

## TITLE: TRAINING GUIDE #17-3

GROSS DECONTAMINATION GUIDE FOR DEALING WITH  
WEAPONS OF MASS DESTRUCTION

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**NOTE:** This Training Guide is not intended to fully explain response procedures, identification, and mitigation measures required for a MCI/Haz-Mat (Weapons of Mass Destruction) incident.

**Purpose**

1. To introduce, to the department, methods of conducting Gross Decontamination of multiple patients at an incident site.
2. To provide guidelines for First Responders in the management and logistical needs of Gross Decontamination at an incident.
3. To familiarize the Seattle Fire Department Personnel with procedures which will **enhance the safety of both Rescuer and Patient.**

**References**

1. IFSTA Hazardous Materials for First Responders.
2. Defense Against Weapons of Mass Destruction – Technicians Course Book.
3. Seattle Fire Departments Metropolitan Medical Strike Teams Operations Plan.
4. Medical Management of Chemical Casualties Handbook (Second Edition).
5. NFPA 472 Standard for Professional Competence of Responders to Hazardous Materials Incidents (1992 Edition).

**Definitions**

**Decontamination** – The physical or chemical process of reducing and preventing the spread of contamination from persons and equipment used at a hazardous materials incident.

**Decontamination Area (Zone)** – The area located in the “Warm” zone where all personnel and equipment shall be decontaminated when leaving the “Hot” zone.

**Note:** The Hazardous Materials Team normally will have a separate decontamination area for their personnel.

**Decon Corridor** – An area, within the “Decontamination Zone” (Warm) where by personnel use apparatus, such as Aerial ladders or engines, in parallel to create a corridor where large volumes of water are used to provide emergency decontamination of a large number of casualties.

**Emergency Decontamination** – The physical process of immediately reducing contamination of individuals in potentially life threatening situations without the formal establishment of a decontamination area.

**Hazardous Materials** – Substances that if not properly controlled pose a risk to people, property, or the environment.

**Hazardous Materials Incident** – The uncontrolled release or potential release of a hazardous material from its container into the environment.

**MCI/Haz-Mat Incident** – A type of incident that includes multiple casualties as a result of a hazardous materials release.

**NBC Event** – The accidental release or intentional use of nuclear, biological or chemical agents in which people, property or the environment is adversely affected.

**Off Gassing** – Giving off a vapor or gas.

**Recovery** – Operations undertaken by responders to recover the remains of victims or property and shall only be implemented when the risk to responders has been reduced to the lowest level possible.

**Rescue** – Operations undertaken by responders to remove victims from hazardous situations in which the victim is able to offer little or no assistance due to their physical condition and/or their immediate environment.

**Personal Protective Equipment (PPE)** – Protective clothing and equipment necessary to prevent injury to workers responding to chemical incidents:

Levels of Protection

- **Level A** – The highest level of skin, respiratory and eye protection. Consists of SCBA and vapor tight, fully encapsulating, chemical protective clothing.
- **Level B** – High level of respiratory and eye protection but a lower level of skin protection. Consists of SCBA and liquid splash-chemical protective clothing.
- **Level C** – Lower level of respiratory, eye and skin protection than Level B. Consists of an air purifying respirator and support function protective clothing.
- **Level D** – Consists of normal work uniform affording minimal protection.

**Risk Benefit Analysis** – The decision making process that weighs the hazards encountered by the rescuer versus the potential benefit.

**Secondary Contamination** – The process by which a contaminant is carried out of the “Hot” zone and contaminates people, the environment, or equipment outside of the “Hot” zone.

**Toxic** – The inherent ability of a substance to cause harm.

**Water Reactive Materials** – A substance that readily react with water or decomposes in the presence of water, typically with substantial energy release.

**Weapons of Mass Destruction (WMD)** – Devices that are designed to cause wide spread damage, injury and death.

### **Zones**

- **“Cold” Zone** – The control zone at a hazardous materials incident that contains the command post and other functions necessary to control the incident. Also can be known as the ***Support Zone***.
- **“Warm” Zone** – The control zone at a hazardous materials incident site where personnel and equipment decontamination and “Hot” zone support takes place. It includes access control points for the decontamination area, helping to reduce the spread of contamination. Also known as the ***Decontamination Zone***.
- **“Hot” Zone** – The zone immediately surrounding a hazardous materials incident site. This zone must extend far enough to prevent the adverse effects of the hazardous material release from affecting personnel outside the area.

