Modular Decontamination Kits – Introduction and Use

Course Design

- This course is designed to provide first responders with information on the basic use of the Firstline Technologies-MDK kit
- The course contains detailed information that may be too in depth for some audiences. Instructors should remove content as needed to meet the audience's needs and course time frame.
- The course is not intended to provide training on decontamination methods, just the use of the Firstline Technologies-MDK kit. Additional training is recommended beyond the basic information provided here.

Wet Decontamination Methods

Mobile De-Gassing Unit No. 1 (WW1)

Emergency Decon Shower (Still in use today)

100 years of decontamination history unimpeded by progress

Technical Decontamination

Little has changed in the last 100 years…Focus has been on physical removal via large volumes of water or dry scrubbing

100 years of decon history, unimpeded by progress

Wet vs Dry Decon

Does it have to be wet vs. dry? What about a hybrid approach? Many legacy decontamination methods create large amounts of cross-contamination!

100 years of decontamination history unimpeded by progress

Decontamination Team Mission

PRIMARY

- **Prevent the spread of contaminants** beyond a specific area
- **Reduce contamination** to levels that are no longer harmful
- **Prevent possible exposure** to hazardous materials by removing contaminants

SECONDARY

- **Gather information** while operating the decon line
  - Casualties entering the decontamination line can aid your team in building a picture of the surrounding environment
  - By the time monitor/survey teams arrive “down range”, your team could have collected critical information to aid the downrange team, to include sample collection on casualties (i.e., opportunistic samples)

Decontamination

- The **physical** and/**or chemical process** of **reducing and preventing the spread and effects of contaminants** to people, animals, the environment, or equipment involved at hazardous materials/weapons of mass destruction (WMD) incidents.

OR

- The **removal** or **destruction** of dangerous substances, radioactivity, or germs from an area, object, or person

Remove vs. Destroy

PHYSICAL

REMOVE

Decon **captures or moves** contamination from personnel or equipment to another place where it is managed with less risk

CHEMICAL

DESTROY

Decon fundamentally changes contamination into something new that **is less hazardous or no longer hazardous**

Decon Principles

- Decon as far forward as possible
  - Limited area – Limit the spread of contamination.
  - Take precautions immediately if grossly contaminated downrange.
  - Do NOT wait until the decon line to start removal of contamination.
- Decon only what is necessary
  - Limit the amount of resources used
  - Minimize waste
  - No need to decon entire PPE with person inside (focus on interfaces/cut-out lines)
- Decon by priority
  - Situation dependent (lowest air? Longest person downrange? Emergency cutout?)
- Decon as soon as possible
  - Do not let surface contamination turn into a matrix contamination (remove contaminant prior to it making its way into skin/materials/objects)

REF: ATP 3-11.32

Three Types of Decontamination

EMERGENCY DECONTAMINATION is the process of **immediately reducing contamination** of individuals in potentially life-threatening situations with or without the formal establishment of a decontamination corridor.

MASS DECONTAMINATION is the process of **reducing or removing surface contaminants from large numbers of victims** in potentially life-threatening situations in the **fastest time possible**.

TECHNICAL DECONTAMINATION is the **planned and systematic process** of reducing contamination to a level that is **as low as reasonably achievable**.

GROSS DECONTAMINATION is a **phase of the decontamination process** where a significant reduction in the amount of surface contamination takes place as soon as possible.

Do not confuse Decontamination with Cleaning! Decontamination reduces the amount of contamination and should ALWAYS be followed by cleaning.

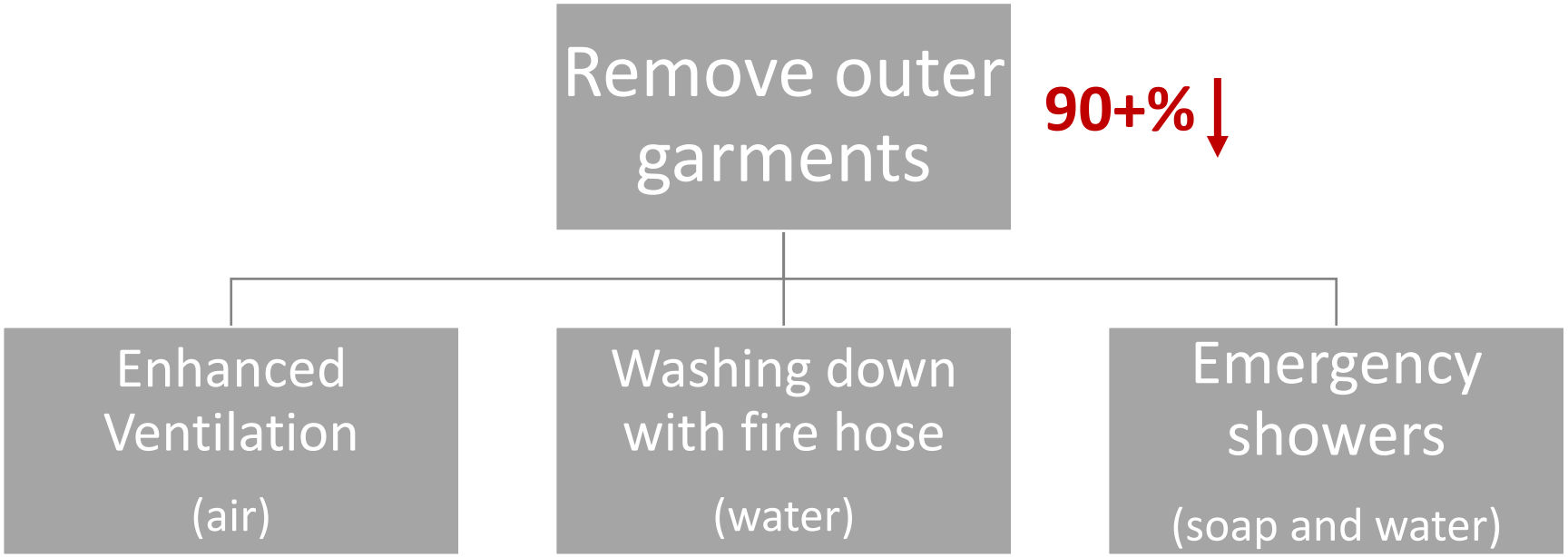
Gross Decontamination

- A phase of decontamination where significant reduction of the amount of surface contamination takes place as quickly as possible.
- Usually accomplished by mechanical removal of the contaminant or rinsing from handheld hose lines, emergency showers, or other nearby sources of water.
- Performed on the following:
  - Team members before their technical decontamination
  - Emergency responders before leaving the incident scene
  - Victims during emergency decontamination
  - Persons requiring mass decontamination
  - Personal protective equipment used by emergency responders before leaving the scene

*"For non-caustic, liquid contaminants (including chemical warfare agents), emergency **dry decontamination should be the default approach** as it is safer and at least as effective as wet decontamination and the resulting waste is easier to contain than water. Dry decontamination is less likely to spread contamination over hair and skin surfaces."*

*Primary Response Incident Scene Management (**PRISM**) – 2nd Edition*

Isolation & Disposal



Removal of the out layer of clothing results in a greater than 90% reduction in contamination!

REF: Levitin HW, Siegelson HJ, Dickinson S, Halpern P, Haraguchi Y, Nocera A, Turineck D. Decontamination of mass casualties--re-evaluating existing dogma. Prehosp Disaster Med. 2003 Jul-Sep;18(3):200-7.

