

## Chapter 6

# Collective Protection

Collective protection is required to provide a safe environment for soldiers to carry out tactical functions, such as medical care, command, control, and communications, without being restricted by wearing NBC protective clothing. Collective-protection equipment (CPE) is integrated into some weapon systems to increase their effectiveness in an NBC environment. Planning for collective protection should be an integral part of plans for the AirLand Battlefield. Commanders must examine and accurately plan for the additional manpower and logistics needed to operate in a collective-protection mode. Collective protection does not replace MOPP gear; it only allows the commander to reduce MOPP levels while in a contaminated environment. Collective protection can provide relief from MOPP4 for eating, rest, and hygiene. Understanding entry/exit procedures will greatly impact on the effective use of collective-protection systems.

### Types of Collective Protection

CPE provides protection to a group of individuals under NBC conditions that permits relaxation of individual NBC protection. Under NBC conditions, CPE allows soldiers to function effectively. CPE comes to a unit as

either a component of a piece of equipment or as a TOE asset. This includes equipment such as the M51 shelter and the M20 SCPE. Used together, these systems enhance a unit's capability to perform its mission in an NBC environment. There are four basic types of CPE: vent ventilated-facepiece, overpressure, hybrid, and total systems (Table 6-1). See Table 6-2 for the advantages and disadvantages of each system.

#### Ventilated-Facepiece System

Ventilated-facepiece systems supply filtered air to the protective mask canisters (both the M25A1 and M42 masks) of combat vehicle crew members and the M24 and M43 aircrew protective masks. The systems are assigned as GPFUS and are rated by their airflow capacity, in cubic feet per minute. The currently fielded systems are given in Table 6-3. Except for the M13A I GPFU, the components of these systems are similar.

The filtered, pressurized air supplied to individuals extends the MOPP gear's capabilities. It reduces breathing resistance through masks, and it aids in sweat evaporation. In addition, it can provide warm air to facepieces in cold weather.

**Table 6-1. Types of collective-protection systems for vehicles and fixed facilities.**

System	Description	Conditions Justifying the Requirement	Example Systems
<b>Ventilated Facepiece</b>	Series of individual respiratory systems (or masks) serviced by a common filter.	<ul style="list-style-type: none"> <li>• Clean working area subject to inadvertent entry of contamination.</li> <li>• High work rate, reduced breathing resistance.</li> <li>• Frequent entry and exit movements.</li> <li>• Brief inside occupation.</li> </ul>	<ul style="list-style-type: none"> <li>• Infantry fighting vehicles.</li> <li>• Self-propelled howitzers.</li> </ul>
<b>Overpressure</b>	A collective NBC filter and overpressure system inside a vehicle or shelter.	<ul style="list-style-type: none"> <li>• Critical manual dexterity skills.</li> <li>• Limited entry and exit movements.</li> <li>• Lengthy inside occupation.</li> </ul>	<ul style="list-style-type: none"> <li>• Air defense.</li> <li>• Communications.</li> <li>• Medical.</li> <li>• Patient evacuation vehicles.</li> <li>• Maintenance and supply sites.</li> <li>• Rest and relief.</li> </ul>
<b>Hybrid</b>	Combination of overpressure and ventilated-facepiece systems.	<ul style="list-style-type: none"> <li>• Flexibility.</li> <li>• Lengthy inside occupation.</li> <li>• Emergency entry and exit movements.</li> </ul>	<ul style="list-style-type: none"> <li>• Armored fighting vehicles (tanks).</li> <li>• Helicopters.</li> <li>• Air defense.</li> <li>• Multiple launcher rocket systems.</li> </ul>
<b>Total</b>	Hybrid or overpressure plus an environmental control system. Other categories may also incorporate environmental control; for example, ventilated facepiece and microclimatic cooling.	<ul style="list-style-type: none"> <li>• Same as hybrid.</li> <li>• Extreme climates.</li> </ul>	<ul style="list-style-type: none"> <li>• Same as hybrid.</li> </ul>

Table 6-2. Advantages and disadvantages of collective-protection systems.

System	Advantages	Disadvantages
Ventilated-facepiece	<ul style="list-style-type: none"> <li>•Reduces stress from breathing resistance.</li> <li>•Reduces eye-lens fogging.</li> <li>•Allows open-hatch operations.</li> <li>•Increases protection level of the mask.</li> </ul>	<ul style="list-style-type: none"> <li>•Requires that users wear MOPP gear.</li> <li>•Is attached by umbilical cord.</li> <li>•Does not protect vehicle interior from vapor contamination.</li> </ul>
Overpressure	<ul style="list-style-type: none"> <li>•Allows reduction of MOPP level.</li> <li>•Reduces vapor contamination inside the vehicle.</li> <li>•Can provide relief from continuous wear of MOPP gear</li> </ul>	<ul style="list-style-type: none"> <li>•Requires closed-mode operations for safe unmasking.</li> <li>•Requires entry and exit procedures.</li> <li>•Increases logistical support requirements.</li> </ul>
Hybrid (overpressure mode)	<ul style="list-style-type: none"> <li>•Allows reduction of MOPP level.</li> <li>•Reduces vapor contamination inside the vehicle.</li> <li>•Can provide relief from continuous wear of MOPP gear.</li> </ul>	<ul style="list-style-type: none"> <li>•Requires closed-hatch operations for safe unmasking.</li> <li>•Requires entry and exit procedures.</li> <li>•Increases logistical support requirements.</li> </ul>
Hybrid (ventilated-facepiece mode)	<ul style="list-style-type: none"> <li>•Reduces breathing resistance of the masks.</li> <li>•Reduces eye-lens fogging.</li> <li>•Allows open-hatch operations.</li> <li>•Increases protection level of masks.</li> </ul>	<ul style="list-style-type: none"> <li>•Requires that users wear MOPP gear.</li> <li>•Does not protect vehicle interior from contamination.</li> <li>•Is attached by umbilical cord.</li> </ul>
Total	<ul style="list-style-type: none"> <li>•Same as the hybrid system.</li> <li>•Reduces heat-stress casualties.</li> </ul>	<ul style="list-style-type: none"> <li>•Same as the hybrid system.</li> <li>•Increases logistical burden, primarily maintenance.</li> </ul>

Table 6-3. GPFU fielded systems.

Number of GPFUs/System	System
1	M60 Tank
1	M60A1 Tank
1	M60A2 Tank
1	M60A3 Tank
1	M728 Combat Engineer Vehicle
1	M1 Tank
1	M1A1 Tank

**Overpressure System**

An overpressure system is an enclosure of pressurized, purified air. Gas and particulate filters remove any NBC contamination from the air. The system does not protect against gamma radiation or neutrons. The air pressure precludes leakage of contaminated air into the enclosure. Personnel enter and exit through a protective entrance. This entrance is an

air lock, and it prevents contamination from entering the enclosure. Overpressure systems for fixed sites are discussed in detail in FM 3-4-1.

**M51 Shelter System**

The M51 shelter is a trailer-mounted system (Figure 6-1). It features an overpressure and environmental control system. The shelter is predominately used by battalion aid stations and other medical units. It can also be used as a temporary rest and relief shelter.