### **General Information**

During the first few minutes of a response to a known or potential NBC event responders will have a number of issues to deal with. What is the location? Time of day? What about wind direction and topography? These are all important pre-arrival considerations. Once on scene you must also keep in mind and be prepared to deal with:

- A large number of victims – This is one of the biggest differences between a standard Haz-Mat situation and a WMD Event.
- Scene Control – This may involve a large area.
- Resource demands – First responders will be overwhelmed, know what resources are available.

Once you have identified that the incident is a MCI/Haz-Mat event, the most important action the first responders can take is:

- Protect yourself
- Protect the public within your capabilities.
- Notify and request appropriate resources. (Metropolitan Medical Strike Team, Haz-Mat and/or MCI response.)

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Like an accidental release that may involve nuclear, biological or chemical agents; a NBC terrorism event will normally not include advance notice. With arrival of the first responders, the ability to protect themselves and begin mitigation measures will be dependent upon the recognition of signs and symptoms, and donning the appropriate PPE

Once you have identified the problem you must begin isolating the area. Establish Hot, Warm and Cold Zones. The zones should be set up for expansion as the incident and the response escalates. The incident will require 360 degrees containment – locator resources to control all sides.

Communicate the need for assistance and what the victims must do. Use the P.A. system or bullhorns if available. It is important that you communicate control and authority while at the same time concern for the victims' situation. You must not allow any potentially contaminated victims to leave the area and at the same time keep unauthorized personnel from entering the area.

At this point, as a first responder, the most important tactical action you can take is to initiate Mass Casualty Gross Decontamination. Set up for this should begin at the edge of the Hot Zone and extend into the Warm Zone.

While the Decon Corridor(s) are being established, evacuate potential and ambulatory victims up wind, and uphill into holding/control areas in the outer perimeter of the Hot Zone. These areas should be easily identifiable through the use of RED scene tape. RED tape only will be used to indicate the Hot Zone. You may have to consider the use of water fog hand lines for control of the scene and/or to protect yourselves. You may want to begin segregation of patients i.e. symptomatic from asymptomatic, male and female etc. However, keep in mind that every person who was potentially contaminated will to be decontaminated.

Your communication skills will be put to the test. In previous large-scale drills with multiple patients, those patients who knew "*why*" were more likely to assist and conform to our requests than those who did not know what was going on. Through communicating the appropriate information, you can relieve some of your patient's anxiety.

One member dressed, at a minimum, in their structural firefighting gear including their SCBA with the facepiece donned, should be positioned at the entry point to the corridor. Wear Nitrile rubber gloves. Minimize your contact with the patients. Keep in mind that even though you may not have physically touched any patients you must consider yourself contaminated if you have been working within the Warm Zone. The use of 1-hour bottles should be considered to minimize the number of bottle exchanges that have to take place.

Within the corridor you may find it helpful to have a second member who controls the flow of the patients. Ensure that all patients have removed their clothing at least to their undergarments. Upon entry into the decon-corridor, each patient should be directed to:

- Enter the water.

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- Raise their arms above their heads and turn 360 degrees, 2-3 times.
- Have the patients pay attention to their underarms and groin area.
- Then direct the patients to the exit/holding area to await medical triage and treatment as needed.

**Note:** Patients who refuse to comply with directions must be isolated to prevent further or secondary contamination.

**Consideration**

Consideration of providing some sort of cover for those patients who have exited the decon-corridor must be planned. Disposable blankets, sheets or even garbage bags with holes cut for arms and head should be available at the exit point. Weather consideration i.e. hypothermia and exposure should also be addressed.

Studies have shown that up to 80% of the contamination will be removed with the removal of exterior clothing. With this in mind it may be to your advantage to have privacy curtains (tarps) set up. Some people will be willing to remove their clothing down to their undergarments if the reasoning is explained to them and you have accounted for their modesty. Provide garbage bags (Red), tape and pens to ease the concerns of people in regards to their belongings. These bags should be isolated for later removal and security.

**Safety****The Four Don'ts**

- Don't become a victim yourself.
- **Don't rush in.** Always assess the situation before doing anything. Always minimize exposure by separation and relocating upwind, and uphill. Establish an outer Cold Line perimeter early and control crowds.
- Don't T.E.S.T. – Taste, eat, smell and touch anything.
- Don't assume anything – Given the potential for a terrorist event, booby traps, secondary devices and perpetrators may be present.

Safety of personnel must be a top priority. If your personnel are exposed and contaminated they have become part of the problem and must be dealt with immediately. As stated prior, you may not know what you have just rolled into, but if you treat each incident with care and consideration of basic hazardous materials response tactics you can minimize the potential of exposing yourself or your crew to an unknown agent. If you have been exposed to an unknown agent it is imperative that you perform self-decontamination.