Isolation & Disposal

REF: Image Courtesy of First Line Technology

Key Considerations for Dry Decon

BLOT vs. WIPE

BLOT

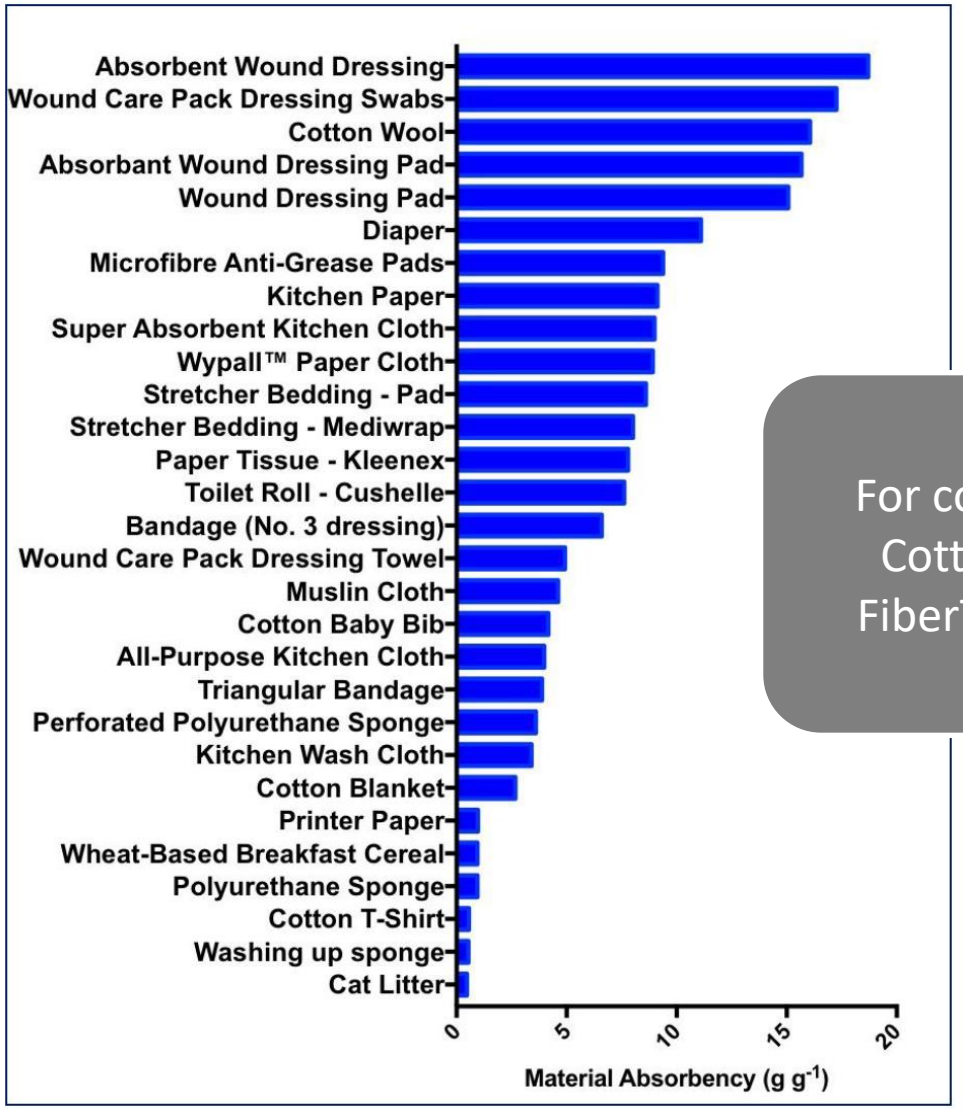
Soak or absorb liquid

WIPE

- Remove by rubbing
- Move an object over, maintaining contact, with the intention of removing some substance from the surface

Key Considerations for Dry Decon

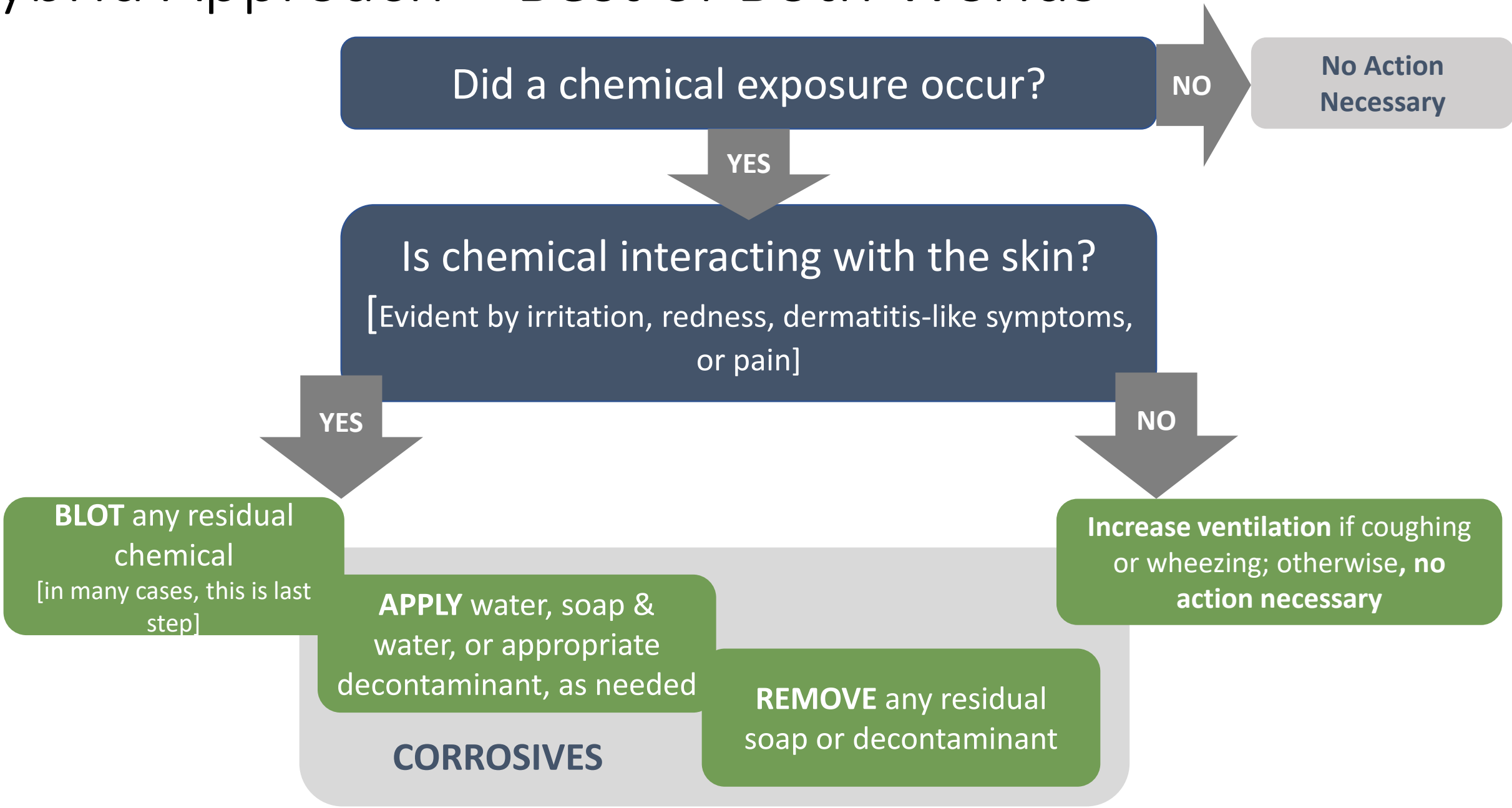
- Absorbent materials
  - FiberTect™
    - 22 g/g material absorbency
  - Wound Dressing
  - Depends™
  - Diapers
  - Wypall™
- Process (liquids)
  - Remove outer clothing
  - **Blot (10 seconds)**
  - Rub (10 seconds)
- Process (gases/vapors)
  - Remove outer clothing
  - Increase ventilation