**M20 Simplified Collective-Protection Equipment**

The SCPE provides a clean-air shelter for use against chemical and biological warfare agents and radioactive particles (Figure 6-2). It is lightweight and mobile, and it allows unit commanders to convert existing structures into protected command, control, and operations centers. Just as the M51, the SCPE can be used as a temporary

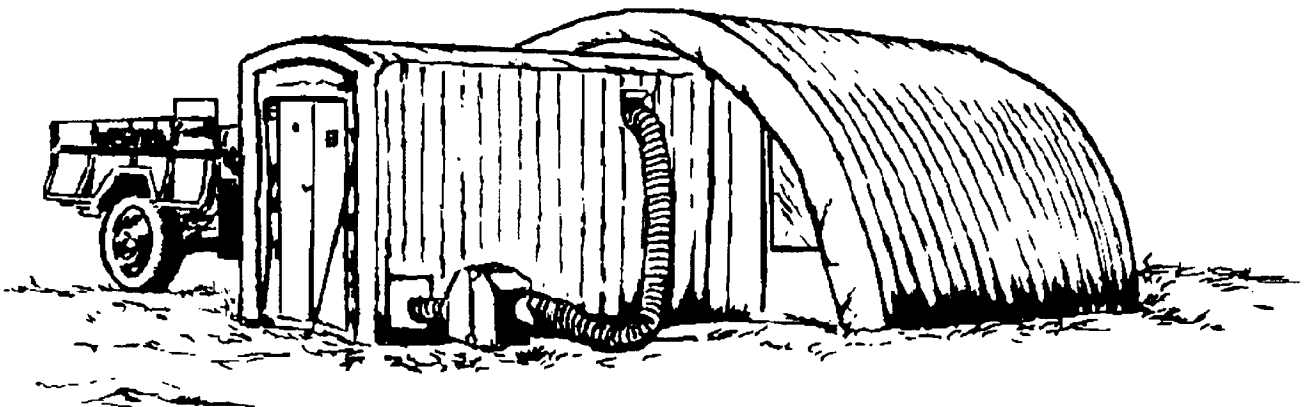


Figure 6-1. M51 shelter system.

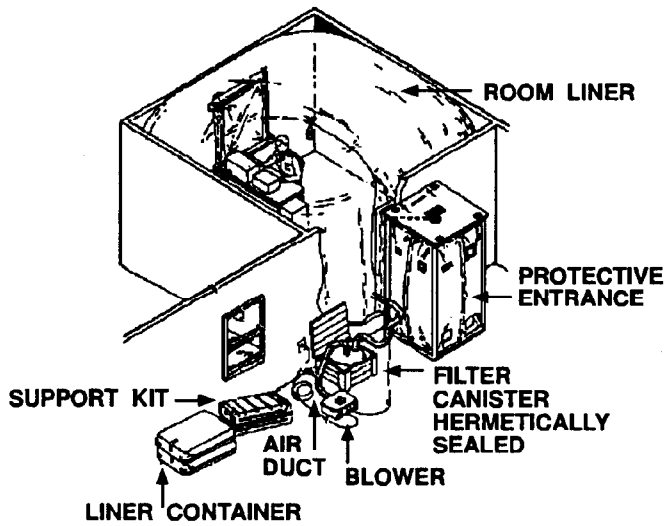


Figure 6-2. Simplified collective-protection equipment.

rest and relief shelter (for example, as a break area for personnel working in heavy maintenance and supply operations) or as a command and control center. It provides a contamination-free environment in which 10 soldiers can work, eat, or rest without the encumbrance of the IPE. The M20 can be erected without the liner using only the protective entrance and blower compartment. Places such as a bank vault or warehouse freezer are examples of where an M20 without liner can be placed. Any cracks or holes will need to be sealed in the doorway. A bib section is available that will fit between the protective entrance and the frame of any door, and when taped down, seals the entrance from outside contamination. Entry and exit restrictions remain the same. For guidance on maintenance and parts of the SCPE see TM 3-4240-288-12&P.

**Modular Collective-Protection Equipment**

Modular CPE provides positive pressure NBC protection to a variety of vans and shelters. The system includes a variety of equipment, consisting of GPFUs, protective entrances, and various installation kits (Figure 6-3). An example of MCPE application to weapon systems includes mounting on a wheeled or tracked vehicle, on the M292 expandable van, or on a series of vans linked together (Figure 6-4).

**Hybrid System**

The hybrid system provides protection for personnel in combat vehicles, vans, and shelters. The system combines positive pressure and

ventilated face mask inside the enclosure with the option of using the positive pressure, the ventilated face mask, or both. The system can be used during closed-hatch, positive pressure operations or open-hatch, ventilated face mask operations (Figure 6-5). During open-hatch operations, the positive pressure reduces the amount of vapor contamination that enters. If contamination enters, the system helps purge the interior of toxic vapors. See Figure 6-6 for components of the hybrid system.

**Total System**

A hybrid system combines with some form of environmental control to make a total system (Figure 6-7). This system reduces heat-stress casualties; however, it increases the logistical burden, primarily because of maintenance. The M1A1 Abrams main battle tank has a total system. During closed-hatch operations the system provides a positive pressure and crew cooling. During open-hatch operations the system will provide cool, filtered air to the ventilated facepiece and cooling vest. Before initiating open-hatch operations, soldiers must be masked before exiting the M1A1 tank to prevent any possibility of chemical agent exposure. Additionally, the system provides modest overpressure that significantly reduces the amount of contamination infiltrating the crew compartment. Consequently, the time required to purge contamination is reduced.

**Associated Equipment**

Collective-protection associated equipment includes cooling and alarm systems and protective entrances.

**Cooling Systems**

Cooling reduces heat stress in soldiers operating in extremely hot and/or humid conditions. MOPP gear significantly increases the potential for heat stress, making cooling systems desirable. The two basic types are crew compartment and individual. Crew

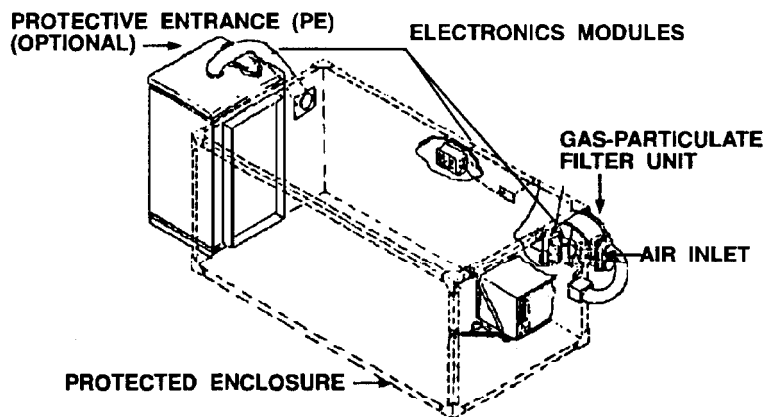


Figure 6-3. Modular collective-protection equipment.

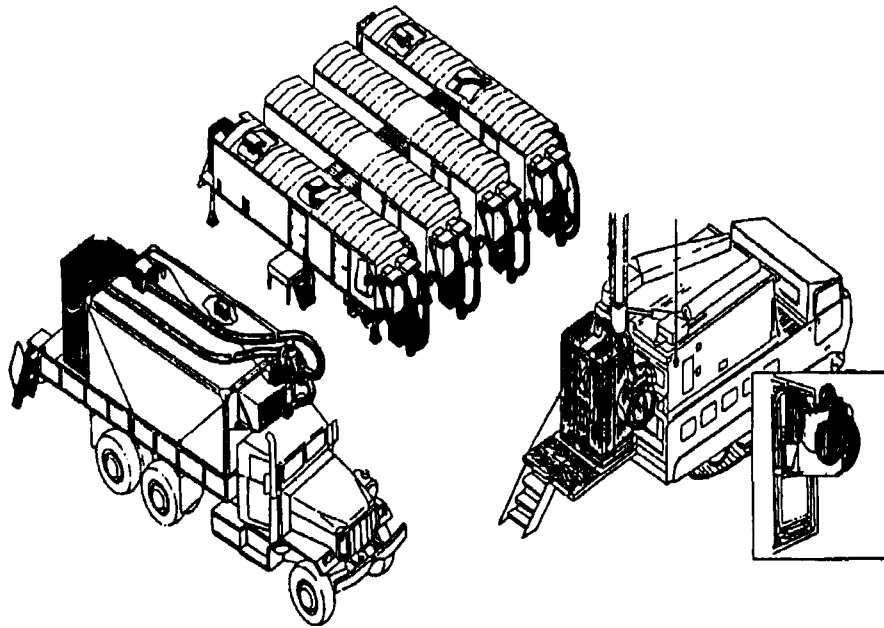


Figure 6-4. Modular CPE examples of application.

