with the  
1665 decon line setup.

1666  
1667 The decon line should be described in a Decontamination Plan prepared before working on the  
1668 site. This Decon Plan will provide details on the contaminants to be deconned, the DL location,  
1669 the number of personnel to be deconned, the decontamination solutions to be used, and a  
1670 description and drawing (optional) of the setup and steps in the line. The decon line is set up in  
1671 the Contamination Reduction Zone (CRZ), in an area free of contamination, flat, stable base,  
1672 ample drainage, and is free of rocks and large debris. It should be placed in a location that is  
1673 upwind of the EZ and in an area with no overhead hazards, if practical. The decon line should be  
1674 constructed with durable materials to withstand high moisture and continued use for the time  
1675 necessary to complete the work on site. If possible, tents or structures designed for decon  
1676 should be used. The DL may require a source of water and electricity for the proper operation,  
1677 which may be available on the site or need to be provided from an available source.

1678  
1679 The recommended layout of the Chemical DL extends from the EZ to the Support Zone (SZ) and  
1680 comprises a Wet Operations area and a Dry Operations area. Appendix I of the SOP presents a  
1681 detailed drawing of the DL. A checklist of materials needed to construct the DL is found in  
1682 Appendix III.

1683  
1684 Before initiating decontamination of personnel, an appropriate DL staging area for the spent  
1685 decon solutions and trash should be set up according to the Waste Management Plan. The  
1686 staging area should be an adjacent area to the DL. The aqueous waste should be properly  
1687 contained in drums or tanks in a bermed area until disposal can be arranged. Check with the  
1688 waste disposal company to determine the planned disposition of the waste, the required  
1689 container types, and any other disposal requirements.

1690

1691 **Sample Decon Procedures**

1692 Before the sample team enters the site’s EZ, sample decontamination guidelines and  
1693 procedures will be established. The guidelines and procedures will be established based on site  
1694 conditions or following protocols from the lead forensic team (such as the Federal Bureau of

1695 Investigation (FBI) or EPA’s National Criminal Enforcement Response Team (NCERT). After  
1696 consultation with the analytical laboratory and transportation consideration, sample  
1697 decontamination and packaging requirements will be site-specific and outlined in the Sampling  
1698 and Analysis Plan (SAP). The laboratory will provide information on appropriate  
1699 decontamination solutions and packaging requirements for sample receipt. The chain of  
1700 custody (COC) must be maintained during sample decontamination. In the field upon collection,  
1701 samples will be placed into labeled sample containers and then placed and tightly sealed into a  
1702 labeled plastic bag along with the COC. The steps summarized below may be used to  
1703 decontaminate these outer plastic sample bags before transport to the laboratory for analysis:

- 1704 • Wipe the outside of the plastic bag containing the samples with disposable bleach cloths  
1705 (such as Clorox® Dispatch®) or another type of disposable cloth with a laboratory-  
1706 approved decontamination solution. Under some circumstances, these cloths may be  
1707 the same wipe cloths used for personnel decontamination.
- 1708 • Place each plastic sample bag into another labeled plastic bag. Keep the air in the outer  
1709 plastic bags to a minimum.
- 1710 • Place all samples into a clean over-pack, such as a sealable cooler, with appropriate  
1711 paperwork and custody seals for transport to the laboratory.
- 1712 • In general, samples should be transported to the laboratory on ice at 2 to 8° C in a  
1713 cooler or special box and analyzed within the method’s hold time. Check with the Site  
1714 Quality Assurance Project Plan (QAPP) or SAP for any specific instructions for shipping  
1715 samples.
- 1716 • The preferred method of delivering the samples to the laboratory would be for a courier  
1717 to pick up the samples from the site or site personnel hand-delivering the samples to  
1718 the laboratory. If either of these options is not available, ship the sample via overnight  
1719 shipment to the laboratory. Department of Transportation and International Association  
1720 of Air Transportation (IATA) regulations for shipments of samples with known chemical  
1721 agents as well as hazardous chemicals should be investigated. Refer to the site QAPP or  
1722 SAP for additional information regarding the proper transport of samples to the  
1723 laboratory via a carrier (air, rail, or road).