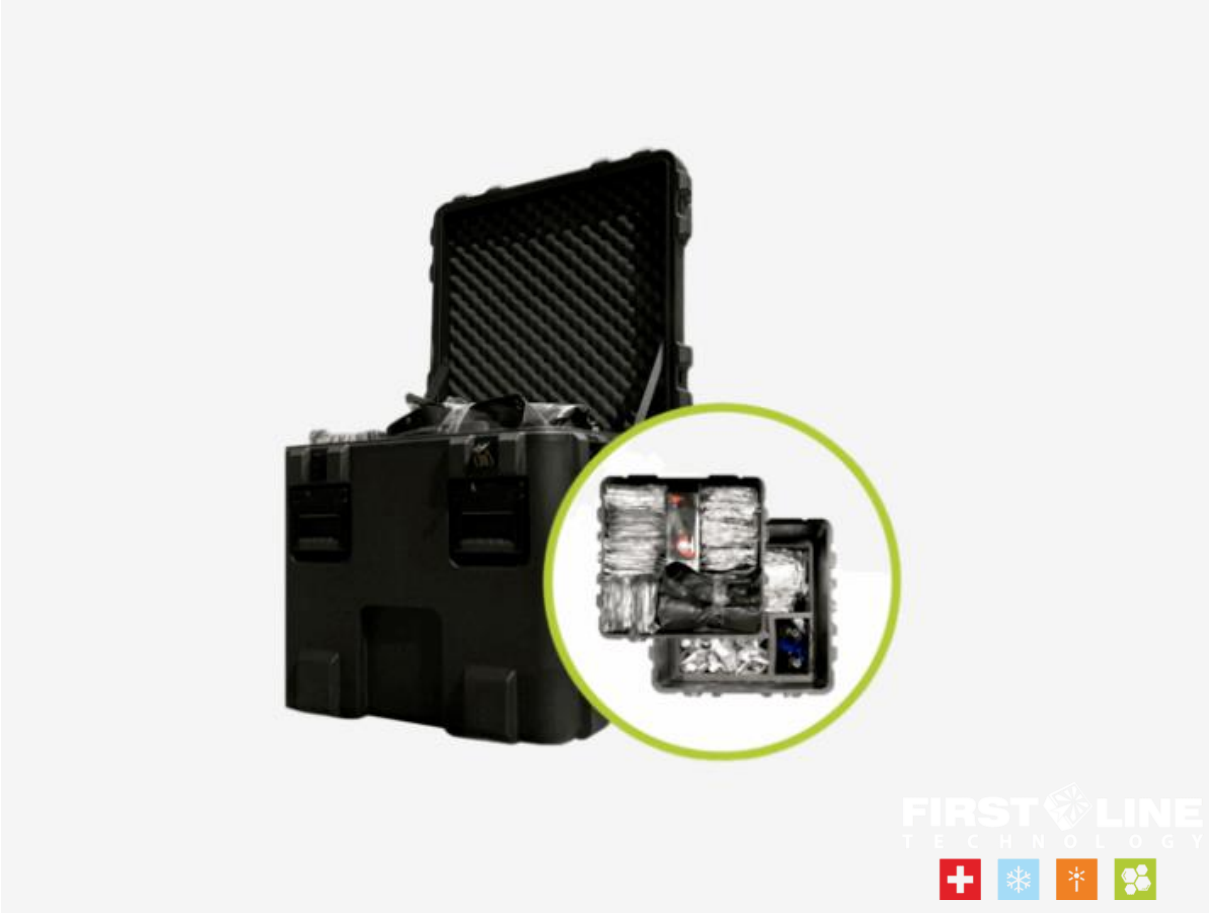
For comparison:
Cotton 25 g/g
FiberTect 22 g/g

REF: Chilcott, Larner, and Mata. Prism Volume I, 2nd edition, 2018.
REF: Kassouf N, Syed S, Larner J, Amlot R, Chilcott RP. Evaluation of absorbent materials for use as ad hoc dry decontaminants during mass patient incidents as part of the UK's Initial Operational Response. Plos One. 2017;12(2.

Hybrid Approach – Best of Both Worlds



Modular Decontamination Kits (MDKs)



Modular Decontamination Kits – Purpose

Compact, rugged, and portable

Treat 50 – 150 contaminated patients or responders

Includes **Dry Decon** and **Hybrid Decon** capabilities

Modular Decontamination Kits – Contents

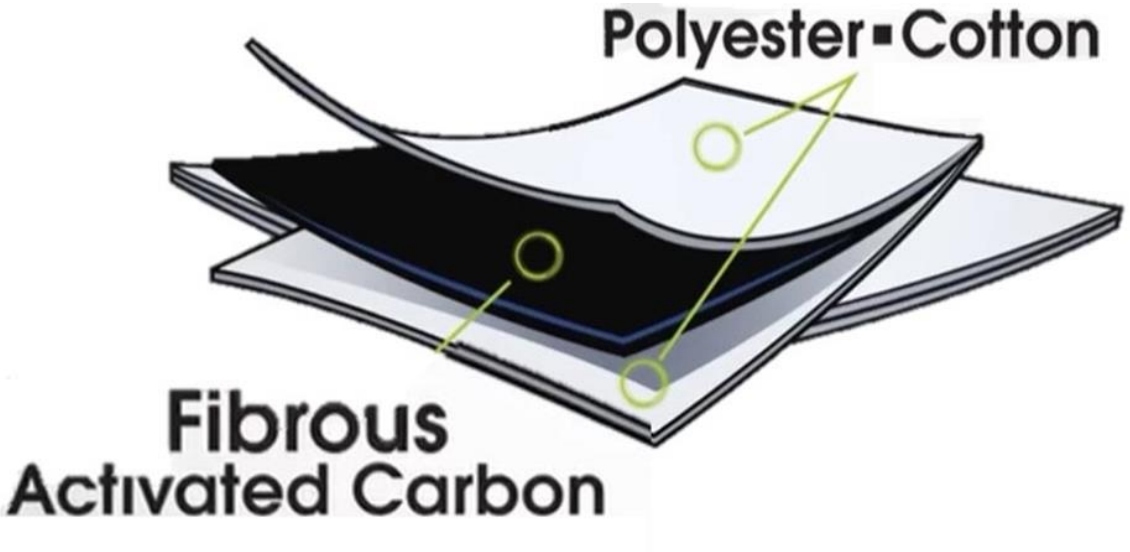
Decontamination triage area (Gross decontamination area)	• 3 foot x 3 foot shuffle pit
Top layer of kit (removable, designed to bring as close as possible to contaminated area)	• Fibertect® wipes (12” x 12”, 6” x 12”, and mitts) • Skin Decontamination Lotion (for pesticides and other organophosphates) • S-cut tools (2X) (easily remove clothing)
Bottom of kit	• Fibertect® shuffle pit liners (3x) • Fibertect® wipes (additional) (~ 150 fibertect wipes in kit) • Dahlgren Decon® (22 oz) configurations (12x) (for use on equipment and PPE) • Tactical Sprayers (2x)

Decontamination Triage Area

- 3’ x 3’ Shuffle Pit
  - Reusable unless grossly contaminated
  - Liners are disposable
- Shuffle pit liners (3X) made of Fibertect® material included in bottom of kit
- Key Functions:
  - Transition area between hot and cold zones
  - Footwear decontamination
  - Containment of contaminants within Fibertect® matrix