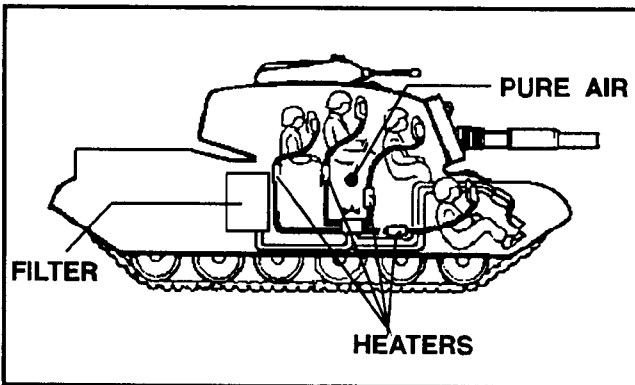


Figure 6-5. Hybrid system.

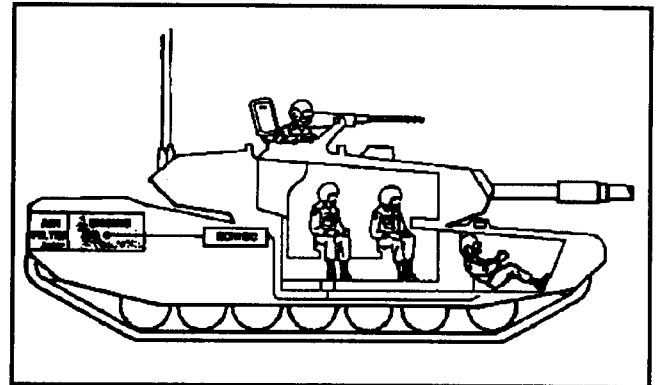


Figure 6-7. Total system (ventilated facepiece not shown).

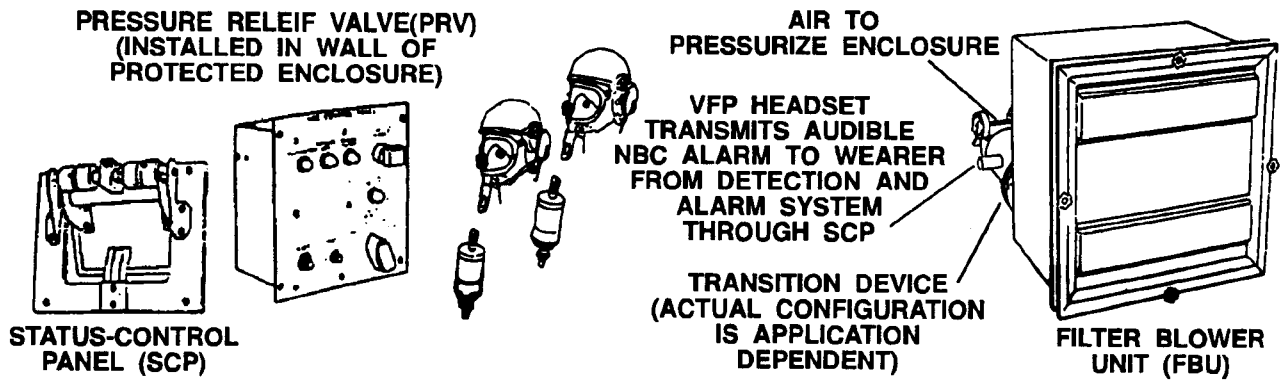


Figure 6-6. Components of hybrid system.

compartment cooling provides air conditioning to the compartment. Individual cooling is more effective when used while MOPP gear is worn. The choice of cooling system depends on the vehicle type and primary mission. The next generation of combat vehicles will provide individual and compartment cooling systems.

### Collective-Protection Alarm Systems

Unit TOE chemical detection equipment and warning assets provide area warning to unit positions. These assets will also provide warning to occupants of collective-protection systems. Dedicated alarms are particularly useful for systems that must operate alone and away from supporting units. Unless an alarm is provided, carry out full entry and/or exit procedures whenever anyone enters and/or exits. Even if an alarm is available, occupants must conduct internal monitoring. This can be less frequent than when there is a known external hazard.

### Protective Entrances

A protective entrance provides an interface between the contaminated environment and the protected enclosure. It enables shelter users to remove contaminated clothing and perform decontamination procedures, providing a relatively clean environment before entry into the shelter.

In a contaminated environment, overpressure systems not having a protective entrance (air lock) must minimize contamination entering the enclosure. They must establish drills and procedures for this purpose. These systems are usually on smaller, S250-type shelter systems and combat vehicles. An example is a main battle tank. Weight and space constraints make an air lock unfeasible. A system without an air lock consists of a clean shelter area only. During a liquid or vapor chemical attack, the system must remain closed, and soldiers must not enter or exit. Opening the doors allows contamination inside, and the crew must assume a higher MOPP level until the interior is purged or decontaminated.

The disadvantages of systems without an air lock emphasize the need for an air lock in a contaminated environment. An air lock prevents contamination from entering the enclosure. The air lock is pressurized, and contamination is eliminated through the use of filtered air. Air pressure in the entrance is slightly less than that in the protective enclosure, but slightly more than outside pressure. Air passing through the air lock purges contaminants that might enter during entry or exit of personnel or equipment. This air comes from the protective enclosure, the filter unit, or both. Different protective entrance configurations create variations of the overpressure category. These variations are those

with a single air lock and those with a two-stage air lock.

**Single air lock.** In most cases, vans and shelters modified for collective protection use a single-compartment protective entrance. An example is the M12 protective entrance (Figure 6-8). This variation consists of the clean shelter area and an air lock (Figure 6-9). Before entering the air lock from a contaminated area, personnel must remove their MOPP gear except gloves and mask. Minor exposure to chemical agent vapor is possible between overgarment removal and entrance into the air lock. Clothing tends to absorb any chemical agent vapor in the atmosphere during this brief exposure. The amount of agent absorbed depends on agent concentration in the atmosphere, length of exposure, type of agent, type of clothing exposed, and climatic conditions. The air purge in the air lock flushes out the contaminated air brought in. It also reduces the amount of absorbed agent on clothing before the soldier enters the protective shelter. After a soldier and/or piece of equipment enters the protective shelter, monitoring ensures hazardous levels of agent were not carried inside.

Two-stage air lock. Adding a contamination control area (CCA) to a single air-lock system creates a two-stage air lock (Figure 6-9). Entering soldiers remove MOPP gear in the CCA. This affords better control of the liquid and vapor hazards of entry and exit.

### Integral Protective Entrances

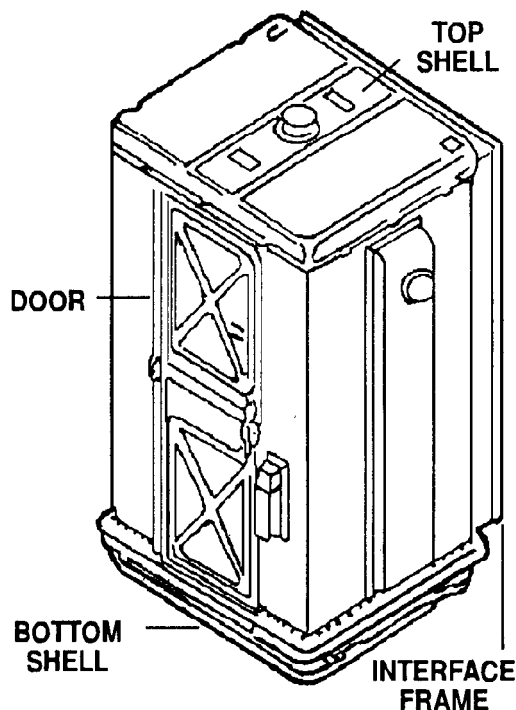


Figure 6-8. M12 protective entrance.

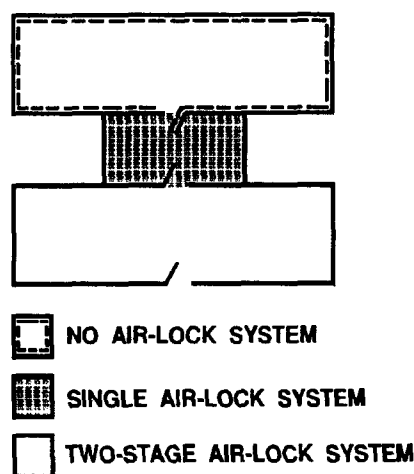


Figure 6-9. Collective-protection entrance configurations.

