

Items with ** are directly applicable to Basic Glove Bag Course Number 020729

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Introduction:

The purpose of this class is to acquaint the student with radiological control containments. To be able to describe the different items that can be called containments and their specific uses. This class is designed for 8 hours, depending on the previous skills and knowledge with radiological control containments.

By the end of the class, the student will have a basic knowledge of:

1. What is a radiological control containment?
2. What are the basic containment components
3. Where and how would the containments be used
4. How do I acquire the containment
5. How do you install a containment
6. Who and how do you inspection/certification a containment.

The Basic Glove bag Class;

1. Welcome to the basic glove bag class. Introductions, Room 222.
2. Discuss origin of the basic glove bag class. Initially was from Oak Ridge and then adopted by Tank Farms as a power point presentation. With ISMS, Fluor choose to make a hands on training class for worker who; installed and who certified.
3. What is radiological containment?
4. Why use radiological containment?
5. Examples of radiological containments.
6. Design of a Radiological containment, who and how.
7. Procuring a Radiological containment, on site and off site suppliers.
8. Tour of Room 226 and 224 of items associated with containments;
 - a. Fixatives
 - b. Black light imitation of loose surface radioactive contamination
 - c. A “green house”
 - d. Containment attachments, (sleeves, smear boxes and etc.)
 - e. Containment glue
 - f. PPE with containments.
 - g. PAPR and respirator equipment and containments.
 - h. HEPA filtered Ventilation
9. Safety brief
10. Practical in Room 220;
 - a. Sleeve attachment to a component.
 - b. Sleeve change out.
 - c. Passing out material in a glove bag
 - d. Passing in material in a glove bag
 - e. Sausage sleeve pass in.

- f. Installing a HEPA filter into material
 - g. Installing a drain into material.
 - h. Installing a drain assembly
 - i. Installing RadCon poly bottles.
 - j. Installing a “good” controlled drain system
 - k. Pre-loading a glove bag prior to installation in a zone.
 - l. Installing a glove bag on a component.
11. Inspection and Certification of radiological containments in Room 222.
- a. Practical inspection and certification of a radiological containment, room 220
12. Clean up from practical.
13. Sign class roster and make out course evaluation in room 220.

Containment Terminology:

1. Catches (drapes);
- a. Can be used separately or with a glovebag.
 - b. Can be just a single sheet of material or a manufactured formed catch.
 - c. Can be a liner inside a containment or tent.
 - d. Can be used for radioactive contamination control or for the collection of radioactive liquids.
 - e. Normally is supported by tie-offs at the corners.
 - f. Catches don't have to be certified as an individual item.
 - g. Maybe included as part of a glovebag/containment certification.
 - h. Should be inspected after installation, prior to each use, by the user.
2. Glove bags:
- a. Can have a single glove or multiple gloves.
 - b. Can be certified or not, depending on work procedure's criteria.
 - c. Glovebags may be used inside a tent.
 - d. Can have HEPA filtered ventilation or not.
 - e. Can have removable tops or be opened. With the top open, the bag can become a “catch”.
 - f. Should use a catch inside a glove bag to collect liquid not the glove bag.
 - g. Use liners inside of the bag. Liner should be fire retardant is hot work or grinding is to take place.
3. Tents (greenhouses)
- a. May or may not have anti-rooms (vestibules) for doffing PPE clothing.
 - b. Can have HEPA filtered ventilation or not.
 - c. May have removable tops or have access doors.
 - d. Can have pass-out/in ports
 - e. Should have liners on the floor for easy Decon or removal if damaged.
 - f. Should have padding under the tent floor for protection during work of the floor material.
4. Spray Protection
- a. Can be just s sleeve with a Velcro closure.

- b. Can have a glove installed to operate a valve.
- 5. Sleeving
 - a. Can be used to insert or remove material from a riser or other openings.
 - b. Normally no closures (i.e., Velcro or a zipper) the length of the sleeve.
 - c. Normally, light weight material to allow bunching of the material over an object.
 - d. Can have gloves installed for internal work.
- 6. Bull Pens
- 7. Wind Breaks

Containment Accessories:

- 1. Drain Assemblies;
 - a. Poly bottles, 5 and 15 gallon.
 - b. Poly bottle swords for venting a bottle.
 - c. 2 CFM HEPA filter on the sword filter the air on discharge.
 - d. Poly bottle bag for outer protection; use as CA and a closure.
 - e. Hose clamp to control draining in the hose.
 - f. Glove bag bottom drains.
 - g. Drain assembly pumps, hand pump and mechanical.
- 2. Ventilation;
 - a. For glove bags, small HEPA filtered vacuum cleaners with speed controllers.
 - b. For greenhouses, HEPA filtered exhauster to 1000 CFM

Why use Containments:

- 1. Containments minimize the spread of radioactive contamination.
- 2. Containments minimize the use of PPE (personal protective equipment) for the workers.
- 3. Containments can eliminate the use of respirator equipment for the worker.
- 4. Containments minimize the production of large amounts of radioactive waste.
- 5. Containments allow co-workers access to the work area wearing less PPE.

Why use HEPA Filtered Ventilation with Containments:

- 1. HEPA filtered ventilation is used effectively for contamination control.
- 2. Allows work with higher levels of loose surface contamination.
- 3. Allows in some cases, the containment to be opened to pass items in or out of the confines of the containment.
- 4. Minimizes the potential spread of contamination if small holes exist in the containment material.

Examples of Containments at Hanford:

1. 241-AR canyon, using positive pressure to inflate the tent sections within a contaminated canyon.
2. 340 Area ventilation, using catch with ventilation drawing out the bottom during separation of filter housings.

Inspection and Certification of Containments

1. Containment ID tag signed by Installer
2. Review checklist for tents and glove bags
3. Fight complacency
4. Deal with changing conditions

Installation of a Containment Tent

Preparation of the Tent Site

This text does not depict a step by step procedure, but a process. Some of the activities may be performed in a different sequence, depending on the area where the tent will be constructed. For instance on uneven ground, the floor of the tent may be attached to the frame before the top is attached.

Sloping tent tops may be used outdoors, but are not normally necessary. For installations outside, where a slope is required for weather protection, usually it is more cost effective to use a covering tarp, allowing an air space between the top of the tent and the tarp. This will effectively give some cooling inside the tent during the summer. If any slope is required, ensure this has been incorporated into the containment design. Keep this in mind when working with custom designed tents. Inside a facility, there is no necessity to have the top of the tent sloped. The usual may not apply.



If the tent is to be installed on a metal or concrete floor, recommend fire retardant plywood be placed on the floor and padding added between the plywood and the tent floor. Normally the padding is covered with a protective material to minimize cross contaminating the material. If the floor is uneven, install scaffolding or other material to give a flat surface for the work section of the tent.

Remove all interferences around the work area that would hinder the work or restrict work area. This might be deck grating, lagging, lockers and other material easily removed. Also, need to protect objects that could be damaged or damage the tent once it has been installed. For example, gages, sensor wires and probes. In some cases, it is appropriate to have built into the tent wall, windows so one can monitor gages or other readout instrumentation or place a in the glove in the wall so one can operate a valve that has become inaccessible because of the tent.

Erect the Frame

Stage all the components in the area where the tent will be erected. The tent may be erected away from the work area and moved into position with a crane, or erected at the work site. Lay out the bottom rails of the frame. If the tent is being installed over a component, take care to orient the door in the proper direction, and ensure that the walls of the tent work area are positioned the proper distance from the component. Use two workers when positioning long poles. If one person moves a pole alone, the end of the pole could strike someone, or something. NEVER carry long poles in an upright position. The pole could come in contact with overhead

obstructions, i.e. steam lines, electrical wires, etc. The top rails are placed next to their corresponding bottom rails and if there are any center overhead rails, they placed off to one side, or in the center of the bottom frame. The corner, side rods and corner brace rods are placed in the generally area where they will be connected to the bottom frame.

These poles are connected with elbow and tee connectors. The corner rods are secured to the bottom rails with cross braces inserted into wye connectors. The retaining bolt is inserted and hand tightened first, then the set screws are tighten with an allen wrench. The Wye connectors may only have set screws. Take care not to over tighten the bolts or the set screws. Completely assemble the bottom of the frame then install the upright rods. The cross braces may be connected next, or after the top rails are in place. If the cross braces are connected first, they may require some adjustments when the top rails are attached to make the frame plumb and square.

Attach the Tent to the Frame

The next step is to put up the tent and attach it to the frame. Roll out the tent inside the frame, taking care to position the slope of the tent and the door in the proper direction. Tents erected indoors may be secured to the frame with nylon rope, plastic cable ties, or other such devices, but tents erected outside must be secured with elastic cord, often called bungee cord, to allow the tent to flex rather than be blown over by the wind. Keep it sloppy or loose when installed outside. The bungee cord is a containment inventory stock item and comes on a spool. It is helpful to temporarily attach the top of the tent to the frame with plastic cable ties, before securing it with the bungee cords.

Bungee Cord

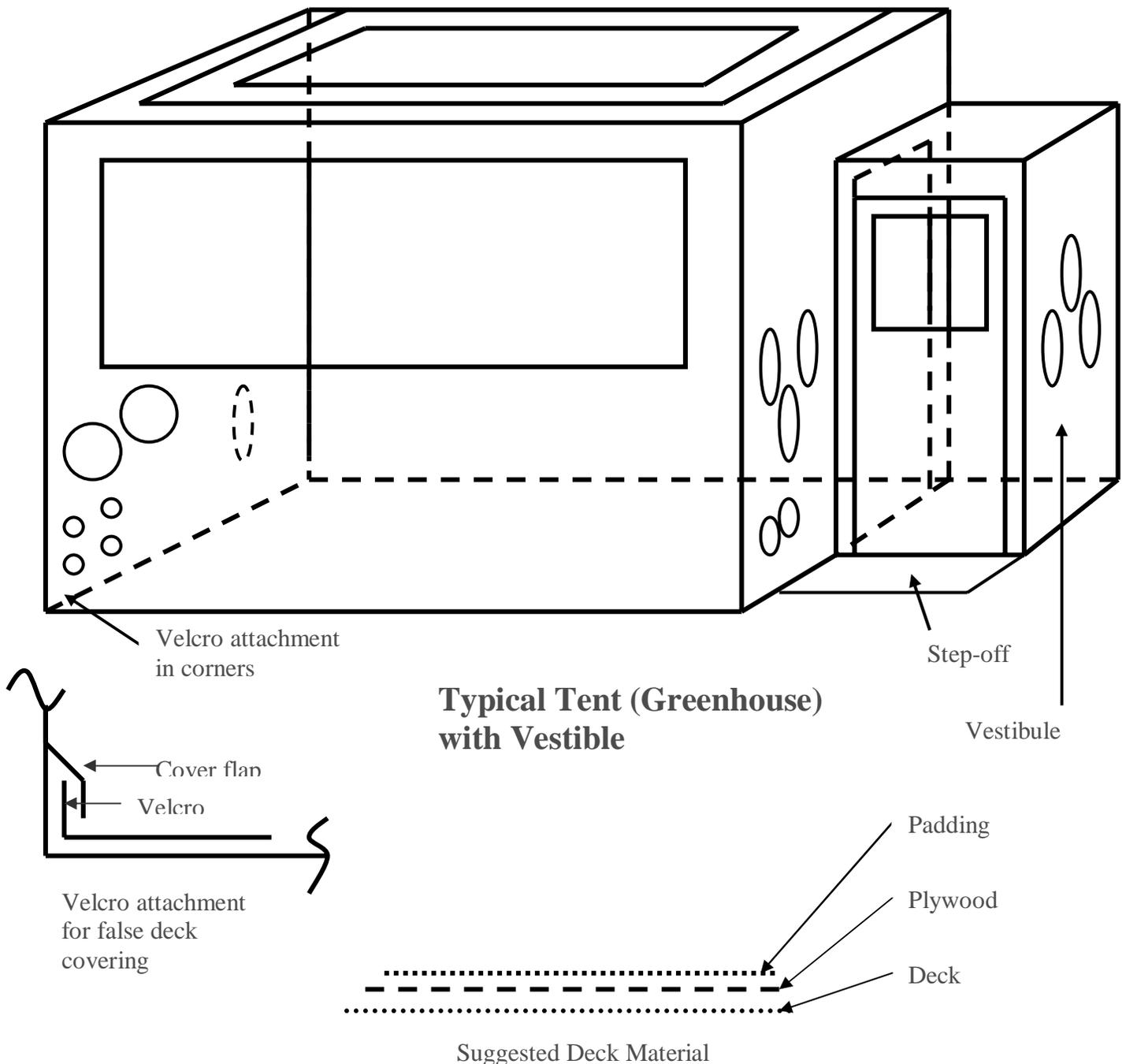
The bungee cord is cut into lengths approximate for the containment. The ends of the cords are Ashoe stringed®, so they can more easily be threaded through the grommets or tie off device of the tent and to prevent fraying. To Ashoe string® a cord, you wrap plastic tape around the end so that it resembles the plastic coated end of a shoe string. The top of the tent or the bottom may be secured first. A step ladder may be needed to secure to top of taller tents. One method of securing the tent to the frame is the zigzag pattern. In this method the bungee cord is looped and tied to the frame then threaded through the hard molded plastic tie-off device on one wall (or the top) of the tent, over the rail, and through tie-off on the adjacent wall. This creates a zig-zag pattern similar to lacing a shoe. Other methods include cutting and tying separate loops of cord to each tie-off or looping the

Bungee Cord Knot



knot.cdr

cord through a tie-off then around the rail. Regardless of the method used, the sides and corners of tent should be secure and pulled taut within the frame. As more cord is added, the cut lengths may be tied together. When tying bungee cord, ensure that the knots in the cords are secure.