Fibertect® Wipes & Mitts

- Absorbs & Adsorbs
  - Absorb: contaminant is drawn into material (e.g., sponge)
  - Adsorb: contaminant adheres to the surface of the material (e.g., carbon filter)
- Dry
- Nonwoven, needle-punched material
- Three-layer design
  - Polyester-cotton (a**b**sorb)
  - Fibrous activated carbon (a**d**sorb)
  - Polyester-cotton (a**b**sorb)
- Inert & flexible



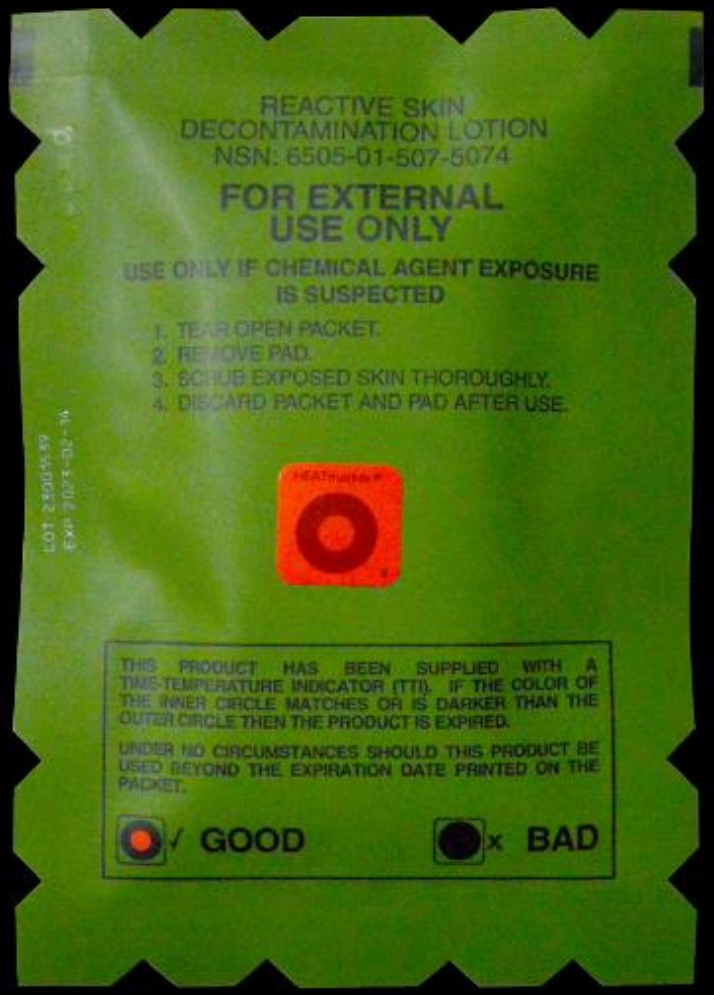
Reactive Skin Decontamination Lotion (RSDL)

RSDL®

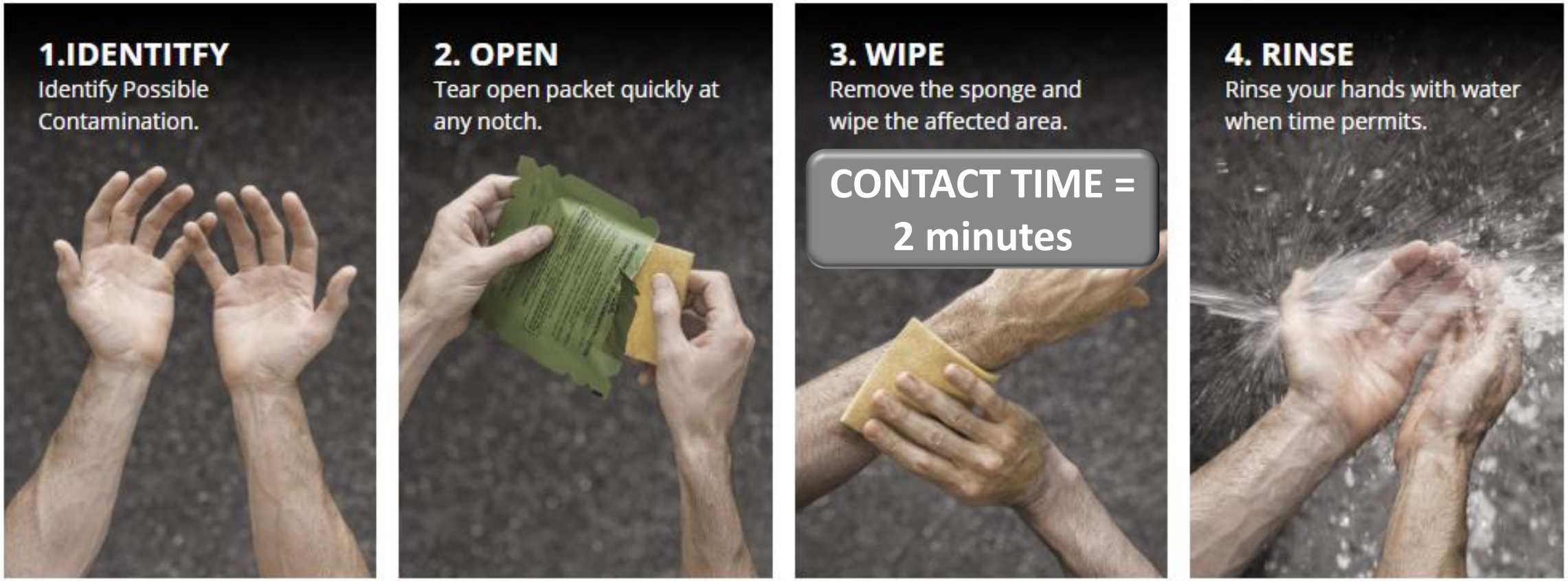
Reactive Skin
Decontamination Lotion Kit

THE *ONLY* FDA CLEARED REACTIVE SKIN DECONTAMINANT

USE ON CWA, OP PESTICIDE, AND T-2 TOXIN ONLY



Reactive Skin Decontamination Lotion (RSDL)