1724

## 1725 **CRZ Breakdown**

1726 The DLAs will be responsible for breaking down the CRZ, including the decon line starting at the  
1727 EZ and finishing at the SZ. All solid waste (e.g., used PPE, poly sheeting, etc.) will be collected,  
1728 consolidated, and appropriately sealed following disposal packaging requirements. Items that  
1729 will be reused will need to be decontaminated during this process. Any stools, tables, tubs or  
1730 basins, and other items that will be reused shall be deconned by the DLAs and the aqueous  
1731 wastes collected. Aqueous and solid wastes will be collected and transferred into the minimum  
1732 number of appropriate containers (e.g., drums, totes, roll-offs, etc.) and disposed of per the

1733 local, state, and federal regulations.

1734

### 1735 **Decon Line Disassembly**

1736 A final doffing station must first be established by placing heavy-duty plastic sheeting (e.g., 2  
1737 mils) on the ground in the SZ but just outside the CRZ. A hand washing station must be included  
1738 (see below). To break down the DL, personnel must start at the end near the EZ and  
1739 disassemble the line towards the SZ. The breakdown should be conducted in Modified Level C  
1740 (i.e., nitrile gloves and latex booties). Caution must be exercised to minimize cross-  
1741 contamination of any residual virus that may be on the decon line structures.

1742 • Once all EZW have exited through the DL, DLAs must containerize all solid and aqueous  
1743 waste (except for what they need to clean themselves). They should also dry the floor  
1744 on the Wet Operations side.

1745 • Clean (wipe or spray) and push out (through support zone) all unneeded containers,  
1746 seats, tools, and instruments from the drop area. Leave large tubs and berms in place.

1747 • All disposable items will be double-bagged and packaged to comply with the  
1748 transportation and disposal requirements. Aqueous and solid waste should be kept  
1749 separate.

1750 • After completing the decon line's disassembly, personnel will move onto the final  
1751 doffing station, doff their PPE, and containerize as appropriate. They must wash their  
1752 hands and faces and comply with HASP requirements. A final inspection should also be  
1753 conducted to determine if the decon pad area needs to be sprayed down after  
1754 disassembly.

1755 • DL workers pair up and proceed thru all DL stations (2nd gross decon thru hand/face  
1756 wash and exit). The last pair sets up a sump or contains any liquids as they leave wet  
1757 ops, using extra gloves as needed, before proceeding to the dry side of decon.

1758 • A follow-up team (Level D; no EZ protection needed; no liquids) can complete removal  
1759 of berms and large tubs, perform final tent collapse when dry.

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## Attachment A – Bleach Decon Solution Preparation

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The standard decontamination solution for chemicals is a 0.5% sodium hypochlorite (NaClO<sub>2</sub>) solution or 0.5% calcium hypochlorite (CaClO<sub>2</sub>) solution for a minimum contact time of 5 minutes (McGuire et al. 2001). Regular liquid household bleach contains from 5.25% to 6.15% NaClO<sub>2</sub>. Thus, a 1:10 dilution or 10% (**1 part household bleach to 9 parts water**) provides about 5,250 to 6,150 ppm available chlorine (CDC 2008).

Only household bleach (5% NaClO<sub>2</sub>) should be used for this procedure. More concentrated products such as Clorox® Disinfecting Bleach, Splash-Less Bleach, or Germicidal Bleach must not be used.

### HEALTH & SAFETY

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When mixing bleach solutions, proper safety precautions need to be taken. Refer to the Site Health & Safety Plan (HASP) and consult the Site H&S Officer. Mixing should be done in an open area or only with adequate ventilation if in an enclosed area. Hand and skin (chemical protective gloves and coverall) and eye and face protection (safety glasses or face shield) must be worn. Monitoring chlorine levels with handheld monitors or a colorimetric tube (e.g., Draeger tube) is an option.