Install the Tent

The next step is to prepare the floor of the tent work area. The work area of the most tents has a detachable inner floor. The floor attaches to the interior walls of the tent with heavy gauge hook and loop fastening tape commonly referred to as Velcro. Some tents are designed with more than one detachable floor. If the tent floor must be cut to accommodate the a protruding component, the best method is take the measurements to determine the location for the cut, then transfer the measurement to the tent floor, and mark it with strips of tape. The cut is then made through the tape. The floor is then positioned in the tent, unrolled, and attached to the wall of the tent closest to the component. The cut opening in the floor is then taped to the component to prevent any leakage through the floor. The last step is to seal the Velcro seam (floor to wall) with tape. In addition to removable floors, the work area floor of the tent may also be covered with an easily removable material, such as sisal paper or plastic sheeting for ease of decontamination. Multiple layers of flooring should be considered for jobs where high contamination levels are expected. Rubber matting may also be put down under the tent floor, where the ground contains sharp rocks, or gravel. Plywood may be used over the flooring if heavy equipment like a forklift will be used to move items in and out of a tent.

Additional Flooring

- Sisal Paper
- Plastic sheeting
- Rubber Matting
- Plywood

Set up the Anteroom (Vestibule) & Postings

Next we turn our attention to the anteroom of the tent. The ante room may be used as an undress area for removing contaminated protective clothing and equipment. If so, the procedure for the proper removal process **MUST** be posted in this area. The arrangement of Step Off Pads and hampers for the protective clothing will be similar to other multiple step off pads and undress areas. It is important to ensure that the arrangement will allow the workers to follow the steps on the undress procedure and that the radiological postings for the anteroom, work area, and exterior of the tent match the RWP and/or ALARA Management Worksheet. The postings must be visible when the doors are closed or open.

Ante Room for Doffing

- **Doffing procedure MUST be posted**
- **Enough room to Doff**
- **Proper setup**
–SOP's, Hampers, etc.

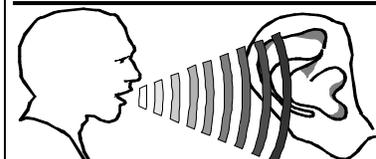
Rad Posting of Tents

- **Work Area & Ante Room**
–Match RWP
–Match AMW
–Visible with doors open or closed

Communication Systems

If a communications system is installed it should be tested before starting the work

Communications Systems



Set up the Ventilation System

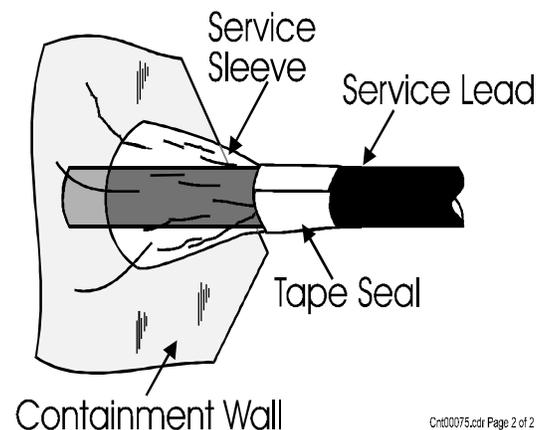
The ventilation system for the containment is checked. The containment may be designed with inlet filters. Check the filters to make sure they are clean before using. If a powered ventilation is NOT used 30-40 CFM inlet HEPA filters may be used. Where a powered system is used, the system should be verified operational prior to each entry. This will be evident by containment sides bowing in and air rushing in through any penetrations. This can also be verified routinely by smoke testing. Air inlets should be secured when the tent is not in service. If the powered ventilation system is not in service and the containment will be used, the air inlets should be verified closed prior to any work.

Ventilation Systems

- Passive systems
- Powered systems

Install the Service Leads

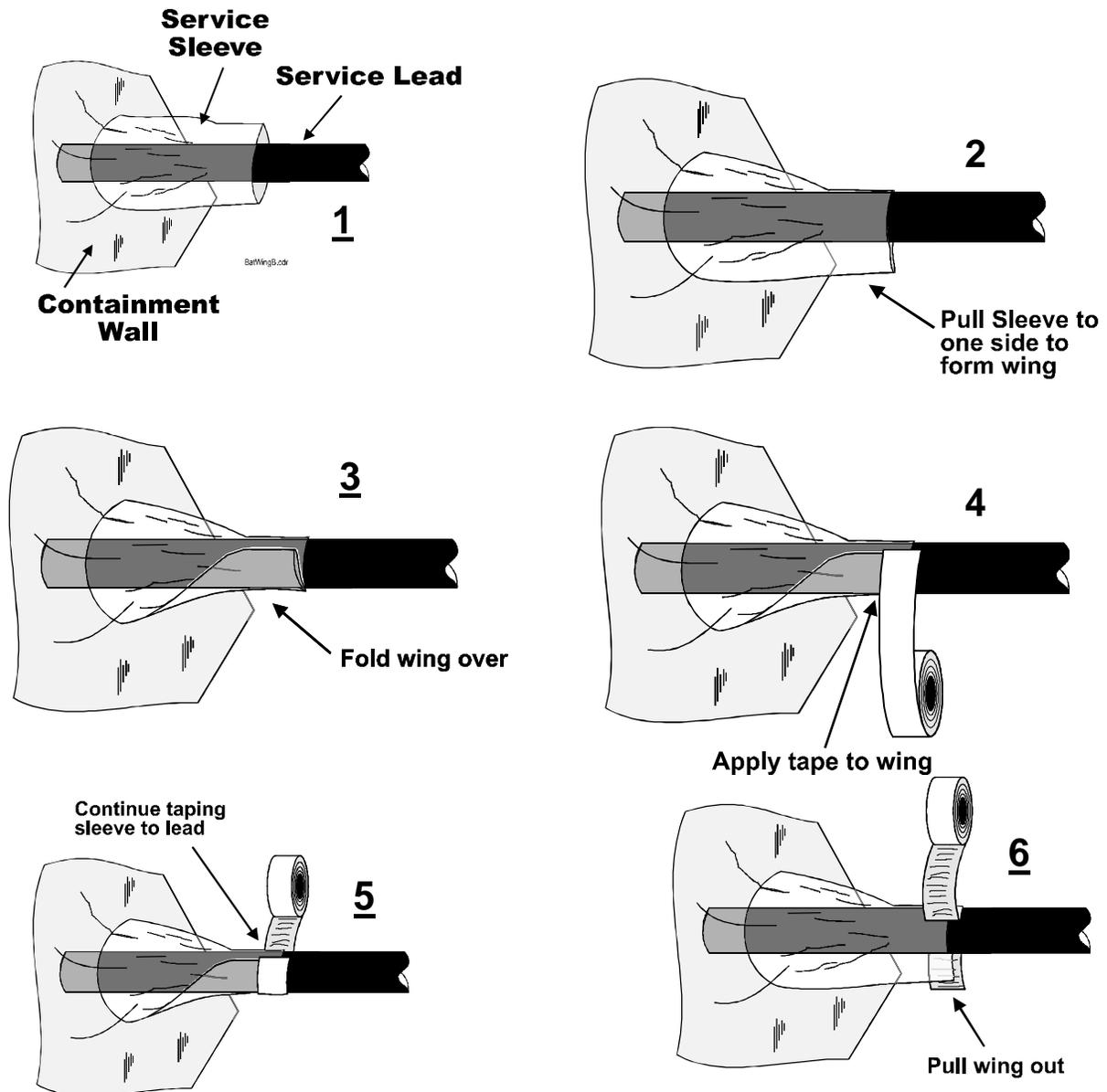
The next step is to install the service leads. Services such as air lines, hoses, power cords, and bonding wire may be installed now, or at a later date, as they are needed. If services are to be installed now, insert each one through the appropriate size service sleeve. Tape the sleeve to the service line. Ensure any unused service sleeves are closed and secured with tape or have the manufacturer's membrane in place. Care should be taken to ensure that the sleeve is properly sealed to the service lead. This is particularly important when moisture is present. Keeping the tape as smooth and wrinkle free as possible helps. Wrinkles in the tape and in the service sleeve creates small tunnels. The tunnels can allow contamination to escape. Contaminated liquid can be drawn into the tunnels by capillary action, and eventually leak to the outside. One method to prevent this is to use a Batwing type seal on the service leads. This type of seal takes advantage of the fact that a tape to tape seal is better than a tape to plastic seal.



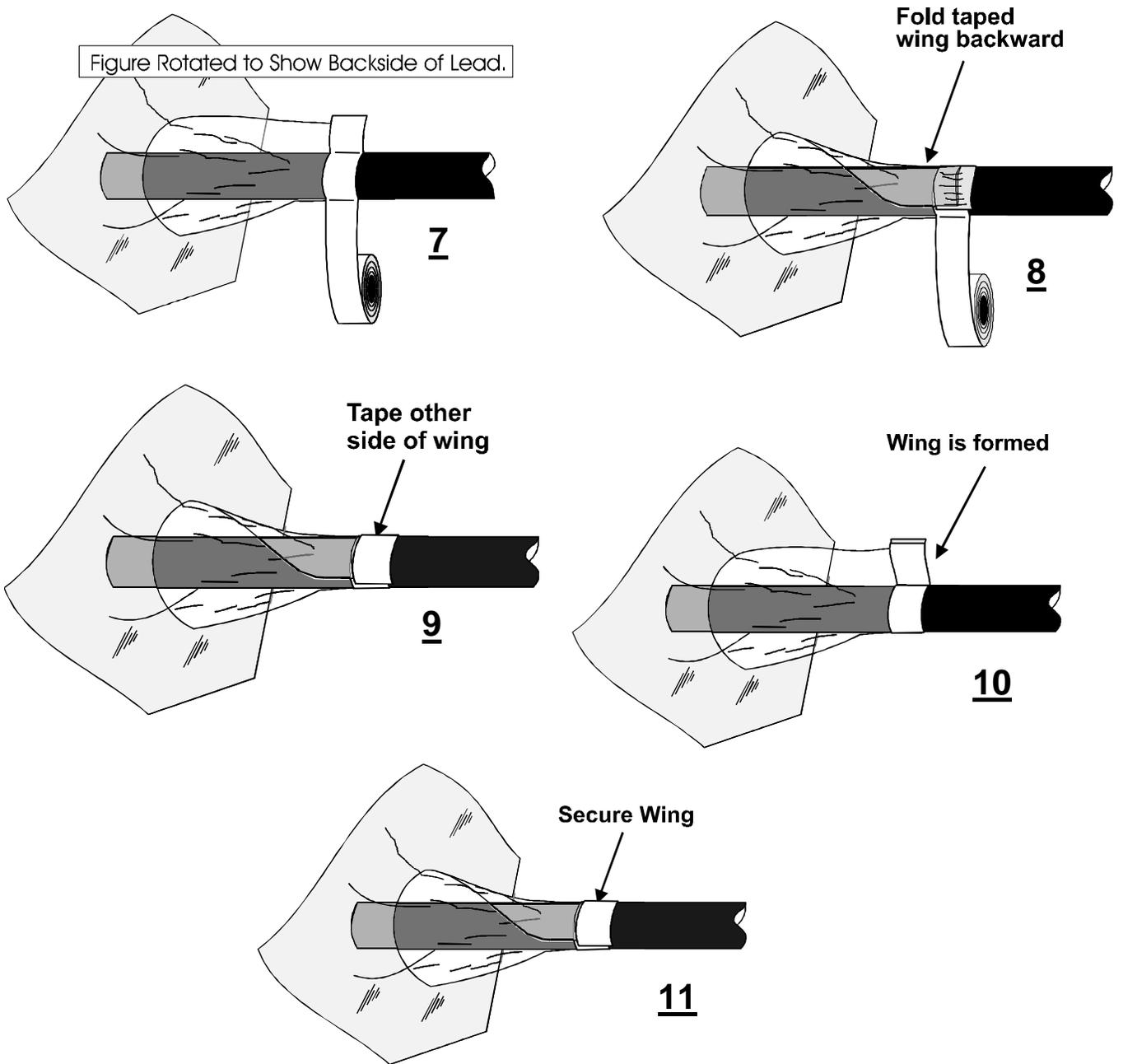
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Batwing Seal

Insert the lead into the sleeve. Pull the sleeve to one side, and fold it over. Start taping the fold in the opposite direction that it was folded. Continue taping the sleeve to the lead, but DO NOT tape over the folded area. Instead pull the fold out to form a wing, pulling the untaped portion of the sleeve taut against the lead. Attempt to maintain fold on top of lead to minimize multiple layers of material on the bottom of the sleeve, creating traps for contamination.