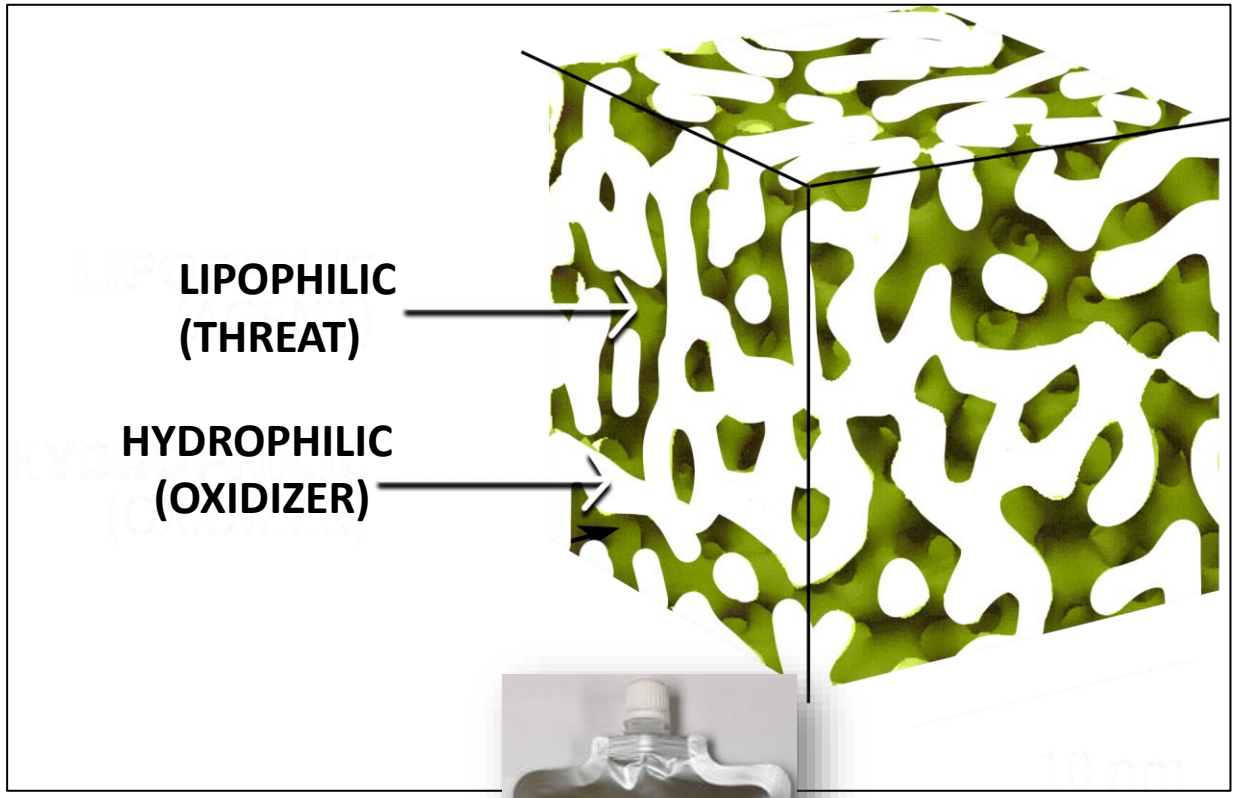
An RSDL ingredient (DAM) is absorbed through the skin and may cause adverse health effects (future cancer risk); therefore, avoid leaving on skin for long periods. It has also been known to cause a mild rash when in contact with skin for more than **6 hours**.

Dahlgren Decon® Solution

- Invented by Navy Surface Warfare Center Dahlgren Division (NSWDD)
  - Licensed for commercial sales by First Line Technology
- Peroxy-Solid Unique active source of peracetic acid (PAA)
- Broad spectrum efficacy (chemicals, biologicals, narcotics)
- Compatible with equipment (pH neutral)
- Non-hazardous to user or environment

Dahlgren Decon® Solution – Part A

- Surfactant **MICROEMULSION** acts like a liquid sponge.
- Removes contaminants from surfaces and holds them in microemulsion.
- Ultra low surface tension allows for rapid interface with reactive decontaminant and absorbents.
- Neutral pH, skin safe, and works at extreme temperatures



Dahlgren Decon® Solution – Part B1

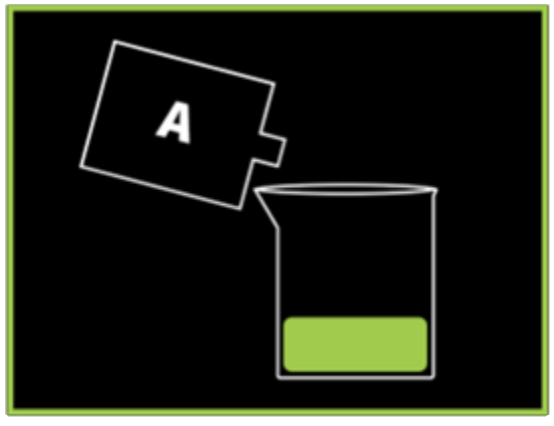
- Acts as a pH buffer
- Sodium hydroxide
- Activates complex buffer system and allows for increased oxidizer levels and efficacy.
- End mixture is pH neutral with significant buffering capacity.

WARNING: Part B1 contains ***sodium hydroxide crystals***. They are extremely corrosive. Avoid contact with skin, eyes, and mucous membranes.

Dahlgren Decon® Solution – Part B2

- Acts as solid oxidizer
  - Provides threat destruction and neutralization
- PES-Solid (Peracid-containing borate salt)
  - Provides peracetic acid (PAA) for neutralization immediately when dissolved in water
  - Creates ~4.8% PAA when mixed as Dahlgren Decon® solution
- Mixed with a surfactant blend microemulsion
- Stable on extended storage

Dahlgren Decon® Solution – Mixing Instructions



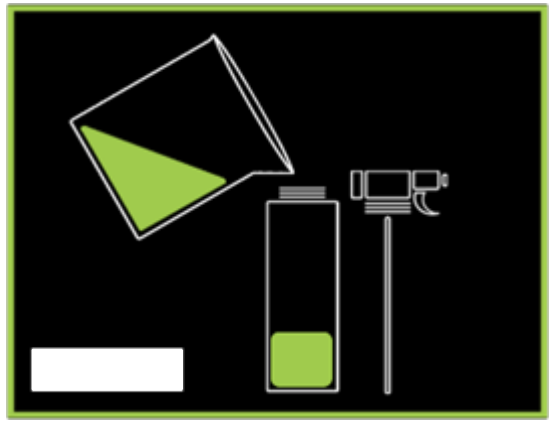
STEP 1: Empty Part A pouch into mixing vessel. No additional water necessary.

STEP 2: Carefully pour Part B1 into Part A. Stir, **DO NOT SHAKE**, until B1 particles completely dissolve.

NOTE: Mixture gets hot.

STEP 3: Gradually add Part B2 to solution. Continue to **stir** until all B2 is dissolved. Break up any clumps.

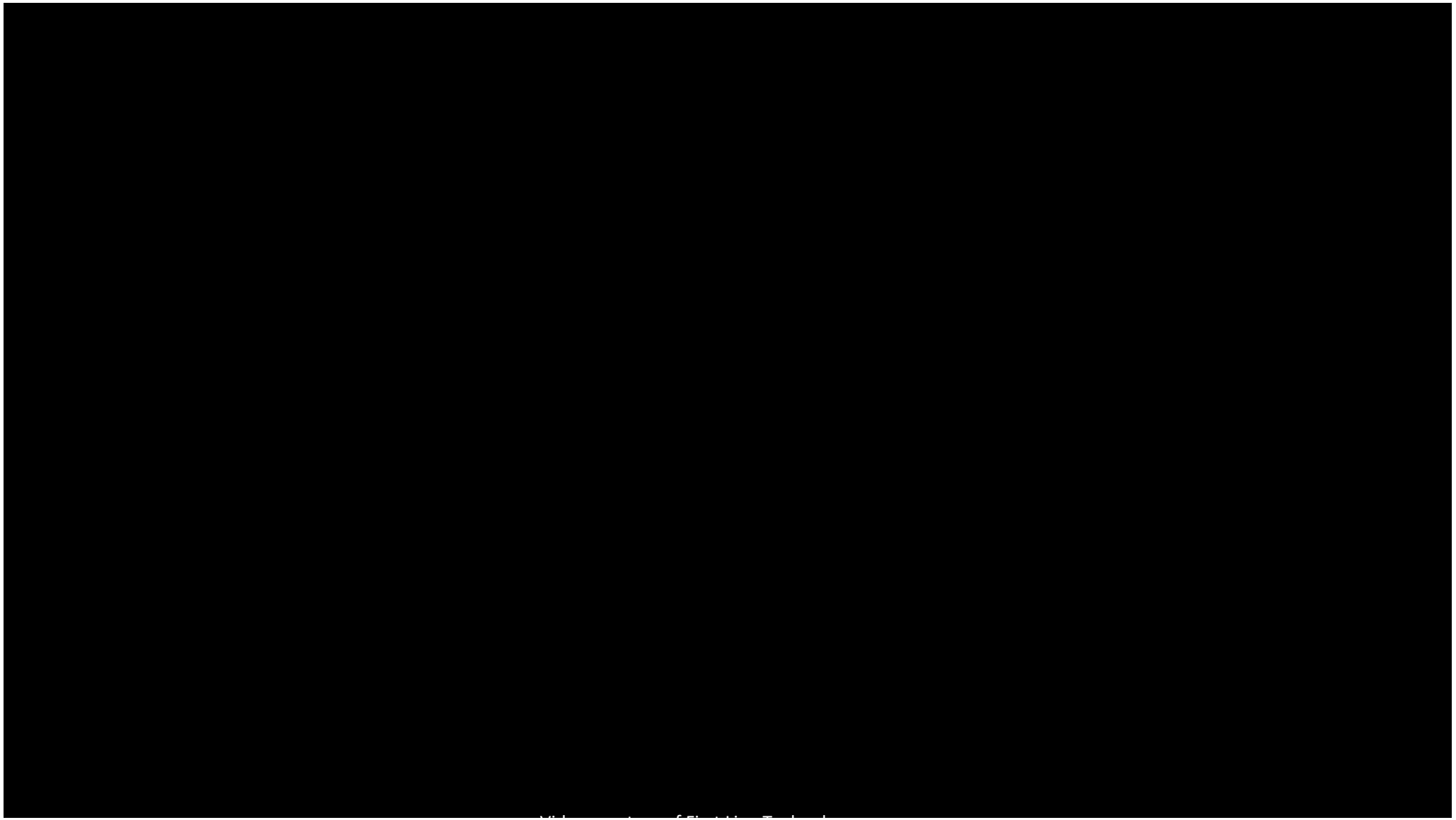
NOTE: Mixture produces peracetic acid vapor.