The following PPE is required:

- If the solution is mixed indoors, Level B: SCBA or supplied-air respirator, eye/face protection, hand and skin protection, and the buddy system.
- If the solution is mixed outdoors, Level C with chlorine cartridges.

**Note:** To ensure safe exposure levels, use either a real-time chlorine gas handheld monitor or a colorimetric tube (e.g., Draeger tube) could be used to check for the level of chlorine in the air.

### REMINDERS

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- Track/record the date, time, and the number of bleach batches made each day, the volume of each batch, and the number of bottles of bleach used. A Bleach Batch Tracking Form is found in Appendix VII.
- Bleach decontamination solutions that get dirty quickly may need to be replaced more frequently.
- Mix new batches of solution as needed throughout the process.

1798 **PREPARATION OF LARGE QUANTITY (200 GALLONS) OF BLEACH SOLUTION**

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1799 The initial bleach solution is prepared and blended in a 200-gallon tank using the following  
1800 procedure (water is added in two doses to ensure proper mixing). Note: Only mix as needed.

- 1801
- Add 20 gallons (2,560 ounces) of regular Clorox® liquid household bleach to the tank.

1802 **Note:** Use only household bleach (5% NaClO<sub>2</sub>). Do not use concentrated products such  
1803 as Clorox® Disinfecting Bleach, Splash-Less Bleach, or Germicidal Bleach.

- 1804
- Add approximately 50 gallons of water.
  - Add water to nearly (but not completely) fill the 200-gallon tank.

1806

1807 **PREPARATION OF SMALLER QUANTITY (50 GALLONS) OF BLEACH SOLUTION**

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1808 If desired, 50-gallon batches of bleach solution can be made and stored in polyethylene 55-  
1809 gallon drums using the following procedure. **Note:** Only mix as needed.

- 1810
- Add 5 gallons (640 ounces) of regular Clorox® liquid household bleach to the drum.

1811 • **Note:** Use only household bleach (5% NaClO<sub>2</sub>). Do not use concentrated products such  
1812 as Clorox® Disinfecting Bleach, Splash-Less Bleach, or Germicidal Bleach. Add  
1813 approximately 10 gallons of water.

- 1814
- Add water to nearly (but not completely) fill the 55-gallon drum.

1815 • Use chlorine hydroxide test strips to determine if chlorine levels are acceptable (Cole-  
1816 Parmer AO-18105-01 High-Level Chlorine Test Strips, 0-10,000 ppm; 50/Pk)

1817

1818 **USE OF GARDEN OR HUDSON SPRAYER**

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1819 Choose the appropriate decon solution for the contaminant of concern. (See Appendix IV,  
1820 Attachment B for Chemical Agent decon solutions). Clearly mark in large letters on the garden  
1821 or Hudson sprayer the contents of the sprayer and applicable concentration (e.g., 10% Bleach  
1822 Solution). If the contents change at any time, correctly relabel the sprayer.

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1824 **DISPOSAL**

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1825 Check the Waste Management Plan for steps for decon solution disposal instructions.

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## Attachment B – Table of Decontamination Technologies for Surfaces