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**Emergency Self Decontamination:**

- Wet down prior to removing clothing for nuclear or biological agents
- Blot chemical agents from exposed skin immediately
- Strip off all the clothing
- Flush the affected area with large amounts of water, working from top down
- Cover and seek immediate medical intervention

At a minimum, all members must have on their turnouts with SCBAs and Nitrile gloves. Based on information received prior to arrival, or upon arrival, you witness patients exhibiting signs or symptoms of exposure, all personnel must use extra caution by covering and “going on air” and don Nitrile gloves prior to any patient contact.

<p><b>Note:</b> Structural firefighter gloves provide limited protection from nuclear, biological or chemical agents.</p>
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At an incident with a potential chemical agent, it is of utmost importance to have respiratory protection donned. Chemical agents in the form of aerosolized liquid droplets, vapor, and/or gas may directly contact the eyes, skin and/or the respiratory tract. Systemic reaction with dry intact skin is usually less important than these other routes. Vapor or gas exposure to the eyes and the respiratory tract is the most important hazard associated with non-persistent chemical agents.

An acronym that you can use to assist in your identification of the signs and symptoms of a potential chemical incident is, SLUDGE:

- **S** – Salivation, drooling
- **L** – Lacrimation, tearing
- **U** – Urination
- **D** – Defecation
- **G** – Gastrointestinal: Pain and gas
- **E** – Emesis, vomiting

Besides the chemical itself, a major concern for firefighters is off-gassing from the patients. Keep in mind that this is a respiratory hazard and can be addressed through the use of SCBAs.

Typically you probably will not arrive on a scene and see people lying around and exhibiting signs of a biological attack. It may be hours or days before a biological scenario becomes evident. In a biological attack the primary routes of entry to the victims are either ingestion or inhalation. Through minimizing contact with patients and wearing the appropriate PPE you can greatly reduce the potential for serious adverse contamination.

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Probably the least likely NBC event that you will respond to is a radiological incident. The key factors for safety at these types of incidents is:

- Time – Attempt to regulate length of exposure.
- Distance – Maintain your distance from the source
- Shielding – Structural turnouts will offer some protection against Alpha particles.

Another issue that must be at the forefront of the responder's mind is the possibility of secondary devices. If you have responded to a scene where there has been an explosion, statistically there is a 70% chance that a secondary device will be present. Be alert to the possible presence of secondary devices and perpetrators in the area. The perpetrators may be the first victims.

**Operations**

If you arrive on a scene and there are indicators telling you this is a potential NBC event, the scene must be treated like a hazardous materials incident. Turnouts and SCBA are **not** recommended for entering atmospheres that may be contaminated with an unknown substance. Until more information becomes available these scenes must be treated with the highest level of entry protection available which is Level A, Chemical Protective Clothing.

**Gross Decontamination Corridor**

The primary objective of the decon corridor is to provide large volumes of water within a controlled area to dilute or remove contaminants from a large number of patients.

- Time is critical.
- A large area will be required upwind of the Hot Zone. The corridor should extend from the hot zone nearest the incident site and extend through the Warm "Decontamination" Zone. It is important that the decon corridor not be too far away from the egress point of the Hot Zone. As a result of contamination, some victims may have vision difficulties or other physiological problems that may prevent them from being able to self-rescue.  
(See Appendix 1)
- The control of runoff should be considered i.e. going back into the Hot Zone. You're primary concern however is to keep the runoff from going into a "Clean" area. If you are dealing with a known radiological incident confinement of runoff is critical.

**Note:** For chemical agents, it is possible that the agents will be diluted by the large amount of water and not present a major downstream hazard.

**Note:** For radiological agents, expect water to spread the contamination.

**Note:** For biological agents, downstream contamination will vary dependent upon the agent and environment.

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- If time permits and resources are available establish segregated lanes for symptomatic and asymptomatic as well as for male and female.
- Take into account modesty and the public eye. Male and female decontamination corridors can be established in short time by using ladder trucks with salvage covers hung from the aerial (**See Appendix 2**).

Corridors can also be established by placing engines parallel and using pike poles or ground ladders strung between the engines and covered with tarps (**See Appendix 3**).