STEP 4: Allow foaming reaction to settle. Transfer settled solution into sprayer. Dahlgren Decon is ready for use.

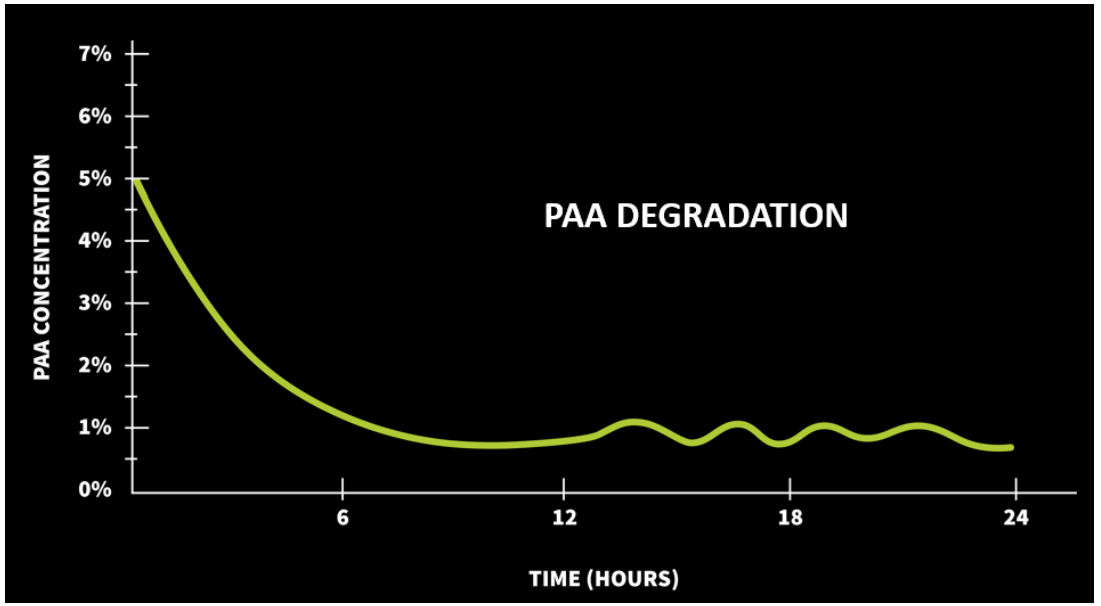
NOTE: If transferred to sprayer too early, it will over pressurize.

Dahlgren Decon® Solution – Mixing Instructions



Dahlgren Decon® Solution – Pot Life

- As PAA levels drop, H_2O_2 levels rise.
  - PAA is twice as effective as an oxidizer as H_2O_2, so even when PAA Levels are approaching zero, H_20_2 levels are approaching 3%.
  - Example: At 6 hours PAA levels are around 1% and H_2O_2 levels are around 2%. Since PAA is 2x as effective, it is the equivalent of having 4% H_2O_2 in solution.
- Temperature and high pH speed up degradation.
  - PAA derived from PES-Solid in Dahlgren Decon degrades much slower at high temps and high pH than regular PAA in solution.
  - **Dahlgren Decon PAA half-life is 158 minutes.** PAA solution half-life is 93 minutes.