DECON TECHNOLOGY	HD		VX		G AGENTS		CORROSIVENESS	TOXICITY	DEPLOYMENT	COST	RESIDUE	SOURCE
	Contact Time	Efficacy	Contact Time	Efficacy	Contact Time	Efficacy						
DF-200 <sup>1</sup>	30 min	>99.8%	30 min	>99.8%	30 min	>99.9%	L	L	M	M	Yes	Proprietary; Modec, Inc., EnviroFoam Technologies Inc.
L-Gel <sup>2</sup>	24 hr.	100%	24 hr.	69% on asphalt 99% on concrete	24 hr.	98% on asphalt 99% on concrete	M	L	M	M	Yes	Proprietary; LLNL
HTH <sup>3</sup>	5 min	✓	5 min	✓	5 min	✓	H	H	H	L	No	Non-proprietary; easily formulated
STB <sup>3</sup>	30 min	✓	30 min	✓	30 min	✓	H	H	M	L	No	Non-proprietary; easily formulated
Bleach <sup>3,4</sup>	5 min	✓	5 min	✓	5 min	✓	H	H	M	L	No	Non-proprietary; widely available
CASCAD <sup>5</sup>	5 min	>99.95%	5 min	✓	5 min	>99%	L	L	M	M	Yes	Proprietary; Allen-Vanguard
GDS 2000 <sup>6</sup>	1 min 3 hrs.	>99.8% 99.87%	1 min 3 hrs.	>99.8% 99.97%	1 min 3 hr.	>99.8% 99.95%	—	—	M	—	Yes	Proprietary; Kärcher Futuretech
Decon Green <sup>7</sup>	20 min 15 min	99.9% 99%	20 min 15 min	>99.9% 96%	20 min 15 min	>99.9% 90%	H	H	M	M	Yes	Proprietary; Strategic Technologies Enterprises
Liquid ClO <sub>2</sub> <sup>8</sup>	Minutes	Good	Hours	Poor	—	None	M- H	M- H	M	L	No	Non-proprietary; widely available
All-Clear <sup>9</sup>	—	—	—	—	30 min	95%	L	L	M	—	—	Proprietary; Kidde
BIT <sup>10</sup>	sec-min	98%	sec-min	99% >99.999%	sec-min	99%	L	L	M	M	No	Proprietary. L3 Titan

## 1828 Notes:

1829 ☐ Technology stated to be effective, but numerical value not given

1830 — Data not available

1831 For corrosiveness, toxicity, and cost, L indicates low, M indicates medium, and H indicates high.

1832 For deployment, L indicates easy, M indicates moderately difficult, and H indicates highly difficult.

1833 For residue, YES indicates the presence of visually noticeable residue that must be cleaned off before reuse.

1834 1. DF-200 efficacy measured in surface testing on chemical agent-resistant coating (CARC) coupons in DOD testing

1835 2. Surface testing on concrete and asphalt surfaces, respectively (Raber et al. 2002), alkyd paint, polyurethane paint, and indoor-outdoor carpet

1836 3. Hoenig 2002; CDC 2004

1837 4. Household bleach (5% sodium hypochlorite in water) diluted by adding 1 part bleach to 9 parts water (McGuire et al. 2001)

1838 5. Laboratory stirred-reactor data from Allen-Vanguard 2005

1839 6. First numbers: laboratory stirred-reactor data (Franke and Toepfer 2002). Second numbers: field tests on painted metal at 12.5°C, includes cold water wash after treatment (Toepfer 2002).

1840 7. Agent removal on CARC coupons (Wagner 2004)

1841 8. Extrapolation from performance of vaporous chlorine dioxide; performance of liquid may differ

1842 9. USGN 2005

1843 10. Binary Ionization Technology (BIT) from L-3 Communications/Applied Technologies/Titan Corporation; numbers primarily for painted surfaces (CARC); additional numbers for VX for bare metal surface

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## **Appendix V: Decon Line Supervisor Lists**

1860 **Decon Line Supervisor Critical List Handout**

1861 Decon Line Supervisors (DLS) are the primary authority on decontamination for all personnel  
1862 who come through the decon line. The DLS will manage DL operations, including safety,  
1863 emergencies, staffing, and general operations. The DLS will ensure that all activities at Stations  
1864 1 through 15 of this SOP are completed, aqueous waste and decon solutions are exchanged  
1865 frequently, decon is executed safely, staffing is appropriate, waste is managed, contact times  
1866 are met, the pace of the decon line matches the flow of Exclusion Zone workers (EZWs)  
1867 entering the DL, and emergencies are handled. The DL Supervisor will ensure that the specific  
1868 tasks outlined in the procedures in this SOP will be executed to ensure all workers who exit the  
1869 decon line are indeed clean at each station. Below are some items that may deserve special  
1870 attention.