Integral protective entrances are designed to offer improved accessibility, more convenient storage and transport, and reduced setup time. There are two types of integral protective entrances: internal and external. Integral protective entrances are smaller than the detachable protective entrances and require less airflow during the purge cycle. The integral protective entrance and the shelter door are provided as a single bolt assembly. Integral protective entrances are currently designed for the S250 and S280 shelters.

**Internal integral protective entrance.** Deployed internally, the integral protective entrance can remain in its functional configuration and need not be stowed for transport. Since it is contained within the shelter, it is much less vulnerable on the battlefield (Figure 6-10).

**External integral protective entrance.** The external integral protective entrance is used for shelters that cannot sacrifice the internal space (Figure 6-11). The self-supporting integral protective entrance must be stowed for transport.

### Field-Expedient Collective Protection

The unventilated shelter is the only type of field-expedient collective protection. Such a shelter has very little value because of the lengthy set-up time and rapid depletion of usable oxygen.

A wide variety of structures may be made into unventilated shelters. Such variety makes specific instructions difficult. Generally, the effectiveness depends largely on the tightness of the seal. The shelter must be airtight, and all openings must remain sealed as long as the hazard exists. Because sealing creates a stagnant air supply inside the shelter, occupancy is limited to a relatively short period.

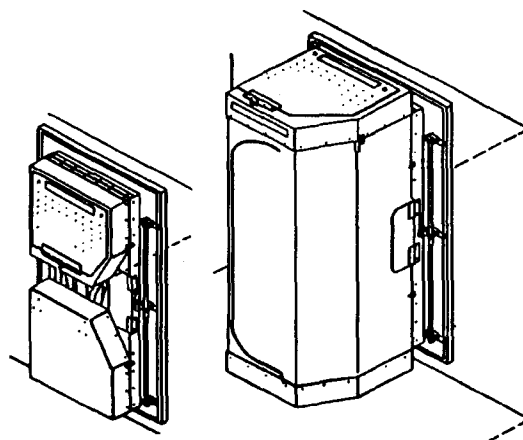


Figure 6-10. Internal integrated protective entrance.

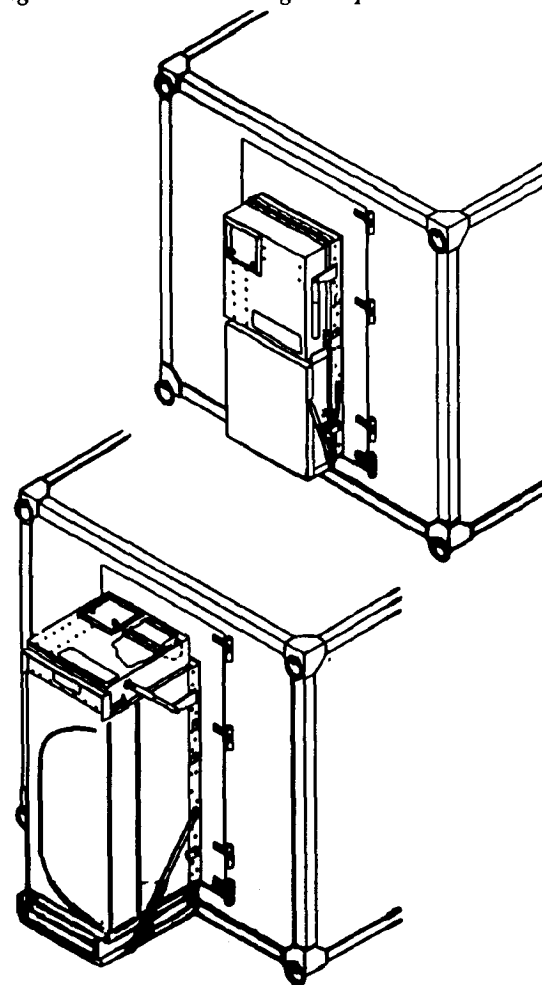


Figure 6-11. External integrated protective entrance.

## Collective-Protection Planning

Providing for collective protection should be an integral part of plans for the AirLand Battlefield. A protective environment allows soldiers to carry out technical functions without the burden of MOPP gear. Also, soldiers need a protective environment where they can seek relief from MOPP gear. In addition, logistics, manpower, and other considerations enter into the planning for collective protection.

### Collective-Protection Uses

Avoiding or displacing from contaminated terrain is desirable. Neither is always possible. It may be necessary to cross, occupy, or remain in contaminated terrain. Otherwise, the enemy could channel our movement and deny us key terrain features that could give our forces a tactical advantage. Every unit is equipped, trained, and conditioned to fight under contaminated conditions when the mission requires. However, individual efficiency and morale may decrease with time, and at some point, relief from wearing MOPP gear is necessary. The best relief method is rotating contaminated soldiers to a known clean area. Even in the worst situations, clean areas exist. Rotation is the least costly in terms of manpower and logistical support. However, the tactical situation may preclude displacement or rotation to clean areas. These situations require collective protection.

Collective-protection systems, like MOPP, are flexible. Flexibility allows the commander to maintain a balance between mission capability and NBC survivability. The commander must consider the threat, mission, tactical environment, and type of collective protection. In assessing a specific situation, the commander must decide if the reduced MOPP levels and relief are worth the additional logistics and manpower burden. For fixed-site collective-protection planning, see FM 3-4-1.

### Logistics

Commanders must plan for supplies, maintenance including filter replacement, and transportation to support collective-protection systems.

### Supply

Adequate supply planning is a key element in effective use of collective-protection systems. These systems are not supply intensive; however, operation of such systems requires a continuous resupply of consumable and expendable items. Included are items that provide a means of contamination avoidance such as

rain gear, ponchos, and plastic bags. These will keep liquid contamination away from the overgarment. Survival under NBC conditions could depend on these items. Therefore, it is not a question of merely maintaining special purpose collective-protection supplies. It is a matter of obtaining needed quantities of existing supplies.

Arrange to have supplies to support extended operations of a shelter kept inside the shelter if possible. Plan for the needed supplies, and stockpile them before an attack. As a minimum, these supplies should include protective clothing, expedient contamination avoidance items, decon kits, detector kits, and filters. These will allow shelter users to conduct an exchange. Provide adequate food and water if the shelter will operate for long periods within the contaminated area. If the shelter requires fuel, ensure it is requisitioned and stored. If the system has an external power supply, store fuel outside and away from the shelter. Plan for supplies to maintain operation of personnel in the shelter. These supplies include pens, paper, batteries, and parts.

### Maintenance

In most cases, maintenance of collective-protection systems is minimal at organizational levels. Most systems have little or no operators' maintenance other than before, during, and after-operation checks and services. Operators may need to reset circuit breakers or perform system start-up procedures. At the unit level, maintenance is usually limited to troubleshooting and removal and/or replacement of major components or major subassemblies.

Changing expended or contaminated filters is the most significant maintenance task. During GPFU operation, soldiers in charge of protective shelters must be aware of the need for replacing filters. Both the gas and particulate filters require periodic replacement.

**Gas filter.** The useful life of a gas filter decreases as operating time and exposure increase. As the filter removes contaminants from the air, its residual capacity decreases. Long exposure to moisture also decreases filter capacity for removing chemical agents. Gas filter life expectancy varies. It depends on the size and design of the collective-protection hardware. To determine when to replace a gas filter, the shelter attendant or another responsible soldier must maintain a log of the filter unit operation. Then soldiers should change gas filters according to the system's technical manual. In general, new filters can withstand several chemical attacks. In most cases, missions of 48 to 72 hours can be accomplished in a contaminated environment without a filter change. Given this capacity, filter change during periodic unit maintenance is often advisable. Soldiers should change filters with the same criteria they use for

mask filters (see Chapter 2). Coordinate filter change operations with the unit chemical NCO.