- An option that should also be considered and may work well while the decontamination corridors are being established or if resources are thin is the use of hand lines with the nozzles set to a wide fog pattern.
- Consider weather conditions. Patients who become hypothermic can become as much of a drain on responders as the actual NBC event itself.
- Communicate what the victims should do. Having pre-made signs, utilizing the P.A. system on the apparatus, or bullhorns should be used to direct victims to the corridor.
- Consider terrain and wind direction, establish uphill, upwind or crosswind as necessary.
- Use hose lines and/or elevated master streams.

<p><b>Note: Do not wait for soap or bleach, use copious amounts of water, immediately.</b></p>
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At the exit point of the corridor you should have a patient containment area where triage can take place without interfering with the decon corridor.

From this point, additional personnel including a medical group should be established. More complete decontamination may be needed however this will need to be addressed through consultation of the Medical Group supervisor and the Decontamination Group Supervisor.

### **Conclusion**

Remember to be **S.A.F.E**:

- **S**afety is first.
- **A**ssess before acting.
- **F**ocus on avoiding the hazard.
- **E**valuate the situation and report.

Remember to Secure the Scene:

- Protect the response team.
- Protect the public.
- Prevent destruction of evidence.



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- Golden rule: Leave it alone unless it is absolutely necessary for the performance of your duties, and law enforcement approves.
- Do your job using the fewest personnel.
- Be aware of secondary devices.

Remember the principles of Triage:

- Don't get contaminated yourself.
- Use resources to treat those with the best chance for survival first.

Remember these Key Points, **R.A.I.N.**:

- **Recognize** – What do you see?
- **Avoid** – Direct contact with victims and avoid becoming a casualty.
- **Isolate** – The area the best you can.
- **Notify** – Size up and report, describe the scene, estimated number of casualties and request assistance.

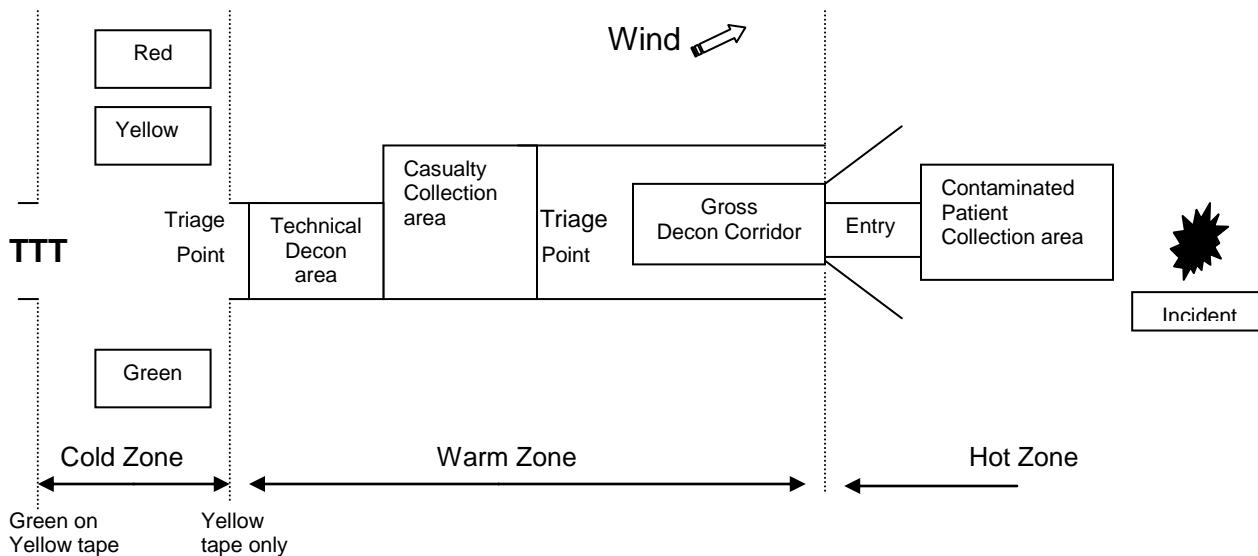
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**Appendix 1****Mass Decontamination area set-up**

Refer to the North American Response Guidebook for initial isolation distances. If product is unknown or not listed use guide #111.