1871

1872 **General**

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- 1873 • Refer to the Safety and Construction Considerations section on page 4 of this document  
1874 and ensure that relevant recommendations are implemented.
- 1875 • Have signage and instructions at each decon step/station (see Appendix VI), so roles and  
1876 responsibilities are clear. Consider printing the instructions in large font and placing  
1877 them in clear covers at each station.
- 1878 • Use the emergency egress corridor (EEC) to supervise all areas. This corridor is primarily  
1879 unused and provides a relatively clean and clear position to oversee all stations.
- 1880 • All EZWs and Decon Line Attendants (DLAs) should have staged a change of clothing in a  
1881 personal belongings bag in the post-shower area before beginning work.
- 1882 • All EZWs and DLAs should have no skin showing. Check especially around the mask and  
1883 throat area, giving guidance or assistance as needed.
- 1884 • All EZWs and DLAs should receive a decon line walk-through brief, with training and  
1885 explanations at each station, before entering the EZ. Also, EZWs should practice and  
1886 become proficient with each step of the site-specific decontamination procedures.
- 1887 • The DLS may need to control traffic if the EEC is used concurrently with regular decon  
1888 ops. Escorting an incapacitated worker takes priority, and all activities should pause to  
1889 devote attention to the emergency. Escorts may break into the decon line, and backup  
1890 entry teams may assist. Remind workers to respect the process.
- 1891 • Monitor the volumes and/or amounts of supplies available and ensure supplies are  
1892 adequate in advance of need.
- 1893 • Monitor waste volumes as they accumulate. Bulk amounts of dry waste (all trash except  
1894 liquids) can be handed to the waste storage area across the EEC. Full aqueous waste  
1895 drums can be topped off and dollied to the same location.

- 1896
- Consider pre-mixing bleach for supply to the decon line.
- 1897
- DLAs should not cross the berm or benches/stools where Wet and Dry Operations are separated. Wet Operations DLAs stay in the Wet Operations area.
- 1898
- 1899
- The floor of Dry Operations (Steps 10-13) in DL should stay dry; have an attendant on the dry side keep the floor dry with mats, hospital chux, or pads. Provide Tyvek® slippers to decon entrants to protect feet if needed.
- 1900
- 1901

1902

### 1903 At Each Station

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1904

#### 1905 Tool, instrument, sample drops, and downrange PPE

- 1906
- Have EZWs drop tools, instruments, and samples at their specific locations.
- 1907
- Tools and instruments will be dropped in the EZ at Step 1 of the DL.
- 1908
- In the CRZ, Step 2 is the Sample Drop area. Step 3 is the location where EZWs should discard any disposable sample supplies or remove task-specific PPE (task-specific work gloves, over-booties, splash shields, hard hats, or aprons) and place it in a trash container at this step.
- 1909
- 1910
- 1911

1912

#### 1913 Outer boot wash 1 and 2 and glove wash in Steps 4 and 5

- 1914
- Keep decon solution in 1<sup>st</sup> Wash in Step 4 and 2<sup>nd</sup> Wash tub in Step 5 relatively clean; have DLA replace as necessary, at least once per four hours.
- 1915
- DLA should greet each exiting EZW, checking for responsiveness and welfare.
- 1916
- Place a boot brush plate in each of the two boot wash pools to facilitate cleaning.
- 1917
- 1918

1918

#### 1919 Outer suit, boot, and glove wash (disinfection)

- 1920
- Ensure the area is large enough to process multiple workers (up to four) simultaneously.
- 1921
- Use curtains or tarps to limit overspray.
- 1922
- Use timers to ensure accurate contact time.
- 1923
- Manage the contact time for each worker on the form found in Attachment A of this Appendix.
- 1924
- Ensure workers get thoroughly sprayed/wiped and remain wet for the entire contact time.
- 1925
- 1926

1927

#### 1928 Outer PPE (gloves and suit) removal

- 1929
- Be sure that workers and attendants are clear about the steps at this station.
- 1930
- The DLA performs all PPE removal, instructing the worker where and when to sit, stand, and place their feet as PPE is removed.
- 1931
- Exiting workers move from Wet Ops to Dry Ops at this station. DLAs should not cross
- 1932

- 1933 this line (keep Wet Ops and Dry Ops DLAs separate).
- 1934 • DLAs must avoid cross-contamination by removing and replacing their outer gloves to
- 1935 handle clean and dirty parts of EZW's PPE.