**Particulate filter.** Within the GPFU, a particulate filter collects radiological contamination and other particles from the air. Such accumulation on the filter does not decrease its filtering efficiency. It does decrease the airflow because of the increase in resistance. In most cases, this increase in resistance is very gradual. It is unusual for the airflow resistance to increase to a level that affects the flow rate appreciably. Personnel should replace this filter at the same time they replace the gas filter or when the system drops below the minimum overpressure level specified in the system's technical manual.

**Contaminated-filter disposal.** Filters do not decontaminate or neutralize contamination; they merely collect and contain it. Therefore, contaminated filters are hazardous. Replacing and disposing of these filters require care to prevent a hazard to personnel or a spread of contamination. Burning does not destroy radiological contamination; therefore, soldiers should bury filters contaminated with radioactive particles. Depth of burial depends on the radiation intensity and soil conditions. Generally, burial under 3 feet of packed earth is adequate. This depth reduces the exposure hazard to less than 1 percent of the initial exposure hazard. (See FM 3-3 for further guidance.) Soldiers must mark burial sites with contamination markers. They must bury or burn filters contaminated with chemical or live biological agents or toxins. If burning is selected, they should place the filters in a pit, soak them with fuel, and ignite them. The heat of combustion kills most biological agents in the filter.

Commanders should establish detailed procedures for filter disposal during peacetime and wartime situations.

### Transportation

Collective-protection systems may or may not have organic transportation. For a maneuver unit, the decision to carry a shelter or components is a matter of priority. For example, there may be no indication the threat will employ chemical agents, or the tactical situation may be unsuitable for collective protection; therefore, the maneuver commander may decide not to transport the M51 or SCPE into battle. On the other hand, the threat may be actively employing chemical agents, or the

tactical situation may be suitable for employment of collective protection. The commander may choose to accept the transportation burden for the advantage of a readily available shelter system. When the decision is made against having shelter assets in the maneuver units, based on the IPB, these assets should be retained in the unit trains area ready for use. This allows a quick response to changes in the tactical situation.

### Manpower

Manpower planning for collective-protection systems encompasses several factors while in MOPP4. These include set-up and tear-down times, lost time from entry and exit procedures, and shelter security. Commanders must estimate these requirements based on information in the next paragraphs.

#### Set-Up and Tear-Down Times

Table 6-4 shows approximate set-up and tear-down times. These are only estimates. Actual times will vary with the situation and degree of training.

#### Entry Times

Commanders should estimate entry processing times for units based on the MOPP gear doffing times in Table 6-5.

#### Shelter Security

Commanders must ensure that security is maintained around any protective shelter. Security requirements depend on the tactical situation. Type and strength of a security element depend upon several factors. These are the type of operation being conducted at the shelter, location on the battlefield, and personnel available to protect the shelter. Physical security involves the immediate area around the shelter and shelter entrances.

Patrols, OPs, or both protect the area around the shelter. The best means of physical security are OPs. Position an OP where observers can give early warning to the main shelter area of any unusual activity or an attack. Several OPs provide overlapping observation around the shelter operation area. Where terrain restricts effective observation or the number of personnel prohibits sufficient OPs, patrols can maintain security. Shelters with high entry/exit require attendants. Post attendants at the shelter entrance to control entry. They should also assist in the external operations of the

### WARNING

**Burning filters contaminated with chemical agents or toxins may produce a downwind vapor hazard. Warn units downwind. After burning, cover ashes with the excavated dirt and mark the site with contamination markers. Disposal of any filters after normal maintenance in peacetime also requires special handling and disposal of these as hazardous waste. This includes all mask filters and canisters and collective-protection equipment filters. Material that has been determined to be hazardous waste must be transported, stored, treated, and disposed of as such.**



Table 6-4. Shelter set-up and tear-down times.

System	Set-Up <sup>1</sup>		Tear-Down	
	Personnel in MOPP4	Time (min)	Personnel in MOPP4	Time (min)
Simplified Collective-Protection Equipment M20	2	30 <sup>2</sup>	2	10 <sup>3</sup>
Modular Collective-Protection Equipment	2	10 <sup>4</sup>	2	5
M51 Shelter	5	30 <sup>5</sup>	5	30

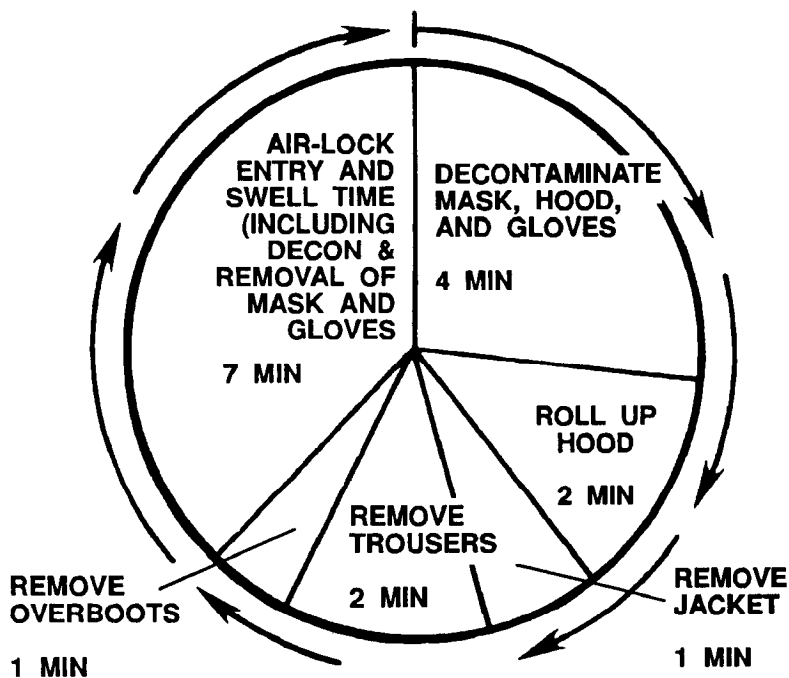
<sup>1</sup> Only set-up time and not fully operational time.  
<sup>2</sup> Does not include time to seal a room when the liner is not used.  
<sup>3</sup> Based on disposing of the room liner in place.  
<sup>4</sup> Protective entrance only.  
<sup>5</sup> Site-prep and stake-down times not included.

antennas away from the shelter. If possible, they should place antennas so that a hill or other obstacle is between antennas and the enemy.

**Latrines**

Collective-protection shelters may include sanitary facilities. If the shelter is in a permanent structure, use existing facilities. Consider the location of existing sanitary facilities in selecting a portion of the building for a soldier relief facility. Where water and sewage facilities are not available, provide covered containers or chemical toilets.

Table 6-5. Entry process times.



**Illumination**

Have lights installed if power is available, and also always provide battery-operated lights for emergency use. Keep electric light usage to a minimum to prevent excessive heat buildup in the shelter. An alternative would be to use cold light sources such as chemical safety lights (them-lites). Take blackout precautions where required. Ensure that lights needed to service filter units or generators are shielded from the enemy.

**Camouflage**

Construct or emplace shelter sites in areas that provide cover and/or concealment. Dense woods or urban areas are best. Commanders must ensure that construction and emplacement actions are well camouflaged.

**Water**

Have filled canteens or other water containers placed inside the shelter. Provide each occupant at least 3 quarts of drinking water for each day of anticipated occupancy. Even if piped water is available, maintain an emergency reserve of drinking water. Additional water may be needed for hygiene.

**Warning and Detection**

Plan for warning and chemical detection devices: M8A1, M256-series kits, or a CAM in each protective shelter. These devices serve several purposes. They detect an NBC attack and determine if the shelter interior is contaminated. These devices also monitor soldiers going through decon and determine when soldiers can safely leave the shelter. In addition, they warn of shelter system failure.

shelter. Exact duties before, during, and after an NBC attack should be outlined in the unit SOP. Soldiers assigned as shelter attendants and their duties will be discussed later in the chapter.

**Other Requirements**

These requirements are already a part of the commander's planning. However, commanders must readdress each of these to consider the effect of collective protection.