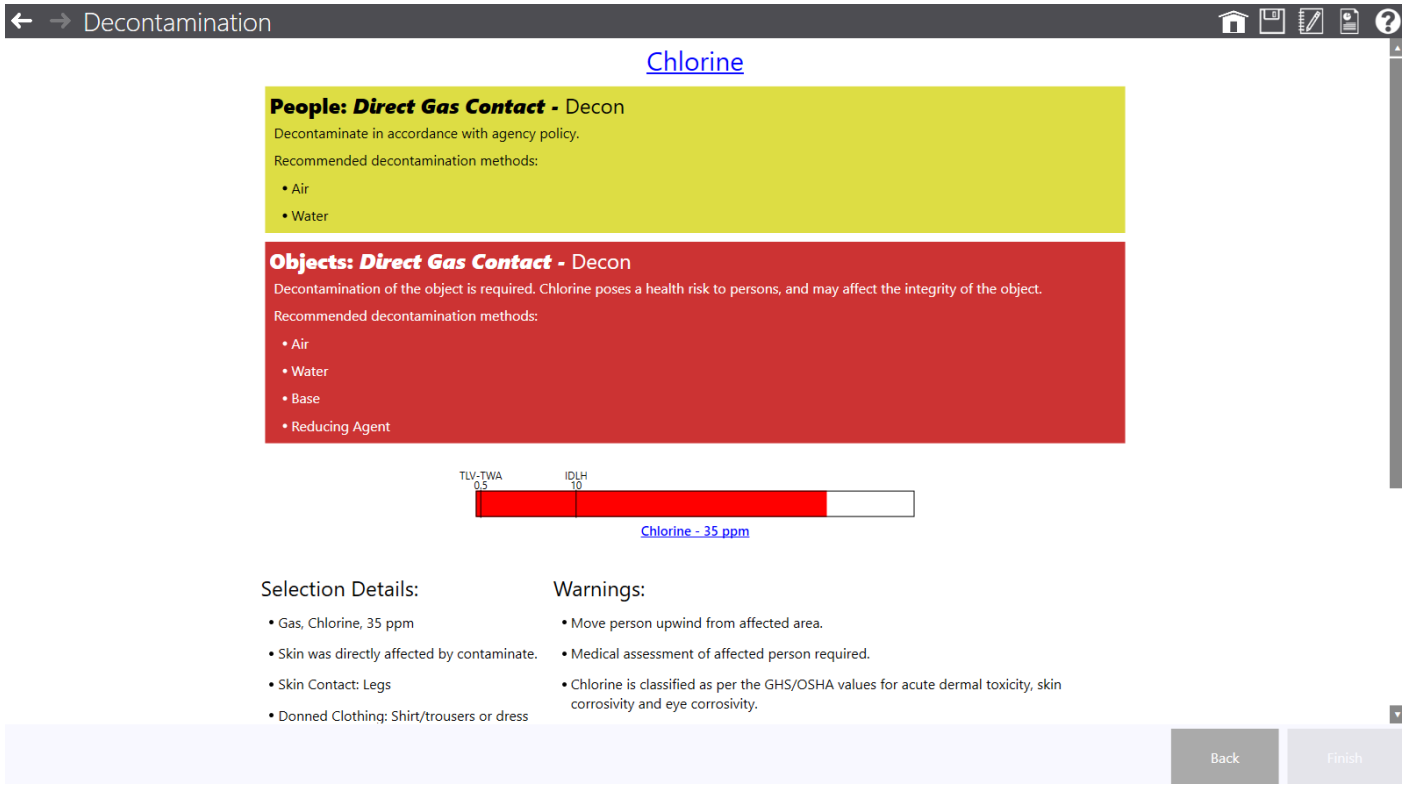


NOTE: Use solution within 6 hours of mixing for most effective results.

Dahlgren Decon® Solution – Dwell Time

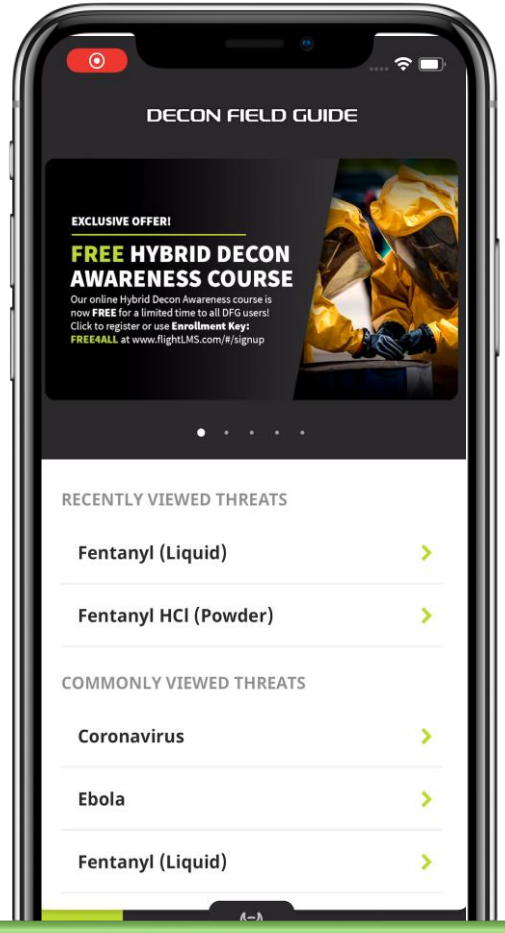
- Dwell Time is the amount of time the decontamination solution should be in contact with the contaminant
- Chemical Warfare Agents
  - Biological: 1 minute
  - Soman (GD): 2 minutes
  - Sulfur Mustard (HD): 5 minutes
  - VX: 15 minutes
- Narcotics
  - Fentanyl: 2 minutes
  - Carfentanil: 5 minutes

Electronic Sources for Decontamination Information (FREE)



www.chemicalcompanion.org

ERDSS, aka Chemical Companion, provides guidance on best methods for decontamination of people and objects.



Decon Field Guide provides guidance on dwell times required for Dahlgren Decon®

Example Wet Decon Layout

Sample Tub

Fibertect wipes open and taped to table

Apply soap and water

Skin wipes, towels, and water

Entry members uniform boots

Trash bag taped to table low

Table

Table

Trash bag taped to table high

Containment pool

Fan

Tool/Sample Drop

Blot with Wipe

Drop Outer Gloves and Boots

Spare trash bags - overpack

When trash bags become full, spray with decon solution and place into second/outer garbage bag

Trash bag taped to table low

Doff PPE

Remove with Wipe

Hygiene

Detect

Example Hybrid Decon Layout

Sample Tub

Fibertect Wipes open and taped to table

Decon Solution

Victory Sprayer

Skin wipes, towels, and water

Entry members uniform boots

Table

Trash bag taped to table high

Containment pool with adsorbent pad

Trash bag taped to table low

Table

Table

Trash bag taped to table low

Fan

Tool/Sample Drop

Blot with Wipe

Drop Outer Gloves and Boots

Apply

Dwell Time

Remove with Wipe

Doff PPE

Hygiene

Detect

Spare trash bags - overpack

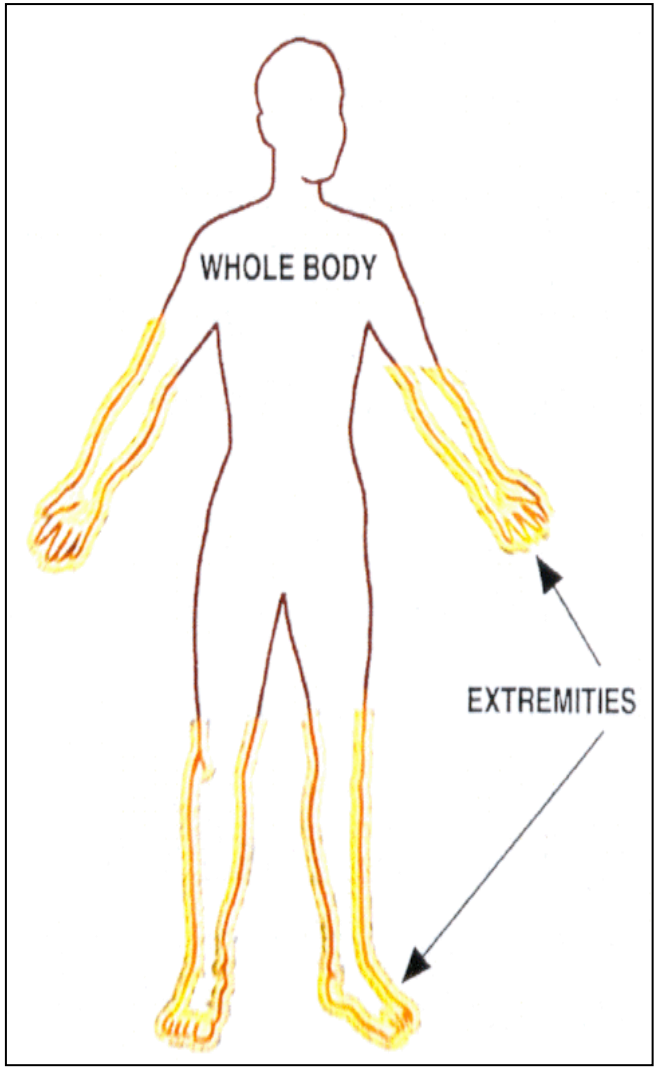
When trash bags become full, spray with decon solution and place into second/outer garbage bag