1936

1937 Inner suit wipe and removal

- 1938 • Ensure the DLA carefully wipes the arm cuffs, zipper, hood near the mask, and inner
- 1939 gloves before any PPE is removed.
- 1940 • The DLA should not break the EZW's mask seal as the inner suit is doffed.

1941

1942 Mask removal

- 1943 • The decon line must be able to handle both PAPR and APR-wearing workers. Step 12 will
- 1944 need an extra container for PAPR blowers.
- 1945 • DLAs can perform decon of facepieces and move these to the Support Zone (SZ) for air
- 1946 drying and recovery by workers.

1947

1948 Inner glove removal and face wash

- 1949 • Exiting workers perform this themselves, but the face and hand wash station must be
- 1950 kept clean and supplied with potable water and soap.

1951

1952 Overall comments

- 1953 • Remove trash as it gets full

1954

1955 The diagram in Appendix I shows how Steps 1-15 (described earlier in this SOP document) can

1956 be implemented. Red arrows represent the workers' path from exiting the EZ through the

1957 decon line. The updated layout resulted from a 2-day exercise specifically implementing this

1958 decon line SOP, with an after-action review by all players and observers. The steps are:

1959

- 1960 1. Initial gross decon – Should be conducted in the EZ if any contamination is observed on
- 1961 the worker's PPE. Gross decon should consist of spraying the affected area with the
- 1962 bleach solution and wiping off the visible contamination. Work gloves should also be
- 1963 doffed in the EZ.
- 1964 2. Tool and instrument drop – Have two separate drops, as tools are sturdy and likely to be
- 1965 contaminated, whereas instruments are delicate and less likely to be contaminated.
- 1966 3. Outer boot and glove wash – Use more than one station to minimize the chances of
- 1967 bringing bulk amounts of contamination out of the EZ.
- 1968 4. Wet Operations (glove, suit, and boot wash) – Use a large area where up to four
- 1969 workers can be simultaneously disinfected via spray/mist/wash and remain for the
- 1970 required contact time. Space and time are the primary bottlenecks to the

- 1971 decontamination line process.
- 1972 5. Wet Operations (outer PPE doff) – A significant concern is having two locations with  
1973 enough room to remove the outer suit properly and prevent cross-contamination.
- 1974 6. Dry Operations (inner suit doff) – Moving to the dry side provides more safety and  
1975 comfort as workers do not wear shoes and have less foot protection when they remove  
1976 PPE.
- 1977 7. Dry Operations (mask removal) – A mask removal station uses a dedicated attendant to  
1978 wash and rinse masks (and hoses if PAPRs are used) and store/clean PAPR blowers.
- 1979 8. Inner glove removal and hand/face wash – Separating these areas to allow eyewash or  
1980 field hand wash stations rather than a single basin is more sanitary and appealing.
- 1981 9. Shower facilities and medical monitoring are conducted in the Support Zone.
- 1982

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## Appendix VI – Decon Line Contact Time Tracking Form

Contact Time Tracking Form

#	Start Time	Stop Time	Name	Agency/Company	Date
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**Appendix VII – Bleach Batch Tracking Form**

2013

Bleach Batch Tracking Form

Batch	Date	Time	Total Volume of Batch	Volume of Bleach in Batch	Chlorine Test Strip Reading (ppm = mg/L)	Name of Mixer
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**Appendix VIII – Decon Line Signage**

2030 **Signs for Decon Line**

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2032 Provided are generic signs for the decon line. Decon line supervisors are encouraged to meet with  
2033 their personnel to customize these signs for specific decon line setups.