## Appendix 2

### Aerial Ladder Gross Decontamination Corridor

#### Equipment needed:

- Tarps, minimum of 6 preferred.
  - Utility rope, approx. 1/4" diameter.
  - Hangers, zip-ties or carabiners to secure the tarps to the aerial.
  - Hose lines, weighted buckets, ground ladders or other means of securing the tarps to the ground.
  - Pike poles
  - Utility (Body loops) straps.
  - Roll of Red Bags, Marking Pens and 2" tape.
1. If possible position the apparatus uphill, upwind of the incident site and in the Warm "Decontamination" Zone. It is preferable to have the rig pointing away from the incident in the event that repositioning or rapid escape is needed.
  2. Extend the aerial directly over the cab or straight off the back, towards the Hot Zone, to a minimum of 75 feet; however, full extension is preferred for expandability of the corridor. Check the manufacturer's guidelines in regards to angle vs. extension.
  3. Gather and place a minimum of 3 tarps on each side of the aerial. Have the ears towards the tip. The tarps should be laid out, working from the tip towards the cab or tailboard of the apparatus. The tarps should be laid out so the long sides come together and the grommets match up (**See Fig. 1**).



Fig.1

- ◆ With full ladder extension the corridor may be able to be expanded to 5 tarps per side. This will allow for expansion of the corridor, give the ability to create segmented rooms and/or provide more room within the corridor for removal of clothing.

4. With two (2) or three (3) members working on the ground, the tarps must be laced together using utility rope or zip-ties. It is much faster if two (2) members work on each tarp (**See Fig. 1**). Starting with the rope nearest the middle grommet, each member then laces towards the ends of the tarp. Approximately every other grommet of the utility rope should be secured with a half hitch to create a tighter seam. Secure the ends of the rope to prevent unlacing (**See Fig. 2, Fig. 3 and Fig 4**).



Fig. 2



Fig. 3



Fig. 4

5. If a third member is available, that person should be laying out the remaining tarps and gathering a long pike pole to assist with hanging the tarps.
6. Secure a utility strap (body loop) to the ear nearest the tip, and when one side of the tarps have been laced, raise the body loop to a member on the aerial. This member will secure the utility strap to the tip and begin hanging the rest of the tarps (**See Fig. 5**).



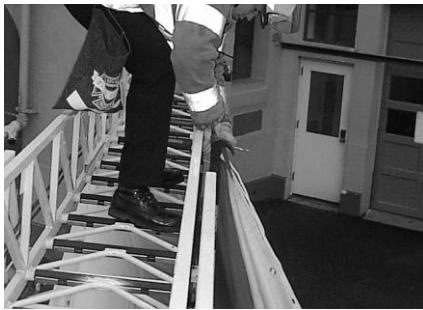
Fig. 5



Fig. 6

7. The member who goes to the aerial should have hangers or other fastening devices available to secure the tarps to the beam or top rail of the aerial (**See Fig. 6**).

8. The member(s) on the ground then assist in hanging the tarps by using the pike pole to lift the tarps to the aerial member. Work down one side and then complete the other **(See Fig. 7).**



**Fig. 7**

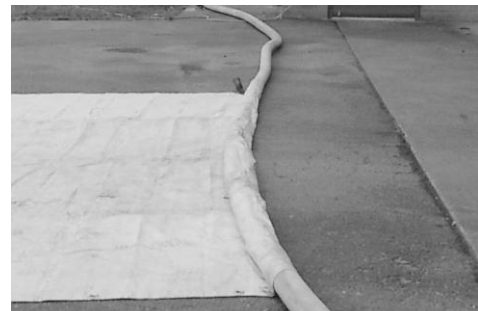


**Fig. 8**

9. Once all the tarps are in position and hung, the bottom of the tarps should be pulled out and secured. This provides a larger corridor and prevents wind from flapping the tarps.



**Fig. 9**



**Fig. 10**

There are a number of ways of securing the bottoms of the tarps not limited to the following:

- Use foam buckets on each side to weight the tarps. **(See Fig. 8)**
- Extend ground ladders and roll the tarps over to lock in. **(See Fig. 9)**
- Use charged supply lines and roll base of tarp in line. **(See Fig. 10)**

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With 3 tarps per side the corridor length will be approximately 36 feet in length. This should provide ample room at the entry point for patients to disrobe and also room at the exit area to cover prior to exiting to the holding area to await triage. **(See Fig.11)**

The entry point should be clearly marked with Red barrier tape. Use cones with lath or secure the barrier tape to objects nearby to create a funnel. The exit point should also be taped off to funnel patients into a holding area. **(See Fig. 12)**



Fig. 11



Fig. 12

The primary objective however is to get the gross decontamination-corridor functional prior to taping off the area.