Fold the taped batwing backward. Continue taping the sleeve to the lead and apply tape to the folded sleeving. This creates a batwing with a tape to tape seal above the plastic. The batwing can be secured to as part of the taping process or secured with an additional piece of tape.



Inspect and Certify It

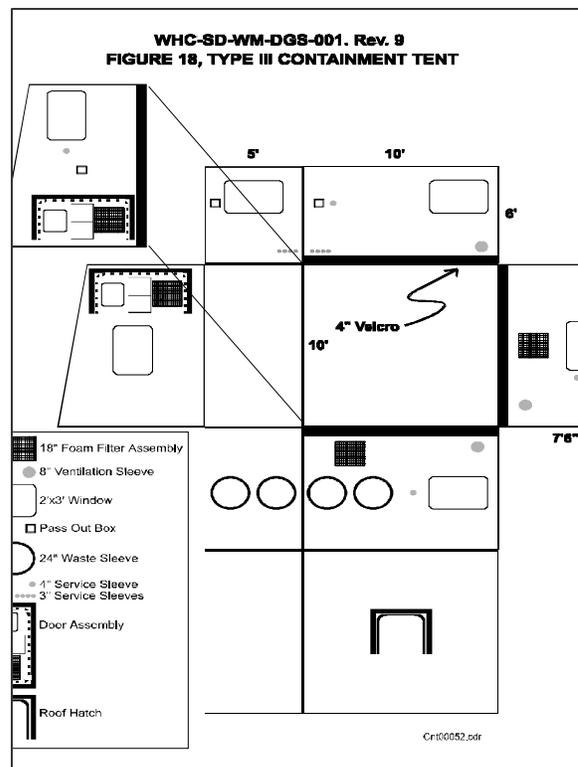
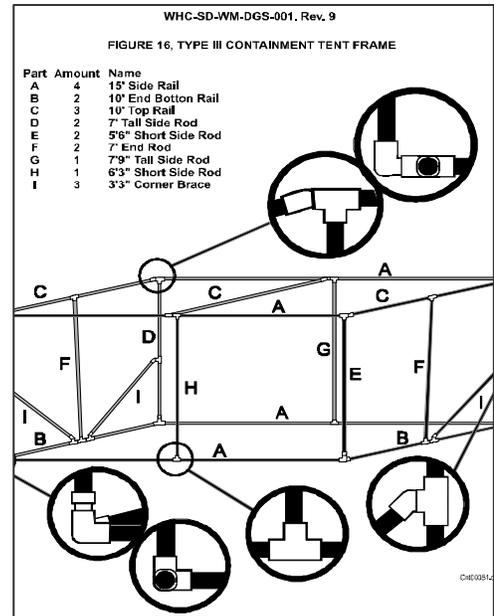
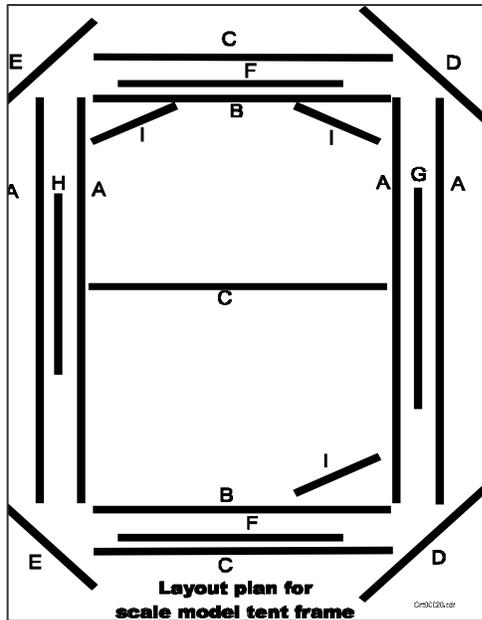
All radiological containment devices must be inspected by the installer to determine if the containments are adequate for the job. This inspection is only documented on glove bags, tents, and partially roofed enclosures, which must also be independently inspected and certified by personnel from the Radiological Control group. The independent inspection is usually done by the HPT. Both inspections are documented on the Containment Identification Tag (BT-6000-787). The identification tag **MUST** be posted on the containment.

Inspections and certifications are critical to the proper installation and use of a containment device. This topic will be covered in more detail in another section of the text.

Containment Identification Tag

Work Package No.					
Installed By			Date:		
Initial Inspection By			Date:		
Record of Routine Inspection					
Date	Time	Signature	Date	Time	Signature

BT-6000-787(08/93)



Tent layout and design

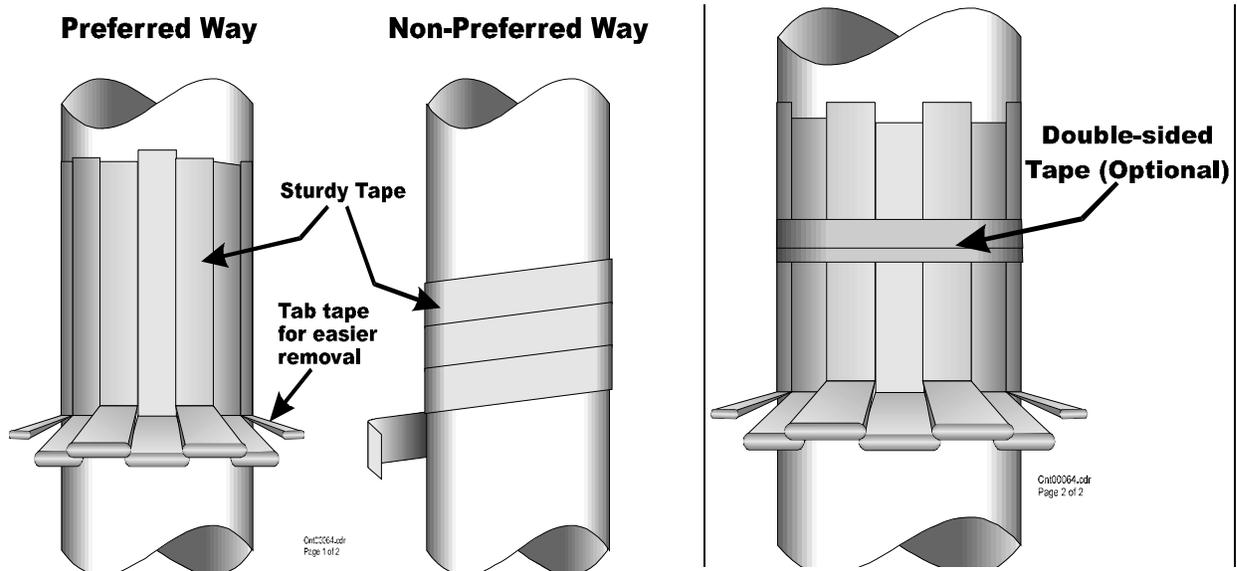
Installation at Work Site

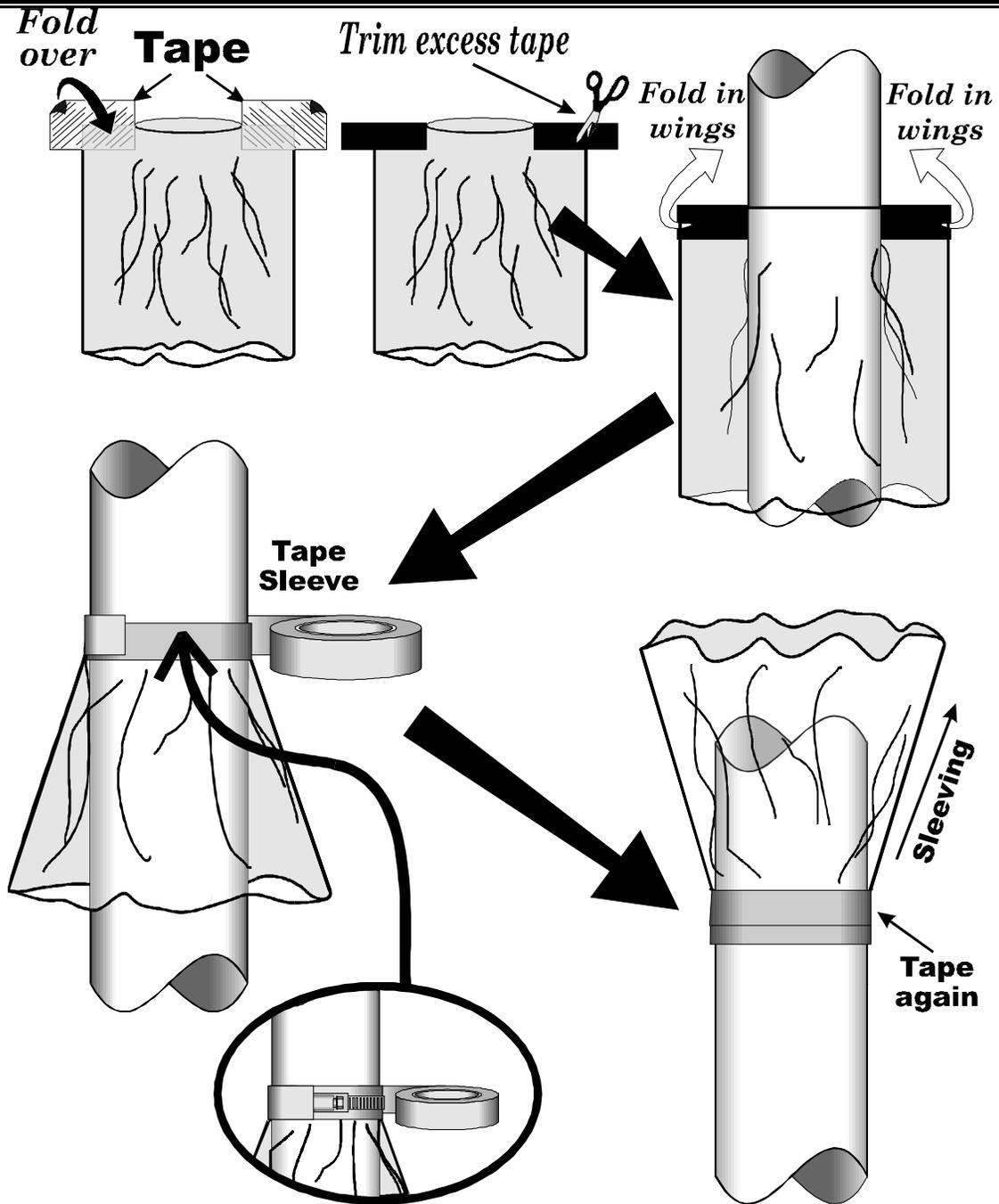
Installation of the glove bag at the work site will vary depending upon the amount of prefabrication and testing that has already been done, but should include preparation of the work area, sealing the containment to the component, attaching and/or checking the supports, and installing the services.

Prepare the Work Area

Prepare the area in the vicinity of the proposed glove bag installation. Cover any sharp or rough edges that could puncture or abrade the glove bag. If the glove bag is to be exposed to the environment, weather protection should be considered. If the adjacent piping or component that may come in contact with the glove bag is hot (surface temperature expected to exceed 150 °F), cover them with fiberglass cloth or equivalent material.

Exposed piping and/or components that will be inside the glove bag may be covered to minimize contamination. Tape Application is one method for component surface protection, as illustrated in the figure. If tape application is used the preferred method is to tape along the length of the pipe or component, with tabs at the end of the tape for easy removal, as illustrated. Double sided tape may be used where the containment will be attached to the component.





Application of hose clamp & tape – optional

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Sealing Containment to a Component

Inside seals are normally required for the lower portion of the containment when liquids are expected, unless otherwise authorized by Radiological Control and Operations personnel.

1. If sleeving diameter is larger than the item to which it will be attached, the sleeving can be fitted by:
 - determine the amount of excess sleeving on each side
 - laying the sleeving on a flat surface
 - placing a piece of tape on the side of the sleeving with part of the tape extended above the cut end of the sleeving.
 - fold the extended tape over and on top of the taped sleeving
 - excess tape may be trimmed off the side.