2034

2035 Steps should **not** be eliminated, only clarified. Adding pictures is encouraged.

2036

2037

# Step 1 - Tool Drop

2038

2039

2040 **Place all tools in this designated**

2041 **drop area before entering the**

2042 **decon line.**

2043

# Step 1 - Instrument Drop

Place all instruments in this  
designated drop area before  
entering the decon line.

# Step 2 -Sample Drop

Place all samples in this designated drop area before entering the decon line.

Ensure all samples are relinquished to the Sample DLA.

# Step 3 -

## Doff Booties and Task PPE and PPE Inspection

Sit on a bench and remove booties and remove task PPE. Place in a bin for re-use or in the trash can. Inspect PPE for tears or contamination.

2067 **Step 4 - 1<sup>st</sup> Gross Decon:**

2068 **Boot & Glove Wash**

2069 Follow DLA's instructions.

2070

2071 Check for gross contamination.

2072 **DO NOT SPLASH**

2074 **Step 5 - 2nd Gross Decon:**  
2075 **Boots, Glove & Suit Wash**

2076 Follow DLA's instructions.

2077 Monitor the timer to ensure that  
2078 the contact time is reached.  
2079

# Step 6 -

## Full Decon of All Surfaces

Follow DLA's instructions.

DLA will rinse your suit, boots, and gloves. Make sure the decon contact time is met.

2087

# Step 7a - 2088 PPE Rinse

2089 Follow DLA's instructions.  
2090 The DLA will rinse you off from  
2091 head to toe.  
2092

# Step 7b - PPE Dry

Follow DLA's instructions.  
The DLA will dry you off with  
disposable towels.

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# Step 8 - Contaminant Screening & Monitoring

Follow DLA's instructions.

The DLA will screen and monitor  
you for contamination.

# Step 9 -

## Doff Outer Boots

Sit on the bench near the berm  
between Wet Operations & Dry  
Operations.

Follow DLA's instructions precisely.

# Step 10 - Doff Outer Gloves & Suit and SCBA

Follow DLA's instructions precisely.  
DLA will remove outer gloves & suit,  
& SCBA.

Keep the mask on & PAPR running.

# Step 11 -

## Inner Suit Removal

Follow DLA's instructions  
precisely.

DLA will remove your inner suit.

# Step 12 -

## Glove Wash/Rinse &

## Mask Removal

Wash hands with soap and water and then rinse. Keep inner gloves on.

Remove mask as directed by DLA.

# Step 13

## Inner Glove Removal and Hand & Face Wash

Remove your inner gloves & place them in the trash can. Wash your hands & face at the wash station.

# Step 14

## Personal Shower & Clothes Change

Disrobe, bag worn clothing, & bring it through shower tent. Take a shower using soap & potable water for 5 minutes. Dry off with a disposable towel. Change into clean clothing. Proceed to Medical Monitoring.

# Step 17

## Medical Monitoring

Report to the medical monitoring station for post-entry monitoring and meet with appropriate personnel for debriefing.

Take a rest break and drink fluids.

# Emergency Egress Decon Procedure

## Recommended Procedures for Incapacitated Workers:

- The DL Supervisor should ensure 9-1-1 has been called. Ask if responders want the patient wrapped and any other instructions.
- At least two backup team members should go to the front of the decon line (through the emergency egress corridor (EEC), carrying the litter/stretchers. A tarp should cover it.
- Remove the SCBA or PAPR belt and BMA, but do not unhook regulators and maintain air. Place the incapacitated worker onto the tarp on the litter, face up with SCBA or PAPR BMA, and belt next to them on the litter.
- The backup team members will carry the worker on the litter through the EEC.
- The outer suit and gloves will be misted or wiped thoroughly with Hype-Wipe®. Alternatively, responders can use a car-wash mitt dipped in a decon solution to wipe the outer suit and gloves.
- Cut the outer suit away from the worker's body, making an extended cut with medical scissors from the neck to below the waist. Then, cut the suit 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.