**Communications**

Personnel use wire communication systems to communicate with those in adjacent shelters or immediately outside the shelter. They may require radios for communications with adjacent units some distance away. If they use radio systems, they should remote the

## Operation of Collective-Protection Systems

Collective protection does not replace MOPP gear nor the MOPP doctrine. For example, the ventilated-facepiece system enhances MOPP gear protection. Overpressure systems create an artificial environment. This changes the nature of the NBC threat and allows the commander to order lower MOPP levels. Commanders and soldiers should be familiar with several actions before, during and after an NBC attack to make the use of collective-protection systems more efficient and effective.

### Actions Before an Attack

Before an NBC attack occurs, several actions should make the use of collective protection easier.

#### Commanders should-

- Determine appropriate MOPP levels.
- Accomplish collective-protection planning.
- Ensure personnel are accounted for and briefed on the threat situation.

#### Individual soldiers should-

- Assume the appropriate MOPP level.
- Check protection system for proper operation.
- Know entry and exit procedures, but these do not have to be followed until an actual agent attack.
- Accomplish individual protective actions.

#### Before an attack the shelter attendant should-

- Inspect and maintain the shelter filter system.
- Inspect and maintain the communication system.
- Know entry and exit procedures.

### Actions During an Attack

During an attack, suspend or minimize entry into the shelter. Shelter attendant should--

- Don mask and alert shelter occupants.
- Aid in securing air lock doors.
- Prevent unauthorized personnel from entering the shelter.
- Test periodically for contamination.

If entry from a contaminated environment is mission essential, internal monitoring becomes critical. Faulty entry and exit procedures may cause hazardous contamination levels inside. Vapor absorbed into clothing can do the same. To minimize this risk, use the following procedures:

- Monitor the shelter interior every 15 minutes using detector/monitoring equipment.
- If hazardous level of agent are detected inside'

suspend shelter operations. Soldiers should assume the appropriate MOPP level and evacuate the shelter.

However, if mission dictates, the commander may elect to have soldiers don their protective masks to continue to operate inside the shelter. This may lengthen the time required to purge the shelter and restore safe conditions. When detector/monitoring equipment no longer indicates the presence of contamination inside, proceed with unmasking procedures and then resume shelter operations.

Further actions during an attack will depend on the type of collective protection. Systems that are components of a weapon system or TOE assets require separate explanations.

### Weapon-Systems Collective Protection

Soldiers in weapon systems with collective protection should anticipate the attack. They must be at the same MOPP level as the other soldiers or be protected by having the collective-protection system functioning. Those who are protected by the collective-protection system may continue at the reduced MOPP levels shown in Table 6-5. Those who are not protected by collective protection when an attack occurs should activate the collective-protection system and assume MOPP4. They must remain at that level until the shelter interior is purged. Required purge times vary with the interior shelter volume and the airflow. Check specific technical manuals for each system. When the required purge time passes, soldiers should unmask as outlined in STP 21-24-SMCT. When the all-clear signal is given, soldiers may resume the modified MOPP level shown in Table 6-5.

During an attack, restrict entry and exit. No personnel or equipment should enter or exit except when absolutely mission essential. When an entry must be made, monitor the interior air. Use detector/monitor equipment and determine if the entry introduced contaminants. If the test detects a chemical agent, assume MOPP3 or MOPP4. Purge the air until tests are negative, and then perform the unmasking procedures. After the all-clear signal, soldiers may assume modified MOPP levels.

### TOE Collective-Protection Systems

The commander decides whether or not to use TOE collective-protection assets. Basis for the decision is the determination that more effective command and control, less performance degradation, or relief from MOPP gear is mission essential. If this decision is made in anticipation of an attack, no special set-up procedures are necessary. However, if the decision is made after the attack occurs, soldiers erecting the shelter must carefully avoid transferring liquid contamination to the

**Table 6-6. Collective-protection MOPP levels**

Soldiers Not in Collective Protection			Soldiers in Collective Protection	
MOPP Level	MOPP Gear		Ventilated Facepiece	Overpressure
Zero	Overgarment Overboots & Helmet Cover Mask & Hood Gloves	Available Available Carried Available	<ul style="list-style-type: none"> <li>Assume MOPP Zero</li> </ul>	<ul style="list-style-type: none"> <li>Assume MOPP Zero.</li> <li>Overpressure off.</li> </ul>
1	Overgarment Overboots & Helmet Cover Mask & Hood Gloves	Worn Available Carried Available	<ul style="list-style-type: none"> <li>Assume MOPP 1</li> </ul>	<ul style="list-style-type: none"> <li>Assume MOPP Zero or MOPP1.</li> <li>Overpressure on.</li> </ul>
2	Overgarment Overboots & Helmet Cover Mask & Hood Gloves	Worn Worn Carried Available	<ul style="list-style-type: none"> <li>Assume MOPP2</li> </ul>	<ul style="list-style-type: none"> <li>Assume MOPP Zero or MOPP1.</li> <li>Overpressure on.</li> <li>Entry and exit procedure not required.</li> </ul>
3	Overgarment Overboots & Helmet Cover Mask & Hood Gloves	Worn Worn Worn Available	<ul style="list-style-type: none"> <li>Assume MOPP3 or MOPP4*</li> <li>When mounted, connect ventilated facepiece to mask.</li> </ul>	<ul style="list-style-type: none"> <li>Maintain MOPP Zero or MOPP1 unless interior is contaminated.</li> <li>Overpressure on.</li> <li>Entry/exit procedures required if an attack occurs.</li> </ul>
4	Overgarment Overboots & Helmet Cover Mask & Hood Gloves	Worn Worn Worn Worn	<ul style="list-style-type: none"> <li>Assume MOPP3 or MOPP4*</li> <li>When mounted, connect ventilated facepiece to mask.</li> </ul>	<ul style="list-style-type: none"> <li>Maintain MOPP Zero or MOPP1 unless interior is contaminated.</li> <li>Overpressure on.</li> <li>Entry/exit procedures required if an attack occurs.</li> </ul>

\* During an engagement, the commander may allow personnel protected for liquid agents to operate temporarily without protective gloves. This option could slightly increase the potential for casualties.

shelter interior. Also, the interior air must be purged as specified in the TM for the system. Next, the air must be tested continuously with detector/monitoring equipment until the reading is negative. If operations begin before the purge is complete soldiers must maintain mask-only posture until they receive the all clear signal.

Limiting entry and exit of collective-protection systems contamination entry. When entry must be performed, soldiers must monitor the interior. This ensures contaminants have not entered. To minimize entry and exit requirements, the commander may choose to locate outside the shelter and let the staff operate inside. A liaison officer, appointed by the commander coordinates between the commander, staff, and troops. Direct coordination with troops and staff consumes a large portion of time performing entry and exit procedures.

When a collective-protection system is used for relief from MOPP gear, the commander must ensure coordination of certain arrangements. These include MOPP-gear resupply and security. Shelters used for soldier relief require a great number of entry and exit cycles. In addition, soldiers must continuously monitor shelter operations. This monitoring ensures the system functions properly and that no contaminants have entered the system.

**Actions after an attack**

Vapor and liquid contamination hazard may remain for some time after an attack. Once it is determined that a hazard no longer exists, contaminated soldiers should conduct

decon IAW FM 3-5. Soldiers also must take the following actions:

- Ensure contaminated items are not stowed in CPE.
  - Acquire decon support if required.
  - Resupply expendable, such as IPE, mask and shelter filters, and individual decon kits.
  - Continue entry and exit procedures until one hour after detectors indicate the absence of agent vapors outside the shelter.
  - Resume before-attack actions, but continue periodic monitoring of shelter interior with detector/monitoring equipment.
- After an attack, the shelter attendant will-
- Pass the all clear signal to the shelter occupants when safe to do so.
  - Service the filter system if needed.
  - Assist entry and exit procedures.
  - Continue attendant duties.