This method can be applied to both sides to form "wings".

2. Slide sleeving onto component, and fold "wings" back, in same direction and tape securely in place.
3. For critical seals install a hose clamp, tape over clamp.

Outside seals are made in the same manner as inside seals except that the sleeving is gathered, clamped and/or taped on the outside of the sleeving.

4. (OPTIONAL) On vertical internal seals, gather material below the seal and tape on the outside as a means of supporting the inside seal and damage to the glove bag during work.
4. Tape any openings if membranes have been removed. Ensure press lock zipper tracks and glider zipper tracks are properly aligned.

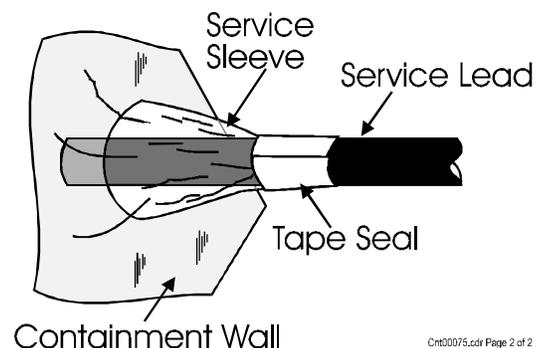
Install the Service Leads

Batwing Seal

See Chapter 1, pages 5 and 6 for the "Bat Wing" seal for services.

Install the Service Leads (optional)

The next step is to install the service leads. Services such as air lines, hoses, power cords, and bonding wire may be installed now, or at a later date, as they are needed. If

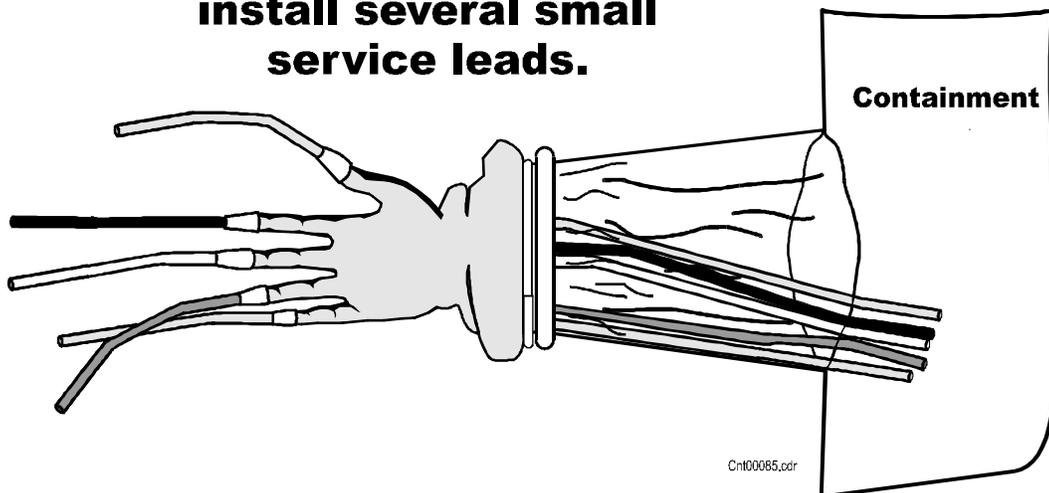


services are to be installed now, insert each one through the appropriate size service sleeve. Tape the sleeve to the service line. Ensure any unused service sleeves are closed and secured with tape or have the manufacturers membrane in place. Care should be taken to ensure that the sleeve is properly sealed to the service lead. This is particularly important when moisture is present. Keeping the tape as smooth and wrinkle free as possible helps. Wrinkles in the tape and in the service sleeve creates small tunnels. The tunnels can allow contamination to escape. Contaminated liquid can be drawn into the tunnels by capillary action, and eventually leak to the outside. One method to prevent this is to use a Batwing type seal on the service leads. This type of seal takes advantage of the fact that a tape-to-tape seal is better than a tape to plastic seal.

Small Service Leads

Installing small service leads such as Tygon tubing for sampling, or grounding wire into service sleeves can be difficult and, sometimes there are more leads than there are individual service sleeves. One method to address both problems is to use the fingers of a glove bag glove as service sleeves. The material of the glove stretches and grips the leads, forming a good seal that is reinforced with tape.

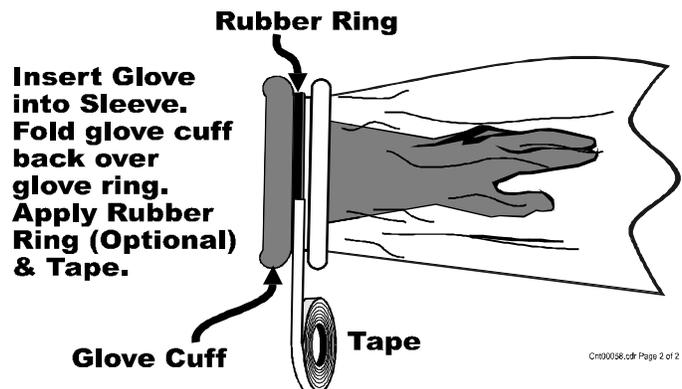
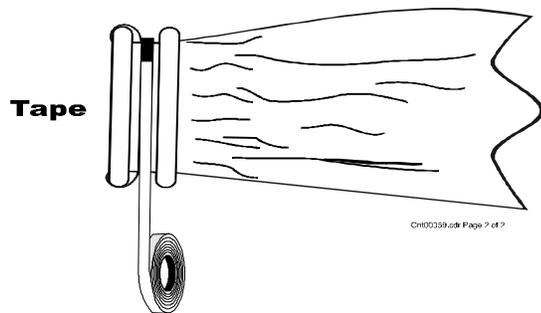
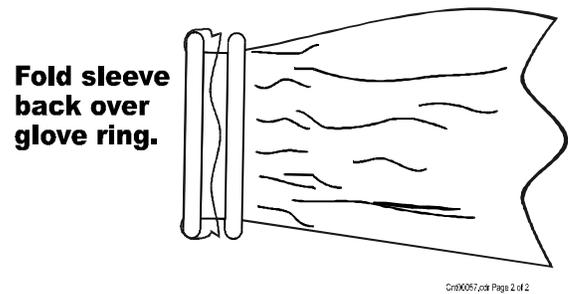
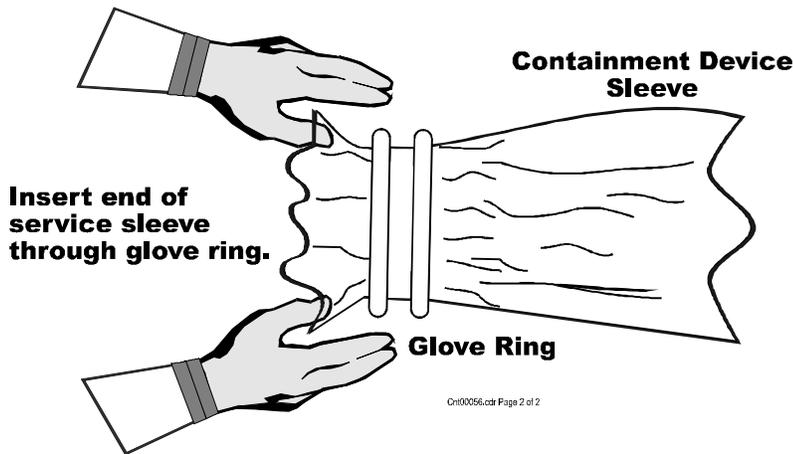
A Glove can be used to install several small service leads.



Prefabrication of a Glove Bag

As with tents the installation of a glove bag will vary with the circumstances, but the basic sequence is the same. However glove bags are smaller, and more portable so they are more easily pre-fabricated, then set into place at the work site. The gloves can be installed as part of this prefabrication.

Installing Gloves

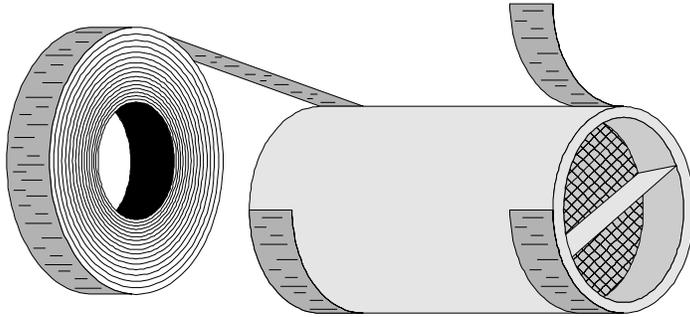


Installing a Glove in a Containment

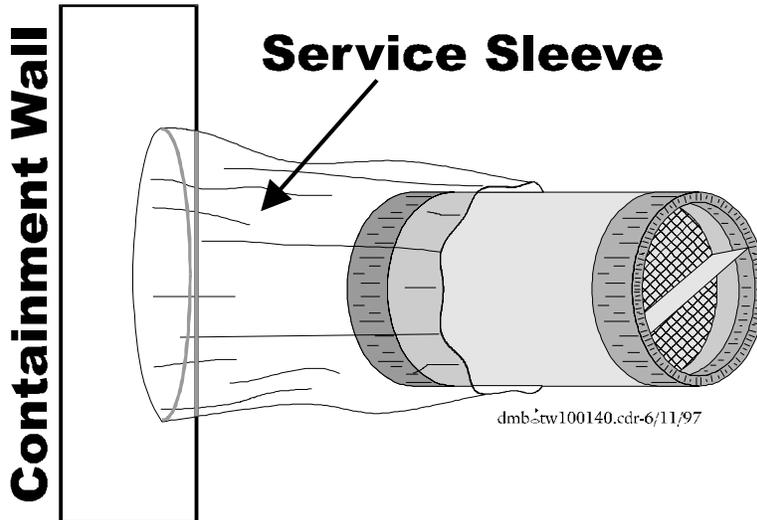
Install rubber gloves (size 10 or 11 gloves are suggested), at locations indicated in the installation sheet. Ensure proper orientation for working position.

- Check the glove for pinholes by trapping air in the glove and squeezing.
- Insert the end of the sleeve through the ring glove, and fold the end of the sleeve over to cover the glove ring. Tape the sleeve into the groove of the glove ring securely.
- Insert the glove into the sleeve in the appropriate working position and fold the cuff of the glove over into the center groove of the glove ring.
- Place the rubber ring (optional) over glove and sleeve and into the groove in the glove ring. Apply tape over rubber ring. In place of a rubber ring you can use a hose clamp, bungee cord, cable tie or Tygon tubing.
- Check that glove is sealed by trapping air in sleeve and glove and squeezing.
- Push glove and sleeve inside the containment.

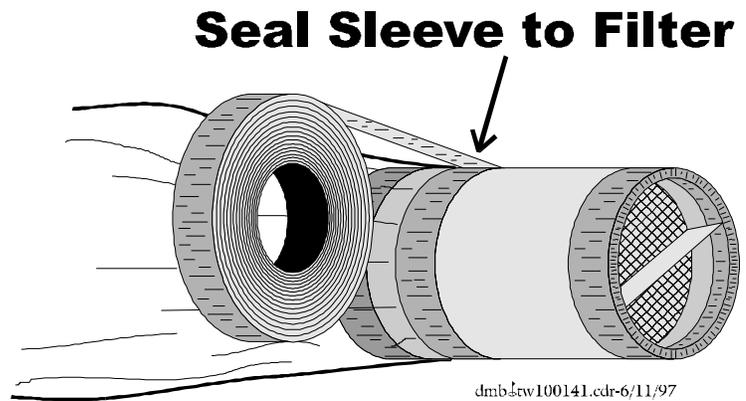
30-40 CFM HEPA Filter



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Installing a 30-40 CFM Canister HEPA Filter

Canister HEPA filters with a 30 to 40 CFM capacity or reticulated foam pad filters are generally used if the glove bag has a negative ventilation; 2-CFM filters are used on non-ventilated glove bags. Installing a filter that is too small could result in the glove bag collapsing due to negative pressure.