Monitoring the Effectiveness of Decon

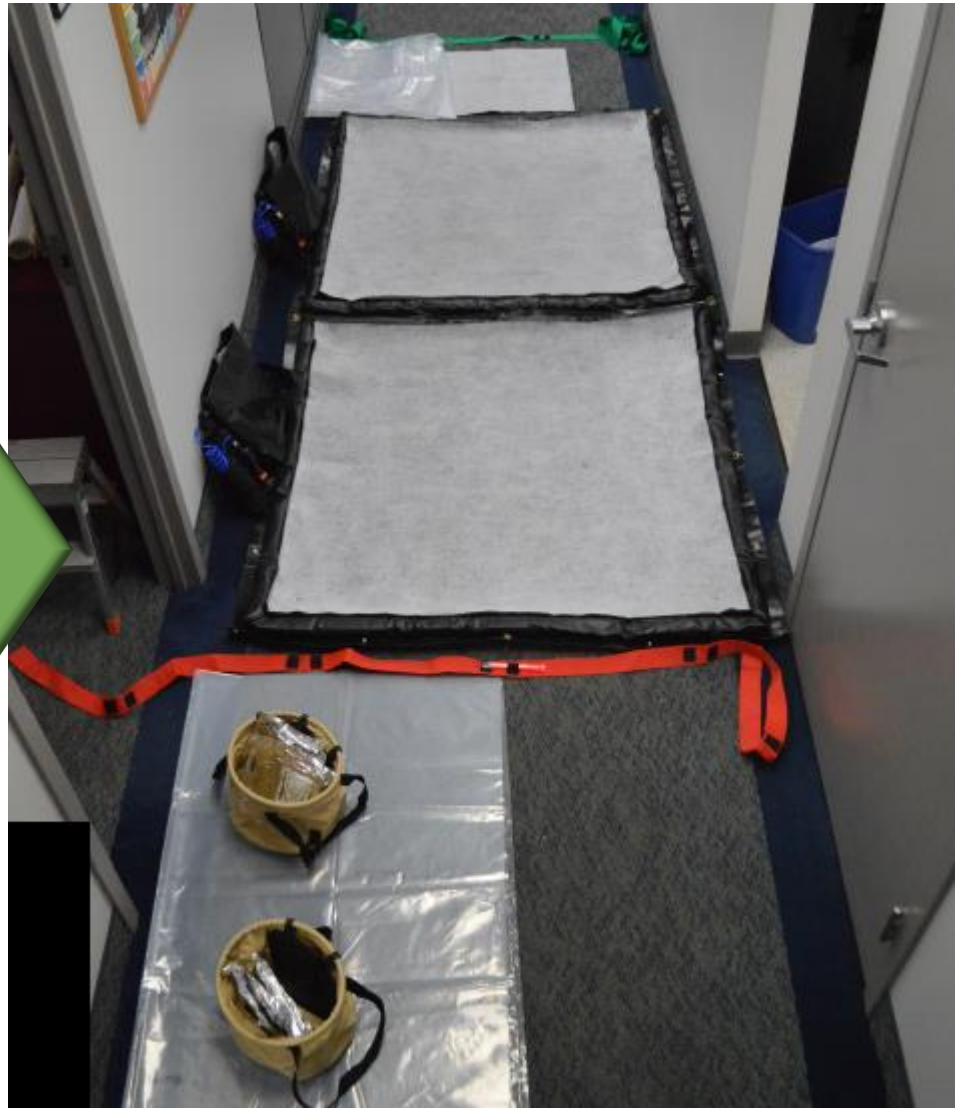
1. Monitoring devices (avoid detectors with long response times)
    1. PIDs
    2. AP4C
    3. Radiation monitors
    4. Electrochemical cells
    5. Papers (pH, M8, M9)
2. Visual observations
    1. Stains and discolorations
    2. Corrosive effects
    3. Others
3. Wipe sampling (send to laboratory for confirmation)

Monitoring – Decon

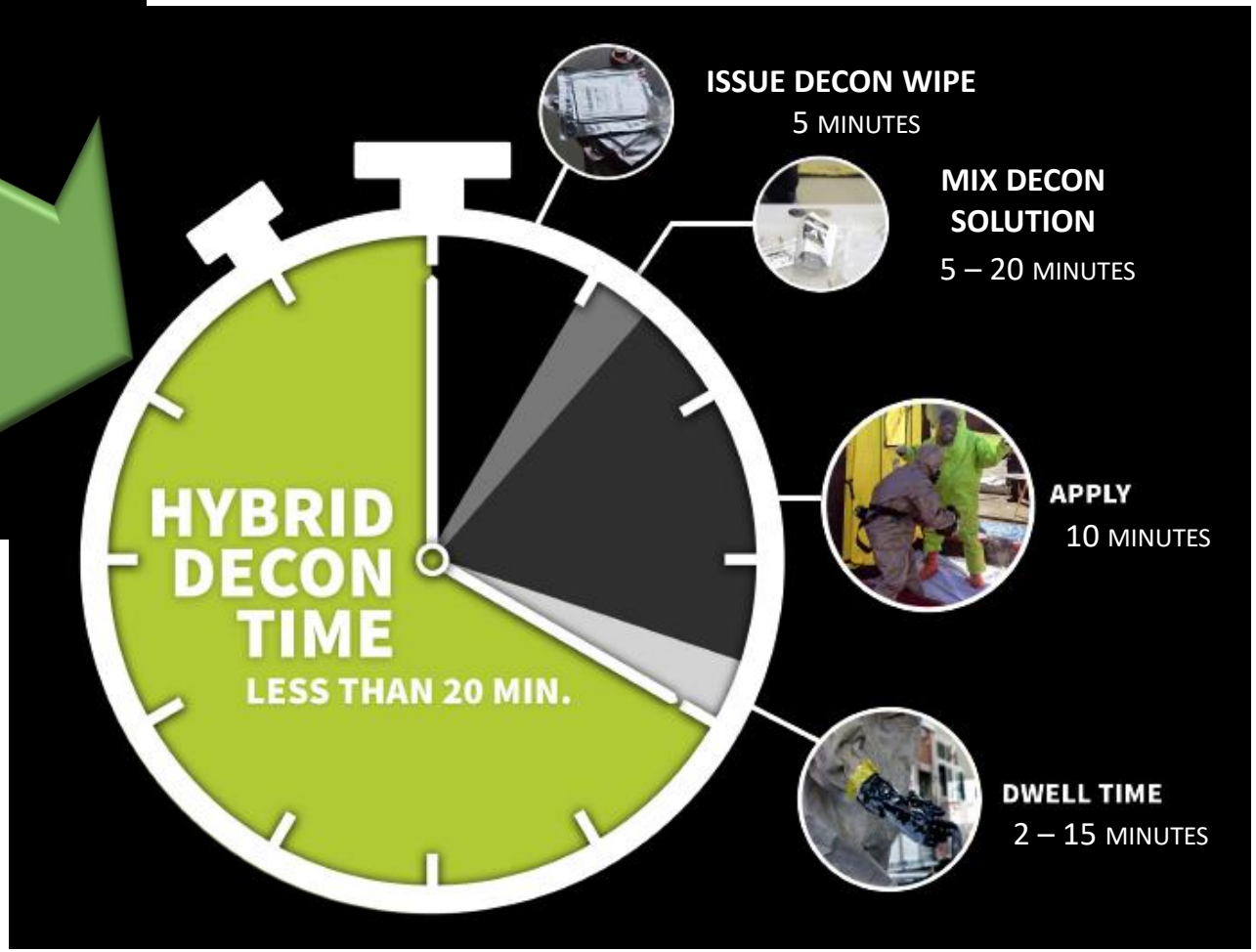
- Occurs after emergency or technical decon
- Monitoring process
  - Stand downwind to monitor decon
    - Increase chance of detecting contaminants
    - Perform decon process from upwind side
  - ½ inch from surface (DO NOT touch)
  - Move slowly (4 in/sec)
  - Place hands together – palms up, then turn hands over
  - Monitor down mid-riff and each leg
  - Ensures no contaminants remain on the person
- Complete organization hazard exposure form (if applicable)



Decon Modernization = Reduced Footprint



Decon Modernization = Decreased Operational Time



Decon Modernization = Drastic Waste Reduction

Thank you