**Entry and Exit Procedures for Collective-Protection Systems**

Entry and exit are slow and risky procedures; therefore, the commander must allow only those soldiers

that are mission essential to enter and exit. Entry and exit are the procedures between individual protection and collective protection. Step-by-step instructions allow for safe transition from individual to collective protection and back. Differences between procedures depend on two variables: the type of MOPP gear and the type of collective protection. Two possible MOPP gear ensemble combinations are used in the examples to follow.

- Ground-troop IPE—field protective mask with hood, carrier, helmet with chemical protective cover, individual weapon, armored vest (if worn), and MOPP gear.
- Combat vehicle and aircrew IPE—tank or aircraft mask with hood, combat vehicle crewman or aircraft crewman helmet, individual weapon, armored vest (if worn), and MOPP gear.

Each ensemble and type of enclosure have certain characteristics that dictate different steps. Therefore, procedures for a particular combination are a composite of general guidelines for individual and collective protection. Entry and exit procedures in this chapter illustrate the necessity to modify procedures based on their application and system configuration. Procedures presented here give steps common to all entry and exit procedures. Actual procedures for a particular system should be more specific. These are in the system's technical manual, and they should also appear in the unit SOP. Guidelines for an SOP are at Appendix B.

### **Collective-Protection Shelter or Van With an Air Lock**

Select a site for shelter erection that is free of liquid contamination. Soldiers setting up the shelter (either M51 or SCPE) should perform steps 1 through 9 of the entry procedures. They should do this before entering the selected set-up site or handling unpackaged liners or support-kit components.

If setting up a shelter where the external agent concentration produces a relative hazard reading of one bar or less on the CAM (indication that no agent is present), entry into the shelter is unlimited. Where the external concentration of agent produces a CAM reading of a seven-bar or more, entries should be discontinued unless they are mission essential.

Soldiers entering the shelter should follow the entry instructions when liquid contamination is detected or suspected on their overgarments. Establish a hot line at least 4 feet from the air lock. Check the floor area between the hot line and the entrance for evidence of liquid contamination. Use both visual check and detector/monitoring equipment. If contamination is present, decontaminate this area; cover it with a plastic sheet, poncho, or similar material; or find another area

if possible. If possible, remove overgarments in a room or covered area that is separate from the room in which the entrance is located, and establish the hot line at the doorway between the two rooms. Keep the room with the air lock as clean as possible.

### **Equipment**

Allow no equipment to enter the shelter unless it is known to be free of contamination. Pre-position decon kits, alarms, detector kit samplers, and a CAM inside the air lock. These components require periodic replenishment, depending on the frequency of entries. The CAM will require fresh batteries based on the technical manual guidance.

### **Entry Instructions for Ground-Troop Ensemble**

It is best to doff (remove) items from top to bottom because upper parts of the ensemble overlap lower parts. This order minimizes contamination transfer. Soldiers can perform entry steps with or without assistance from a buddy or shelter attendant. However, soldiers can perform some steps more easily and safely with help. Therefore, the buddy system is strongly recommended. Soldiers in the ground-troop ensemble should use the following 13 steps:

**Step 1.** Use detector paper to determine areas of gross liquid contamination on your equipment and garments. Give special emphasis to these areas, and use field-expedient absorbents, such as sand, dirt, or rags, to remove the gross liquid contamination. Take special care to avoid touching these areas during overgarment doffing.

**Note:** If a radiological or biological hazard is present, lightly wipe down the overgarment with hot, soapy water prior to entry into the shelter. This will dampen the overgarment and reduce any secondary aerolization of either radiological or biological contamination while conducting doffing procedures.

**Step 2.** Remove LCE, mask carrier, and helmet before crossing into the shelter. If the hood is worn over the LCE, loosen the hood straps. Remove your M258A1 or M291 and your M 1/Mill waterproof bag, and take them with you.

**Step 3.** Untie the ankle cords, and open the velcro and zippers of both trouser legs.

**Step 4.** Undo rear snaps of jacket. Leaving top snap closed, undo the remaining two front snaps. Untie waist cords, but leave zipper closed.

**Step 5.** Undo shoulder straps. Remove them from beneath the arms and reattach them over the shoulder.

(Use assistance if possible.) Loosen the neck cord. Decontaminate your mask and hood with your M258A1/M291 skin decon kit. The M258A1 decon kit is a two-packet, two-step process. Use both packets over the same area. Take special care to decontaminate around the eye lenses, inlets, and voicemitter. Decon solutions may leave a residue on the eye lenses. To prevent this, reverse the order of application of the decon packets. Use packet 2 first and then use packet 1. The M291 decon kit replaces the M258A1 and is a single-packet, one-step application. Instructions are included in the M291 packet. Open the packet, slip fingers into the pad, strap, and decon your mask and hood thoroughly.

### WARNING

Do not reverse the order of the packets in the M258A1 kit when decontaminating skin. It may cause burns.

The M291 can also be used to decontaminate equipment that needs to be taken into the shelter.

**Step 6.** Decontaminate gloves before rolling hood. (Use assistance if possible.) Leave the hood zipper closed. Grasp the hood by the straps and lift the hood off your shoulders and partially off your head until most of the back of your head is exposed. Roll the hood. Start at your chin, making sure the zipper and neck cord are tucked into the roll, and work around the entire mask until the rolled hood will stay up, off your shoulders. Roll the hood tightly against your mask without pulling the hood off the back of your head.

**Note:** If your assistant is also entering the shelter, steps 1 through 6 should be performed on him or her before proceeding to step 7.

**Step 7.** Undo the top jacket snap, and open the jacket zipper. With one hand, pull the sleeve band over your hand without loosening your glove (make a fist if necessary). Remove that arm from the sleeve. Repeat for your other arm. Place jacket away from the entry path.

**Step 8.** Stand against a wall or other support for balance, and unsnap and unzip your trousers. (Use assistance if possible.) Pull or have the assistant pull your trousers over the heels of your chemical overboots/GVOs for removal, or “walk” the trousers off. To do this, alternately lift one foot while holding trouser material to the ground with your other foot. Leave the overboots or GVOs on, and place trousers away from the entry path.

**Note:** Your assistant, if also entering the shelter, should perform steps 7 and 8 now before proceeding to step 9.

**Step 9.** Air-lock entry.

a. Ground-based shelter with air-lock entry is not applicable to the Patriot. NOTE: Specific reference to the M14 protective entrance (PE) does not appear in this manual.

b. For a van with air lock go up the steps, and loosen your overboot laces or GVO clasps. Open the door. Remove one overboot or GVO at a time, toss it away from the steps, and step into the air lock with your exposed field boot. Do not touch exposed field boots on the exterior platform surface or stairs after removing your overboots or GVOs.

**Note:** When you are operating an air-lock system in a contaminated environment, the protective entrance and shelter interior must be monitored with detection equipment.

**Step 10.** Enter air lock and ensure door is closed. When the low pressure indicator light in the PE module goes out, rotate the purge time clockwise to its full extent. Do not set the purge time until after the low pressure light goes out.

**Step 11.** Decontaminate your gloves again. Then decontaminate the bottom (rolled portion) of your hood. Wait for completion of the purge cycle. When the timer bell sounds, loosen your gloves but do not remove them yet.

**Step 12.** A trained operator will use the CAM, if available, to detect and indicate the relative level of chemical agent vapor hazard present on personnel/clothing/equipment as well as the interior of the PE/shelter.

When sampling results are negative, stop breathing (hold your breath), remove your mask and hood, and place them in your M1/MIA1 waterproof bag. Remove

### WARNING

Suspected false positive reading must be verified with other monitoring equipment such as M8/M9 paper and M256 detector kit before proceeding further.

your gloves and drop them to the floor. Carry the M1/MIA1 with you.

**Step 13.** Enter the shelter and resume breathing.

### WARNING

When entries are performed in a contaminated environment, monitor every 30 minutes. If detector/monitoring shows positive, all personnel should mask until the source of the contamination is located and removed and/or further tests indicate the contamination is no

### Exit Instructions for Ground-Troop Ensemble

Overgarment donning procedures for exiting the shelter are less time-consuming and risky than doffing procedures. Whenever possible, ensure replacement or spare overgarments are pre-positioned inside the shelter. For systems with a high rate of entry and exit, commanders must provide for periodic resupply of spare overgarments. Soldiers should follow these four steps:

**Step 1:** Put on clean overgarments, overboots, and gloves inside the shelter.

**Step 2:** Check the compartment control module (CCM) to ensure the air lock (M14 PE) is unoccupied. Stop breathing, and step into the entrance taking your M1/M1A1 bag with you.