Before installing the filter check the following:

- Efficiency test stickers attached
- Metal housing intact and not deformed
- Filter elements intact

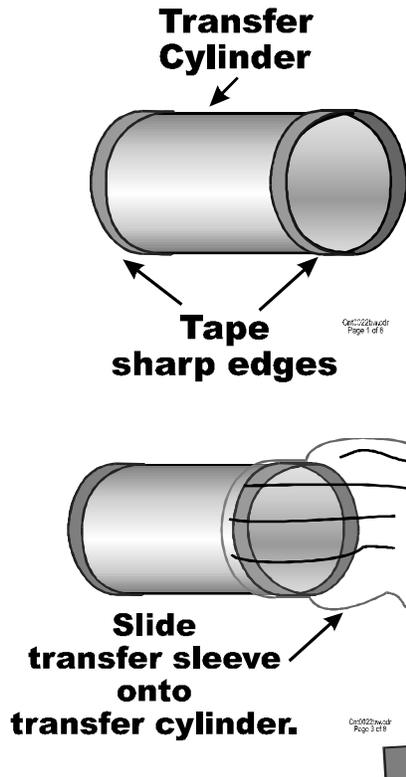
Tape over possible sharp edges on the filter to protect sleeving.

Trim excess sleeving (concentric taper) and install filter as close to containment as practical to prevent the sleeving from twisting or folding over and pinching off the airflow path. (See option below)

Install the filter in the highest practical portion of the containment, ensuring that the filter does not obstruct visibility of the work area. Attach tie-off rubber band and cord to metal strap on filter to secure it into place. The filter should be installed so that the direction of airflow, as identified by the manufacturer is from inside the glove bag to outside the glove bag. This may seem to be backward; because while the glove bag is in use the airflow may be going into the glove bag through the filter. But remember that the purpose of the HEPA filter is to prevent contamination from escaping the glove bag, and the airflow direction on the filter indicates that the filter efficiency was tested with air flowing in that direction. (OPTIONAL) If it is not practical to install the filter directly to the glovebag because of restriction, a four + inch flex ducting can be installed into the glovebag sleeve and the filter installed by a sleeve at the other end of the ducting at a convenient location.

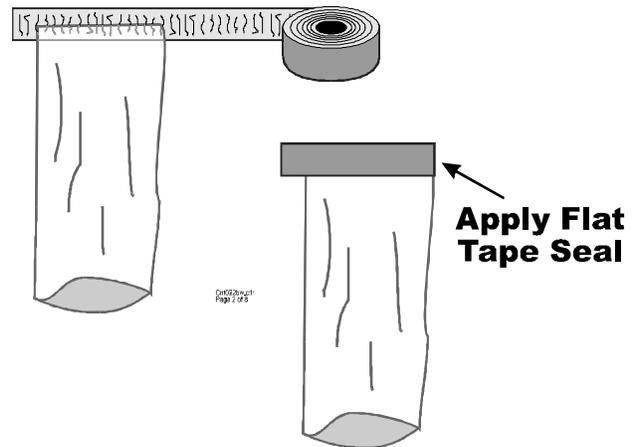
Tape the sleeving to the filter. Optional- install a hose clamps and tape over the hose clamp

Install Pass Sleeve (Transfer Sleeve)

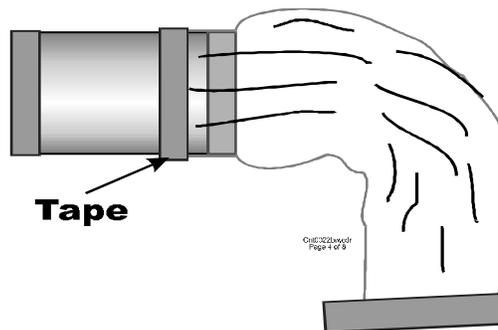


1. Cover sharp edges of pass ring (transfer cylinder) with tape.

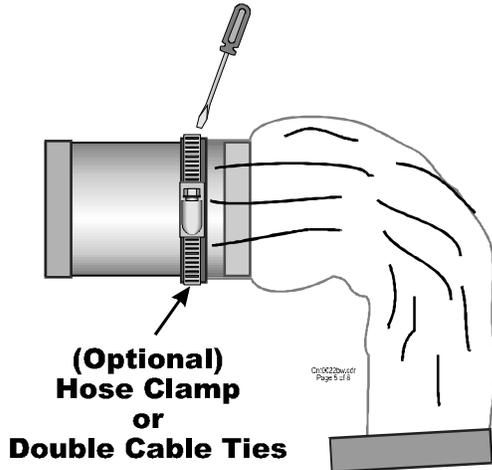
2. Seal one end of the sleeve, with a flat tape seal or J-Seal. This figure represents the flat seal. The J-Seal will be covered later in the text.



3. Slide the sleeving over ring, tape onto ring end as shown.



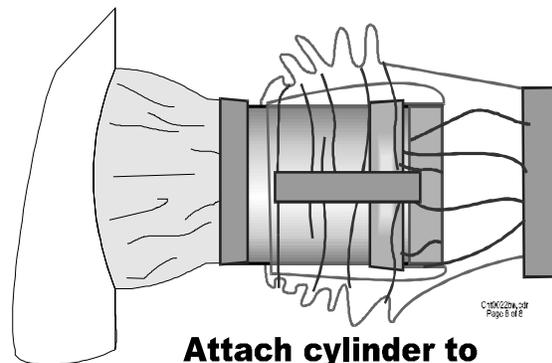
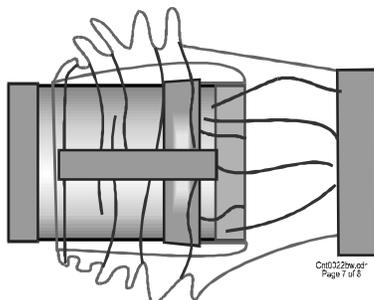
4. An **OPTIONAL METHOD** of attaching a service sleeve is to install a hose clamp or double cable ties to secure the transfer sleeve to the transfer ring. Tape is then put over the hose clamp or cable ties.

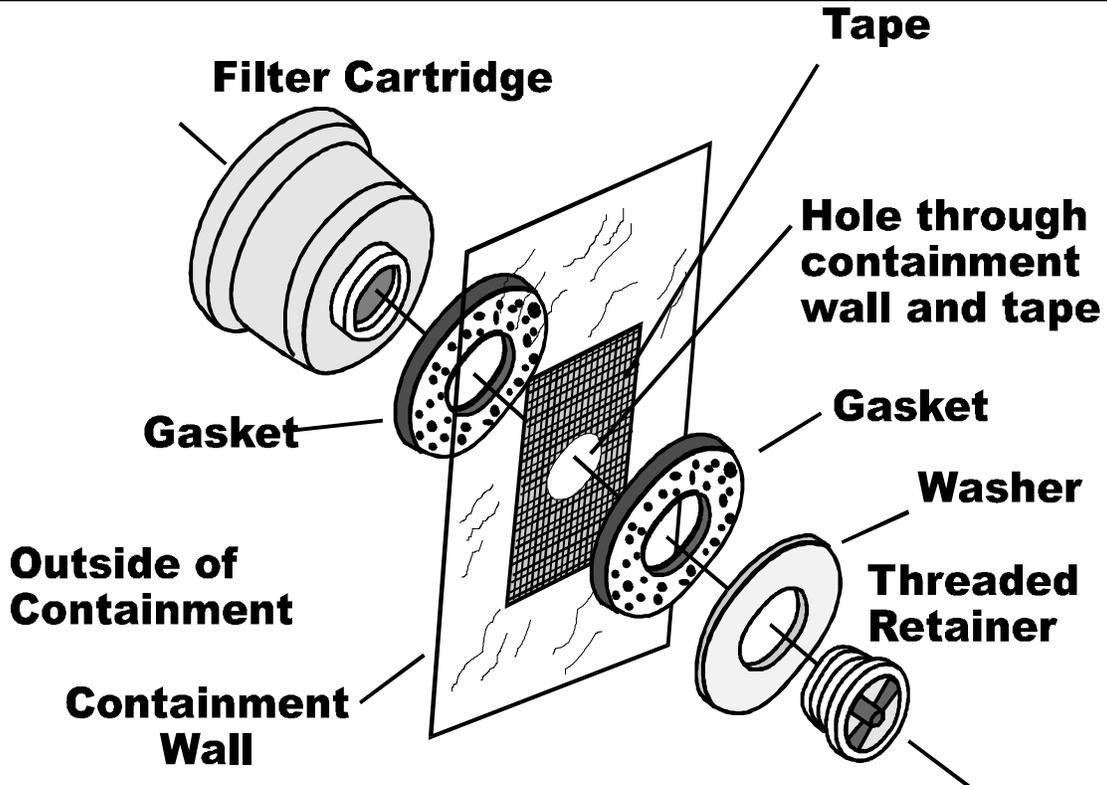


5. Push sleeving over ring, accordion as shown, and apply tape strips to hold sleeving in place.

6. Attach transfer cylinder to glove bag service sleeve. Secure with tape; clamp over tape, and then tape over clamp.

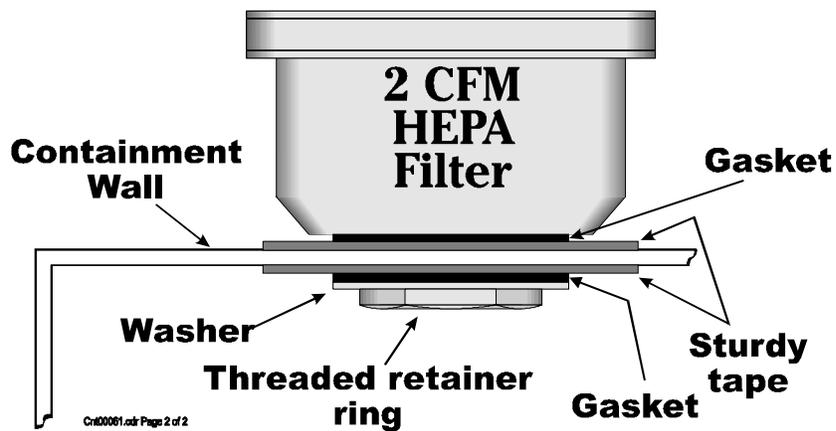
7. Ensure the transfer ring and sleeve are properly supported and not obstructing work area.





2 CFM HEPA Filter Installation

Cnt00060.cdr 1 of 2



Cnt00061.cdr Page 2 of 2

Installing a 2-CFM HEPA Filter

If a 2 CFM HEPA filter is required, ensure that the filter housing and filter elements are intact, and the threads on the filter are in good condition. Install the filter(s) in the highest practical position on the glove bag, at least one inch from seals, and as far away from the operators face as reasonable. Ensure that the filter(s) does not obstruct visibility of the work area.

1. Apply tape to an area (approx. 2" x 2") inside and outside containment in the area selected for the filter.
2. Cut or punch an appropriate size diameter hole through the tape.
3. Install HEPA filter as illustrated.

Drain System

If the presence of liquid is expected to be greater than can be dealt with using absorbent, a drain system may be needed. If a gravity drain is used in a glove bag, the drain should be installed in the lowest portion of the containment at least one inch from seams.

To install a drain:

1. Apply tape to an area (approx. 2" x 2") inside and outside containment in the area selected for the drain.
2. Cut or punch an appropriate size diameter hole through the tape.
3. Install drain fitting as illustrated.
4. Protect sharp edges (such as hose clamps) with tape.

This installation should be done as part of the prefabrication if you can determine the low point of the containment, however this is not always the case. Sometimes the drain must be installed after the containment has been installed at the site and prior to installing the drain collection system. The installation of the drain collection system will be discussed later as part of the installation at the site.

Note that if a drain is installed the containment must be water tested. Air testing of a containment is optional. For details of how to air test a glove bag refer the appropriate section of the 0749 manual.

Bungee Cord

See Chapter 1, page 2 for information on use of bungee cord.

Set up the Ventilation System

The ventilation system for the containment is checked. The containment may be designed with inlet filters. Check the filters to make sure they are clean before using. If powered ventilation is NOT used 30-40 CFM inlet HEPA filters may be used. Where a powered system is used, the system should be verified operational prior to each entry. This will be evident by containment sides bowing in and air rushing in through any penetrations. This can also be verified routinely by smoke testing. Air inlets should be secured when the tent is not in service. If the powered ventilation system is not in service and the containment will be used, the air inlets should be verified closed prior to any work.

Supporting the Glove Bag

Unlike tents, glove bags may be suspended off the ground, so extra care must be taken to support the bottom if heavy equipment will be used in the glove bag. Some glove bag frames have a metal bottom for added support and for catch containment pads.

Connect and adjust tie offs to obtain the best working position for the containment. Multiple methods of supporting glove bags exist, however, use of an external frame and elasticized supports is preferred. Large rubber bands or cords can be used in conjunction with nylon rope as illustrated, or bungee cord alone may be used.

Using elasticized supports, sometimes called shock supports, helps to prevent the glove bag from being torn during the work activity. Some applications may require an external platform under the glove bag to support heavy items. If a table is used to support the glove bag, padding should be used between the table and the glove bag.