**Water supply needs****Equipment needed:**

- Standard ladder pipe equipment
- Tri-gated wye
- Ladder pipe supply hose
- Ladder pipe appliance
- 500gpm Mystery nozzle or 2 ½" fog nozzle in place of the smooth bore tips carried on the ladder pipe
- Utility straps to secure the supply line and/or the ladder pipe
- One engine company supplying the Tri-gated wye with 300 to 500 gallons per minute or adequate hydrant supply

While the tarps are being laced and positioned, the third or forth crewmember must be addressing the water supply. For this training guide we will be showing the set up for using a ladder pipe. Alternatives will be explained at the end.

1. Direct the Engine Company to set up and supply the Tri-gated wye for a standard ladder pipe evolution.

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2. Working from the Tri-gate, the aerial member removes the barrel of the ladder pipe and attaches the Mystery nozzle or 2½" fog nozzle directly to the ladder pipe appliance **(See Fig. 13 and Fig. 14).**



Fig. 13

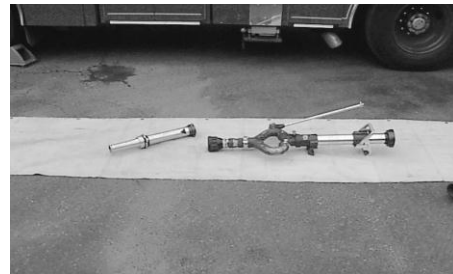


Fig. 14

3. Secure the ladder pipe assembly approximately half (1/2) way down the extended Aerial with the nozzle pointing straight down towards the ground. **(See page 14 for Fig. 15).**



Fig. 15



Fig. 16

4. Secure the supply hose as needed and charge the pipe **(See Fig. 16).**
5. Adjust the nozzle to provide a medium width spray pattern and, using the gated wye, adjust the water volume so that the force of the water will not cause injury **(See Fig. 17)**



Fig. 17



6. At this point this member should assist with hanging the tarps or report to the officer for another assignment.

**Alternatives:**

- Use a wye or tri-gated wye with fog nozzles attached in place of the ladder pipe assembly (**See Fig. 18**).
- The main issue here will be securing the wye to the ladder to prevent tip reaction from pushing the wye up or tipping it to one side. Use cribbing or utility straps to secure (**See Fig. 19 and Fig. 20**).



Fig. 18

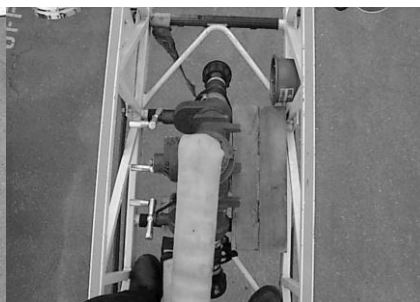


Fig. 19



Fig. 20

**Alterations:**

- Provide a tarp at the opening or pull one corner of a hanging tarp over the opening to provide some measure of privacy.

## Appendix 3

### Engines in Parallel

An effective decontamination corridor can be set up quickly by positioning two engines parallel approximately 20-25 feet apart.

With 2 ½" fog nozzles attached to the discharge ports, position the engines so the fog patterns overlap in the corridor between the engines **(See Fig. 20)**.

It is advisable to position the engines pointed away from the incident and at an angle so the front ends are closer than the tailboards. This does three things: It puts you in position to drive away if needed, it creates a natural funnel point for the patients and it will direct the water back towards the Hot Zone **(See Fig. 21)**.



Fig. 20



Fig. 21

The engine on the left has the nozzle connected directly to the discharge port with the bail open approximately half. The engine on the right has the nozzle connected to a Siamese with the bail open approximately one quarter. (See figures 22 and 23 below)

**Note:** With down turned discharge ports you may find that you can get better directional control of the nozzle if you attach a Siamese or gated wye. (See Fig. 22) versus attaching the nozzle directly to the port (See Fig. 23).

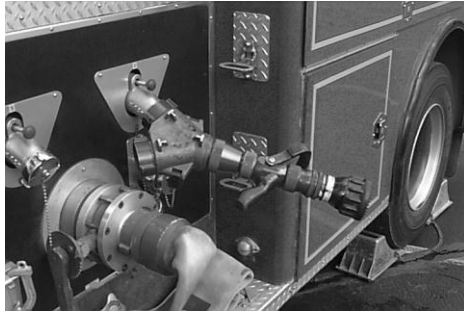


Fig. 22



Fig. 23

The basic concept is that by using large volumes of water at low pressure you will ensure a more complete decontamination.

With this type of set up you may need to provide some sort of cover to address the modesty issue that some of your patients will have. If the engines are placed slightly closer you may be able to bridge ladders over the hose beds and cover with tarps.