**Step 3:** Open the M1/M1A1 bag, remove your mask by the straps with one hand, and make sure the hood is inside out over the front. Place your mask to your chin and face, and pull the head harness over your head. Tighten cheek straps, clear and seal your mask, and resume breathing. Unroll the hood. Pull the hood over your head, attach the straps, and tighten the neck cord.

**Step 4:** Exit the air lock and ensure the PE door is fully closed after exiting.

### Entry Instructions for Combat Vehicle and Aircrew IPE

Use of the CVC mask (M25-series/M42) or aircraft crewman helmet with a different mask (M24/M43) configuration requires differences in removing and handling the hood. The microphone cord hangs down to the shoulders. It can transfer contamination if not secured to the helmet in some way. The microphone boom must be tucked in well against the helmet; otherwise, it snags the hood. In addition, the main power cord extends beyond the hood. If contaminated, it will be very difficult to decontaminate. To avoid these problems, soldiers should use the following four steps:

**Step 1.** If you wear your vehicle helmet underneath your hood, the first step is to remove the hood (from back to front) from your helmet. Then remove it from around the eye lenses and then from the filter hose. If you wear your hood underneath your helmet, remove your helmet first. Then remove the hood from your mask in the manner described.

**Step 2.** With mask and helmet (if applicable) still on, remove your overgarment jacket and trousers. Use the same basic procedures outlined for troops in the ground-troop ensemble, with one exception. When performing the doffing procedure, bend at your waist to prevent the filter canister and hose from touching you when your overgarment is being removed.

### WARNING

Ensure the undressing area is well ventilated, and remove contaminated overgarment from the hot line area to avoid buildup of vapor.

**Step 3.** Proceed to the air lock or hot line. Remove boots as you step into the air lock.

**Step 4.** Just before entering the protective enclosure, remove your mask, helmet, add gloves. Seal your mask inside your M1/M1A1 bag and enter the enclosure.

**Note:** For systems without an air lock, remove your mask, helmet, and gloves only after tests indicate the absence of vapor. Place your mask inside your M1/M1A1 bag and seal the bag.

### WARNING

Do not touch the eye lens area or the canister hose. These are difficult to decontaminate and are potential transfer hazards.

### Exit Instructions for Combat Vehicles and Aircrew IPE

Overgarment donning procedures for exiting the shelter are less time-consuming and risky than doffing procedures. Whenever possible, ensure replacement or spare overgarments are pre-positioned inside the shelter. For systems with a high rate of entry and exit, commanders must provide for periodic resupply of spare overgarments. Soldiers should follow these four steps:

**Note:** For systems without an air lock, all soldiers don MOPP gear before anyone exits the protective enclosure. After the exit, those remaining reseal and purge the enclosure. When vapor contamination drops below detection levels, the remaining soldiers can follow unmasking procedures.

**Step 1.** Put on clean overgarment, overboots or GVOs, and gloves inside the shelter.

**Step 2.** Check to ensure the air lock is unoccupied. Stop breathing, and step into the entrance, taking your M1/M1A1 bag with you.

**Step 3.** Open the M1/M1A1 bag, don mask, and put on gloves. (Note: A bib section is available that will fit between the protective entrance and the frame of any door, and when taped down, seals the entrance from outside contamination. Entry and exit restrictions remain

the same.) For guidance on maintenance and parts of the SCPE see TM 3-4240-288-12&P.

### Hatch Vehicular System Without an Air Lock

These procedures are for entering and exiting a tank in a chemical environment. These procedures can be modified for shelters without an air lock. Before exiting for mission-essential tasks, soldiers should don their SCALP or another expedient contamination avoidance item, if available, or rain gear over their MOPP gear. When they complete the tasks, they should remove any expedient contamination avoidance items or rain gear in a top-to-bottom sequence. They must avoid touching clean overgarments with the cover exterior. If heavy liquid contamination is present and/or additional overgarments are available, soldiers must perform two doffing procedures—one for the cover and one for the overgarment.

Entry and exit procedures detailed here assume the following conditions:

- Tank exterior is contaminated.
- Crew is operating “buttoned up” with the NBC overpressure system on.
- Crew is wearing all protective clothing (except mask and gloves).
- Exit is for a mission-essential task, such as corrective maintenance.
- Overpressure system remains on throughout the exit and entry cycle.
- Tactical situation is relatively safe, such as in rearming and/or refueling operations.
- The tank is not under fire.
- Contact with the enemy is unlikely.
- Immediate movement is not anticipated.

#### Entry Instructions

If you are the loader, perform steps 1 through 8. If you are not the loader, when the loader completes step 8, perform step 1 and then steps 4 through 8. If you are the last soldier in, close the hatch. With hatch closed, the crew performs steps 9 through 12.

**Step 1.** Mount the tank over the left front road wheel.

**Step 2.** Decontaminate the hatches and area around the hatch (approximately 4 feet in diameter) using either the M 11 or M13 DAP. Acquire the water can from the left bustle rack.

**Step 3.** After the required stand time, flush the decontaminant from the loader’s hatch and surrounding area.

**Step 4.** Stand next to the loader’s hatch and remove any field-expedient contamination avoidance items or rain gear jacket. Take care not to touch the exterior of any field-expedient contamination avoidance items, rain

gear, or gloves to your overgarment. Discard the removed items over the side.

**Step 5.** Loosen the rain trousers, if worn. Roll them with clean side out while pulling them down to your ankles. Do not allow the contaminated side of field-expedient contamination avoidance items, or rain gear, or the contaminated gloves to touch your overgarment. Discard rain trousers over the side.

**Step 6.** Lift one foot and remove the boot cover. Discard it over the side of the tank, and place that foot with exposed boot inside the decontaminated area. Repeat this procedure for your other foot.

**Step 7.** Decontaminate your gloves with your personal decon kit, and discard the used wipes over the side.

**Step 8.** Lower yourself into the tank.

**Step 9.** Resume operations as if in a contaminated environment.

**Step 10.** After a purge cycle and as the tactical situation permits, monitor the interior. A crew member should begin sampling with detector/monitoring equipment.

**Step 11.** If detector results are negative, proceed with unmasking procedures. If no symptoms appear, remove masks and gloves at the tank commander’s order. Operate in the normal overpressure buttoned-up mode.

**Step 12.** If detector results continue positive, remain in MOPP gear. You must remain protected until the mission is complete and further decon can be performed or until further tests are negative.

#### Exit Instructions

**Step 1.** Traverse the turret until the main gun is centered over the front slope.

**Step 2.** Put on mask and protective gloves.

**Step 3.** If you are the loader, perform exit before any crew member begins.

Put on the SCALP or either a field-expedient contamination avoidance item or rain gear and boot covers. Carrying your personal decon kit, exit through the loader’s hatch.

**Step 4.** If you are not the loader, but are required to exit, move to the loader’s station. Put on the SCALP or a field-expedient contamination avoidance item or rain gear and boot covers. Carry your personal decon kit and exit through the loader’s hatch. If you are the last to exit, carry the decon apparatus and close the hatch.

**Step 5.** If you are the loader, determine if the tank and surrounding area are contaminated.

**Note:** Follow procedures for detecting the presence of chemical agents. For hasty identification, the loader should use M8/M9

chemical agent detector paper for suspected liquid agents. The tank commander can use detector/monitoring equipment to detect any vapor agents. If the need to exit the tank is urgent, skip this time-consuming step and assume this area is contaminated.

**Step 6.** If no contamination is present, crew members may reduce their MOPP level and perform step 7. If contamination is present, decontaminate the loader's hatch and an area approximately 4 feet in diameter around it.

**Step 7.** Perform the task(s) that dictated the exit.