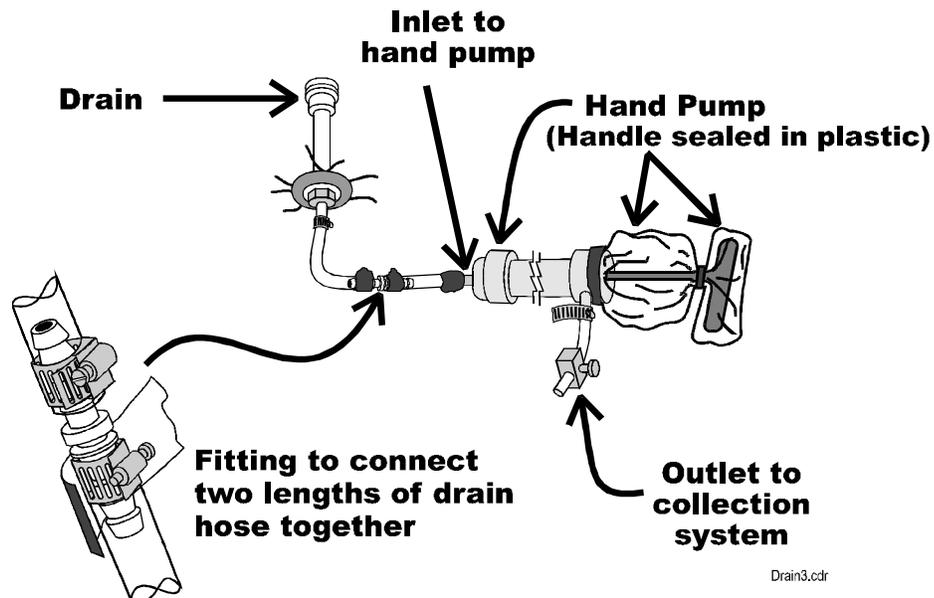
CAUTION: Ensure CAUTION/DANGER tags or other labeling devices are not obscured by the glove bag.

Installing a Drain Collection System

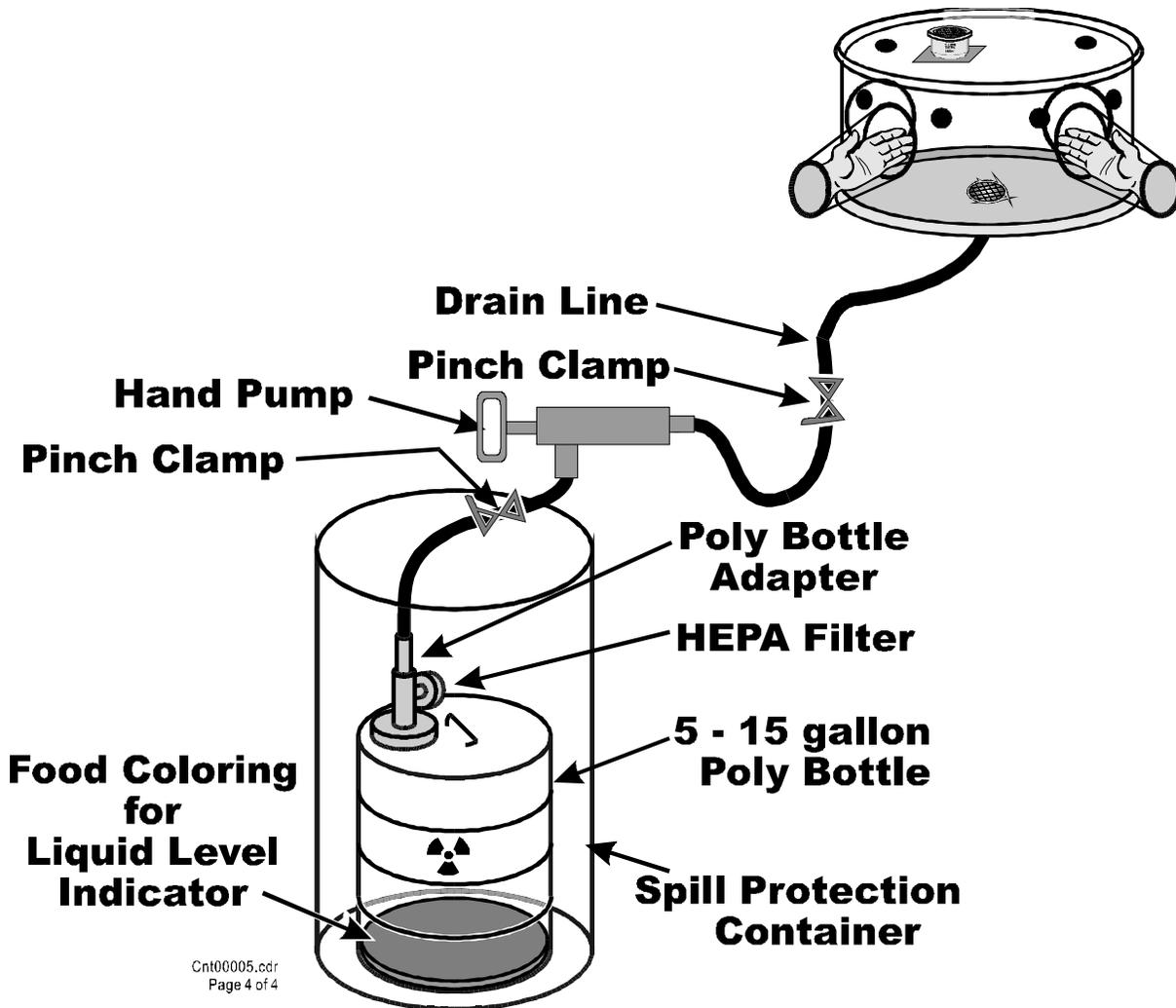
If a drain system is required, the drain fitting may have been installed as part of the prefabrication, but is usually installed at the site to ensure that the drain is in the lowest portion of the glove bag. The drain is connected to the appropriate collection system via a drain line. Ensure that the weight of the drain and attached drain line does not put undue strain on the lower seal of the glove bag. If the drain assembly will be subjected to stress, consider using a sealant when installing. If the drain line cannot drain by gravity, a Hand Pump Assembly may be connected between the drain and the collection system. After installation water test the drain and the collection system as a unit after installation even if the drain itself was tested during prefabrication.

Installing a Drain Collection System

Hand Pump Assembly



As we discussed earlier, the drain systems go to a facility drain or to a container such as a poly bottle system.



Installing a Poly Bottle Assembly

Radiological Control personnel should be notified before the installation or removal of poly bottles.

Limits and Precautions

POLYBOTTLES

LIMITS & PRECAUTIONS

The following are some limits and precautions associated with the use of poly bottle systems.

- Right size for volume and location
- Out of traffic and secured
- Leak test drain lines
- Cover hose clamps with tape

☞ The temperatures of liquids collected in poly bottles should not exceed 65 °C (150 °F) unless provisions are made to disperse the heat.

☞ Ensure that appropriate measures are taken to prevent freezing of the liquid in the temporary collection tubing and/or poly bottle.

☞ Precautions should be taken to prevent spillage of liquids during installation and removal of poly bottles.

☞ Prior to poly bottle use, verify each bottle to be installed has a label identifying the bottle's location and the liquid source to be collected.

☞ Prior to collecting liquid in a poly bottle, verify that dye (red or blue food coloring) has been added to the bottle as a visual aid for determining the liquid level.

☞ Poly bottles should have a maximum fill line which represents 75% capacity marked on the external surface. Bottles should not be filled above this line.

☞ Poly bottles should be equipped with a HEPA filter and a bottle adapter. The adapter provides a hose connection and a means of directing liquid flow to prevent moisture from contacting the HEPA filter media.

☞ The poly bottle size used for a particular installation should be adequate to contain the amount of liquid expected to be collected, but the weight of a full container may require a smaller size bottle be used for ease in moving full bottles.

- Notify Rad Control
- Hot liquids
- Freezing
- Spills (installing/removing)
- Dye
- 75% capacity mark
- HEPA filtered adapter

- ☞ Poly bottles should be located in low traffic areas and placed in a poly bottle containment and securely tied off to prevent tipping over.
- ☞ All drain collection lines and connections should be leak tested prior to placing the collection system in service. Where attached to a glove bag this step should be done in concert with the water test.
- ☞ Drain installation tubing connections should be secured using hose clamps covered with tape.
- ☞ Drain lines between poly bottles and catch containments should be arranged and supported so that low points where liquid can collect are minimized.
- ☞ Drain lines should be routed and secured in a manner that will prevent them from being inadvertently pulled out of their connections, pinched off or damaged in any way.
- ☞ Drain hoses should be identified at frequent intervals with "CAUTION-INTERNALLY CONTAMINATED" tape.
- ☞ Poly bottles should not be stacked. This applies to installed bottles, filled bottles, and those awaiting removal from the collection area.
- ☞ Poly bottles containing liquid should be moved using techniques that avoid tipping.
- ☞ Poly bottles shall not be used with solutions containing or systems that may contain fissile materials unless evaluated by criticality engineering.
- ☞ When it becomes necessary to tip a poly bottle in order to remove it from interference, remove the fill and vent assembly and install the bottle plug prior to moving.
- ☞ Requirements for installation and amount of liquid expected should be determined and all necessary sketches, drawings, and plans for the installation have been approved and are available to be used with the work procedure.
- ☞ All required system isolation, tagging, draining and venting should be completed before the installation of the system.

- **Line drains**
 - **No low points**
 - **Won't get pulled out or pinched closed**
- **Lines "CAUTION-INTERNALLY CONTAMINATED"**
- **Don't stack bottles**
- **Don't tip bottles**

- **Fissile material requires Criticality review**
- **Remove adapter to move**
- **Install per work document**

- **Assemble as much as practical outside radiological area.**

- ☞ All required tools, equipment and protective equipment should be assembled, and the system assembled (as much as is practical) outside of the radiation/contamination areas.

- ☞ If the poly bottle collection assembly is to be connected to a system line fitting, the drain hoses should be connected to the poly bottle and the entire drain collection system leak tested prior to line fitting connection.
- ☞ If however, the collection assembly is connected to a catch containment, the assembly should be leak tested in place.

Gather the Equipment

The following equipment and supplies should be used to perform this process:

- Protective clothing
- Poly bottle(s), bottle adapter(s) and HEPA filters required by the installation design
- Clear Tygon¹ tubing of length, size, and wall thickness required by the installation design. If the tubing is too thin, it may bend and obstruct the flow.
- Hose clamps, pinch clamp as required by the installation design and tape.
- Hand tools required to install drain fittings and drain hose.
- Plug wrench for removing and reinstalling poly bottle plugs.

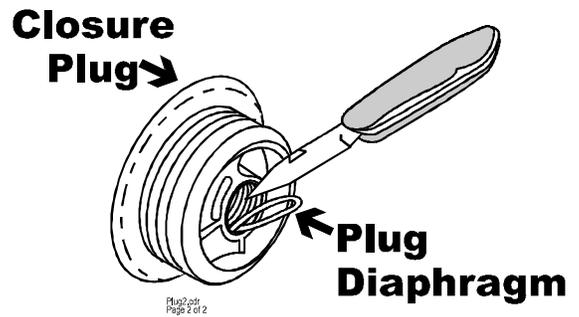
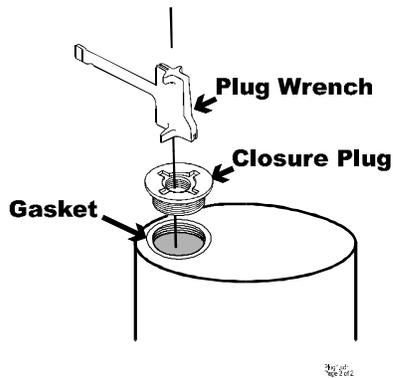
Poly Bottle Equipment

- Protective clothing
- Poly bottle, adapter, HEPA filter
- Tygon tubing
- Hose and pinch clamps, tape
- Hand tools & plug wrench

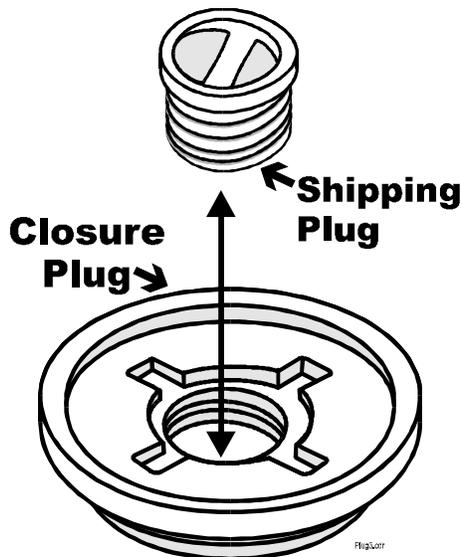
¹ Tygon is a registered trademark of U.S. Stoneware Co.

Installation of Poly Bottle Adapter and Filter

1. Inspect the poly bottle and poly bottle containment and ensure they are in good condition and free of damage or holes.
2. Remove the poly bottle closure plug and cut out plug diaphragm.



3. Remove the shipping plug from the closure plug (if included), place it in a poly bag and tape it to the top of the poly bottle.

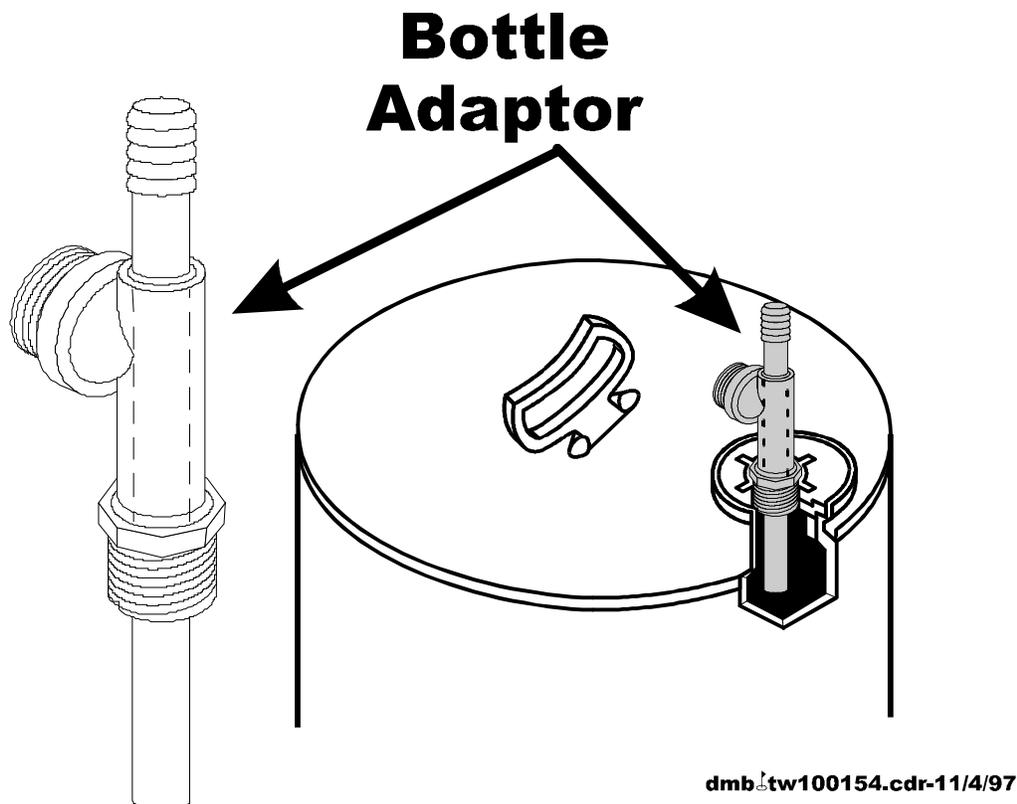


4. Reinstall the closure plug gasket.
5. Reinstall the closure plug and tighten it snugly with a plug wrench.

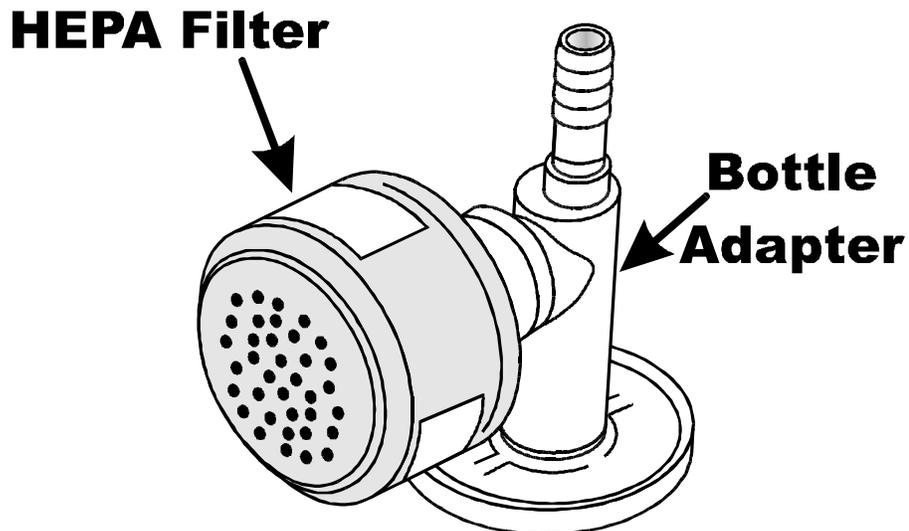
CAUTION: Over-tightening the closure plug may cause damage to the plug or the bottle opening.

6. Screw the bottle adapter into the closure plug, ensuring that the filter connection faces inward as illustrated.

CAUTION: Failure to install the bottle adapter so the filter connector faces inward could result in damage to the filter and/or the adapter.



7. Ensure the filter rubber gasket is properly in place.
8. Screw the filter on to the filter connector and tighten snugly by hand.



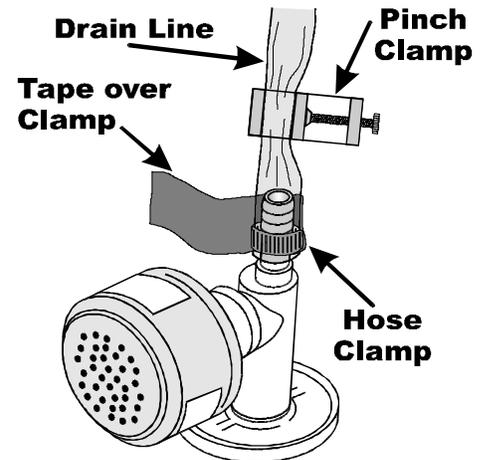
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CAUTION: Over-tightening the bottle adapter or HEPA filter may cause damage to these components.

Installation of Poly Bottle at Collection Location

Once the adapter is in place the bottle may be transported to the collection site. Verify that the poly bottle to be installed has a properly filled out identification label attached. Ensure that the location of the poly bottles is in a low traffic area as near as possible to the point of collection.

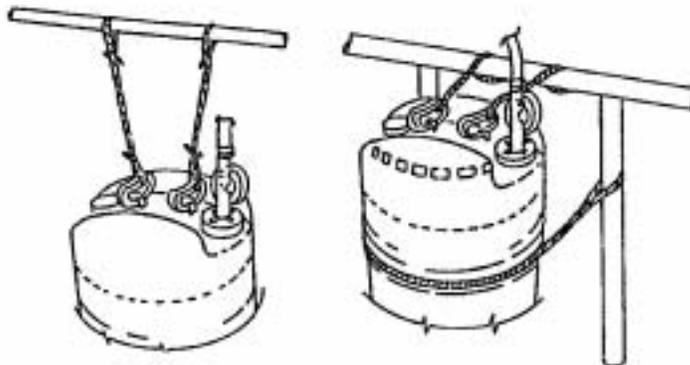
1. Install the drain hose (usually Tygon) onto the barbed fitting of the bottle adapter as illustrated.
2. Install and tighten a hose clamp to secure the drain hose to the bottle connector.
3. Install tape over the hose clamp.
4. Route the drain hose between the poly bottle and the collection drain point.
5. If the arrangement of the drain installation will not support gravity draining to the poly bottle, install a hand pump between the collection point and the poly bottle to facilitate pumping the liquid to the poly bottle. The pump should be sleeved as shown earlier.



Drain Hose Installation

NOTE: If a hand pump is installed, ensure that it is installed in the vertical position with the suction of the pump at the lowest possible point in the collection system.

6. Connect the drain hose to the designated drain connection.
7. Attach an identification tag (indicating the source of the fluid) to the drain line near the poly bottle.
8. Place the poly bottle in a poly bottle containment at the desired collection location and secure it in place.



NOTE: Rigid structures such as hangers, stanchions or other components should be used to secure poly bottles.

9. Close the top of the poly bottle containment, if applicable.

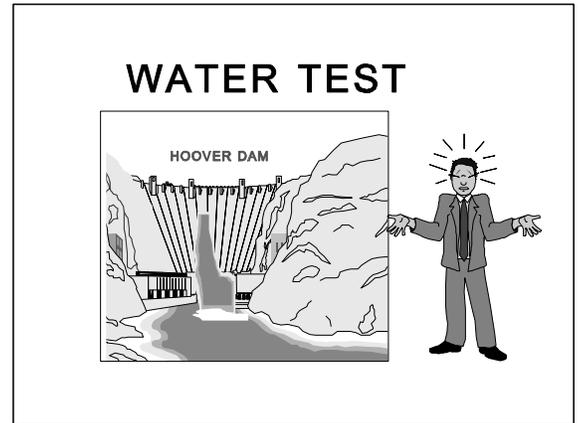
Securing Poly Bottles to Prevent Tipping.

Water Testing

Water tests are often used to test the integrity of glove bags and drain collection systems before installation and following installation but before use. A water test may be part of the prefabrication of glove bags fabricated in-house with non-heat-sealed (glued or sewn) joints.

If a water test is required, sufficient liquid should be used to adequately test the containment under expected or likely use conditions. As a minimum 500 ml should be used.

1. Secure drain line with pinch clamp or crimp and tape.
2. Pour approximately 500 ml of water through an available opening being careful not to wet the outside of the containment; use enough water to "puddle" around any lower penetrations or seals (e.g., drain fitting). It is a good practice to pour some water down the drain hose and check all the connections for leaks.
3. After approximately 2 minutes, check for leaks.
4. Correct deficiencies if practical, or reject the containment.
5. Loosen the "pinch" clamp to allow flow through the drain line to the poly bottle. Ensure that the liquid flows freely from the containment to the poly bottle. Remove water from the containment after completion of the water test and before start of work.



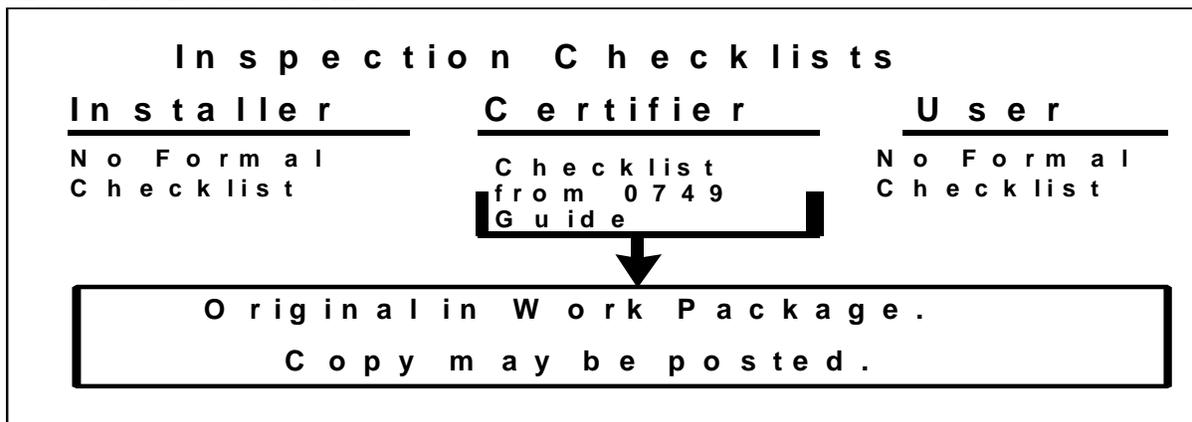
Inspections and Certifications

As discussed earlier, inspections of radiological containment devices is a critical part of installing and using them. All radiological containment devices must be inspected by the installer after the installation is complete and by the user before each use of the containment. Glove bags, tents, and partially roofed enclosures must also be independently inspected and certified by the Radiological Control department. All of these inspections are essentially the SAME inspection conducted by different people. This is a good method of independent verification. The primary difference between the inspections is how they are documented. ONLY the inspections of glovebags, tents, and partially roofed enclosures are documented, and the inspections by the installers, certifiers and users are documented differently.



Inspection Checklists

At this time PHMC does not use a formal inspection checklist for the installer or user of the containment. The HPT or designated certifier who conducts the second inspection uses the glove bag or tent certification checklist in the work package. These checklists are found in the 0842 procedure and closely match the ones in the 0749 manual. Refer to the sample checklists on the next two pages. The tent checklist should be used for the partially roofed enclosures. The checklist must be retained in the work package, but a copy may be posted on or near the containment for reference purposes. The installer may use a copy the checklist for the initial inspection, but this copy does not have to be saved or filed. The user may likewise use the checklist to conduct the inspection prior to using the containment, but again any copies generated by the user are not saved or filed.



SAMPLE CONTAINMENT TENT CERTIFICATION CHECKLIST

<u>Containment Tent Certification Checklist</u>		
<u>Location</u>		<u>Work Package #</u>
<u>Activity</u>		
<u>Check if waived *</u>	<u>Check if adequate at installation</u>	<u>CRITERIA</u>
		1. <u>The tent is free of tears, loose seams, cuts or other loss of integrity.</u>
		2. <u>The tent is properly oriented and supported.</u>
		3. <u>Sharp objects are properly covered to prevent inadvertent penetration of the tent.</u>
		4. <u>Installed services use service sleeves and are taped.</u>
		5. <u>Unused service sleeves are sealed or taped closed.</u>
		6. <u>Radiological postings and protective clothing removal procedures are prominently posted at the entrance/exit.</u>
		7. <u>Proper lighting is provided.</u>
		8. <u>Doors work properly.</u>
		9. <u>The tent seal to the component is properly made.</u>
		10. <u>If HEPA filtered ventilation is used, the system is properly installed, including connections, proper labeling, proper flow, and current efficiency test label.</u>
		11. <u>Step-off pad(s) and clothing and waste receptacles are in place.</u>
		12. <u>If welding, grinding, or burning is to be done inside or near a containment tent, the affected areas are covered with flame-resistant materials.</u>
		13. <u>The inspection certification is posted on or near the containment.</u>
		14. <u>Other</u>
		15. <u>Other</u>
		16. <u>Other</u>
<u>Comments:</u> _____ _____ _____		
<p>*Checkoffs in this column must be supported by comments and/or approval signatures. If no criteria are waived or added, approval signatures are not required.</p>		
Approval: Health Physics _____ Operations _____		

SAMPLE GLOVE BAG CERTIFICATION CHECKLIST

Glovebag Certification Checklist		
<small>Location</small>	<small>Work Package #</small>	
<small>Activity</small>		
Check if Waived *	Check if adequate at installation	CRITERIA
		1. The glovebag is free of holes, tears, or defects in materials.
		2. Components and surfaces inside the glovebag are covered to minimize decontamination.
		3. The containment is protected from sharp objects, internal and external.
		4. The glovebag and installed service sleeves are properly supported.
		5. The gloves are properly attached and free of cracks, splits, or holes.
		6. The glovebag seal to the component is adequate and inside seals are used (if possible).
		7. The glovebag is properly aligned to allow access to the work.
		8. If a drain is used, it is located in the low point of the glovebag, is unobstructed, and is securely fastened to an appropriate collection system.
		9. If a vacuum is used with the glovebag, it is HEPA filtered and has a current efficiency test label.
		10. Other
		11. Other
		12. Other
<p>Comments:</p> <p>* Checkoffs in this column must be supported by comments and/or approval signatures. If no criteria are waived or added, approval signatures are not required.</p> <p>Approval: Health Physics _____</p> <p>Operations _____</p>		

Initial Inspection

When the installer completes the installation and initial inspection of the containment, he or she records on the Containment Identification Tag (BT-6000-787) the number of the work package used to install the containment or the number of the work package that will be used to conduct the work in the containment, the installer's name, and the date. The installer's signature on the ID tag documents that the inspection was conducted by the installer on that date and the containment found it to be adequate for the job. The installer posts the identification tag on the containment.

NOTE: The certifier may need to witness any leak testing of the containment done by the installer in order to provide certification.

Containment Identification Tag

Work Package No. ETF-97-00330/0					
Installed By I.M. Worker		Date: 11/7/97			
Initial Inspection By		Date:			
Record of Routine Inspection					
Date	Time	Signature	Date	Time	Signature

BT-6000-787(08/93)

Independent Inspection

The HPT or designated certifier performs the second inspection and checks for the same things that the installer did plus verifies that the installer signed, dated and posted the ID tag. The certifier checks off the items on the checklist, under the “Check if adequate at installation” column. The approval signatures from Health Physics and Operations are ONLY required if any of the items on the checklist are waived or new items are added. For a partially roofed enclosure, part of item 1 on the tent checklist, would be waived (“The tent is free of tears, loose seams, cuts or other loss of integrity.”). For a tent, having the roof off would constitute “loss of integrity”, but is allowed for a partially roofed enclosure. The other parts of the item would apply, i.e. no tears, loose seams, etc. A comment may be added to the checklist indicating that the tent is being used as a partially roofed enclosure. A comment for a waived item is not required, but the approval signatures are. Once the checklist has been completed, the certifier records his or her name, and the date of the inspection on the Containment Identification Tag. The certifier’s signature documents that the INITIAL INDEPENDENT inspection was made and the containment is ready to use. The tag must remain posted on the containment device as long as it is installed.

Containment Identification Tag

Work Package No. ETF-97-00330/0					
Installed By I.M. Worker		Date: 11/7/97			
Initial Inspection By M.E. Tou		Date: 11/8/97			
Record of Routine Inspection					
Date	Time	Signature	Date	Time	Signature

BT-6000-787(08/93)

User Inspection

If the containment will be used by someone other than the personnel who installed or if the installer/user was not present when the certification inspection was conducted, the user should inspect the containment again, checking the same items inspected by the installer and the certifier plus verifying that the ID tag is posted and the certifier signed and dated the ID tag. If the user of the containment is the same as the installer and was present during the certification, then the user need only verify that the ID tag is posted and the certifier signed and dated the ID tag.

User Verifies Certification <u>Current</u>
<u>Recertification</u> <u>done each day of use</u>

If the containment remains in place, it must be re-certified each day that it is USED, or the same day that it will be used again. For an instance if a containment tent with a powered exhauster is installed over an open pit to contain the contamination in the pit, it would need to be re-certified each day. If a tent is installed for a pipe jumper change that was started and completed on the same day (Monday), but was left in place for another jumper change on Friday, the tent would only have to be recertified on Friday before the start of the work. For recertifications the certifier performs the same inspection, records the date and time of the inspection and signs the tag.

The user is expected to verify that the certification signature on the ID tag is current prior to using the containment.

Work Package No. ETF-97-00330/0					
Installed By I. M. Worker				Date: 11/7/97	
Initial Inspection By M. E. Tou				Date: 11/8/97	
Record of Routine Inspection					
Date	Time	Signature	Date	Time	Signature

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The back of the Containment ID tag also lists some of the items to be inspected. These reminders and the certification checklists are both useful tools for conducting inspections of containments.

Containment Identification Tag (Back)

Routine Containment Tent Inspection

1. The containment tent is properly supported to hold its own weight and internal
2. negative pressure (if negative ventilation is provided).
3. The containment floor has no tears and/or punches.
4. All seams are complete, no holes or tears are present in the fabric.
5. Tools and equipment are properly stowed.
6. Housekeeping is adequate.
7. Identification tag is installed.
8. The external of the containment has no removable contamination.
9. Exit and unsuiting instructions are posted.
All Velcro and zippers are operational.

Routine Containment Inspection-Glove Bag

1. The glove bag is free of holes, tears, or defects in the containment materials;
gloves are free of cracks, splits or holes. NOTE: If holes are noted, install
2. a
3. service required tag, survey and tape the affected area.
4. Materials in the glove bag are properly stowed (i.e., no sharp edges
5. exposed).
Ensure Containment ID tag is installed.
6. The external of the containment has no removable contamination.
Glove connections, sleeve rings, and clamps are covered with cloth-backed tape.
Supports are adequate.

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Things to Inspect

The certification checklists and ID tags cannot list all the things that may require inspection. On the following pages are some things to consider when conducting the inspection whether as an installer, certifier or user.



Containment Is Free of Tears, Loose Seams, Cuts and Other Loss of Integrity

Make sure it has no tears or loose seams. Give special emphasis to those areas where higher levels of contamination will be present. Inspect all seams. Using the thumb, apply moderate pressure to the seam to verify it is completely sealed. Inspect the seams where sleeves attach to the containment, tug on the sleeves to verify the connection is sealed. Ensure that gloves are properly attached and free of cracks, splits or holes.

NOTE: At colder temperatures many plastics become stiff; this can make many simple operations very difficult. For example it is very difficult to change a pass out sleeve or tape up a service lead in cold weather. For tents, little can be done unless the tent can be heated. For glove bags, polyurethane is a viable alternative as it maintains flexibility in extreme cold.

Components and surfaces inside the containment are covered to minimize decontamination.

Non-essential surfaces that could become contaminated during work should be covered with tape or plastic materials.

Labels Not Obscured

Glove bags installed on valves or switches should not cover the identification plates, if possible. Notify the PIC to have temporary label plates installed, if required.

Containment is properly orientated

A person working in the glove bag must be able to reach the work. Verify the alignment of the glove bag is such to minimize interference. Ensure the right and left hand gloves are installed in the proper sleeves with the thumb tilted slightly inward.

Containment Is Properly Supported

The tent walls should be supported so they are not bunched or sagging and not collapsed when the HEPA-filtered ventilation is operated. Adjustments to the elastic cords may be required. Services that pass through service sleeves of a glove bag, or above ground level of a tent, should be independently supported. The elastic cord supporting the glove bag should have sufficient give so the worker will not damage the bag during work operations.

Sharp Objects Are Properly Covered to Prevent Inadvertent Penetration of the Containment

Corners of sharp objects outside the glove bag should be padded or taped. Protective covers should be in place on components near the glove bag that could be damaged during work. Sharp tools used in the containment should be kept covered when not in use.

If sharp or heavy objects are going to be used inside a tent, a liner made from metal, wrapped plywood or other padding on the floor may be needed to prevent damage to the floor.

Installed Services Use Service Sleeves and Are Taped

All services should be supplied through service sleeves instead of doors or slits in the containment. The length of each service in the containment should be long enough to perform its function but not a large amount of extra material that will create additional radioactive waste.

Unused Service Sleeves Are Sealed or Taped Closed

Check each unused sleeve to ensure it is sealed or taped properly. All service sleeves should be securely taped if the membrane has been cut.

Radiological Posting and Protective Clothing Removal Procedures Are Prominently Posted at the Entrance/exit

Radiological posting should be visible. For tents the postings must be visible with the door open or closed. The undressing sequence must be posted in the undress area. The RWP must be posted or readily available in the work package.

Proper Lighting Is Provided

The clear windows in tents will generally allow sufficient light for daytime operations, but if lighting is installed it should be checked as part of the inspection process. This is particularly important for night work. If exterior lighting is provided for glove bag work, ensure that the lights do not create a glare on the plastic that will interfere with the visibility in the glove bag. If the lighting needs to be adjusted, remember that natural or fluorescent lights are preferred. If incandescent droplights are used they **MUST** be enclosed, and should always be less than 50 watts. Care should be taken with positioning the lights, as they can soften or melt the plastic of the containment.

Precautions for Welding, Grinding or Burning

If welding, grinding or burning is to be done inside or near a containment, the affected areas are covered with flame-resistant materials.

In addition to the flame resistant materials inside the containment, a fire extinguisher should be immediately available, and a fire watch maintained.

Containment Seal to the Component Is Properly Made

This is critical. If the containment is sealed to a component and then loosens during work, high levels of contamination could be spread. Where possible, the seal should be made with clamps, double sided tape, cable ties, bolting rings, etc., rather than just taping to the component. The more positive this connection, the less chance it will fail during work.

If HEPA-filtered ventilation is used, the system is properly installed, including connections, proper labeling, and testing is current.

If a powered ventilation system is used, the system should be verified operational prior to EACH use of the containment. Verify there is a measurable in-flow of air into the containment by observing for a bowing in of the containment walls. Direction of airflow in a tent can be observed at the door by checking with a smoke tube or a powder "gun". Ensure that loose materials such as tape and rags cannot be sucked into the ventilation and plug the filter. Check the in-take filters too. Air inlets should be secured when the containment is not in service. If the ventilation is not in service and the containment will be used, dampers should be verified closed prior to any work.

Step-off Pad(s) and Clothing and Waste Receptacles Are in Place

The number and locations should match the RWP and the posted undressing sequence.

Access Points Are Functional

Check the operation of all tent doors; if possible, to make sure they work properly. If not, make a close visual inspection. Zippers tend to fail where they turn corners. If the door was made so that it can be locked by lacing wire through grommets (or equivalent), make sure the door can be locked properly. Verify that all accesses into the containment, i.e. pass out boxes, and equipment openings, are sealed appropriately before beginning work.

Drain System Is Adequate and Secure

If liquids will be deliberately introduced into a containment during the job, verify that a "leak test" has been performed as part of the installation process. Drain fittings should not be blocked with absorbent material and the drain should be connected to an appropriate collection device and to the lowest point of the containment when possible.

Vacuum Cleaner or Portable Exhaust System is HEPA Filtered and Has a Efficiency Test Label

If a vacuum cleaner is used with the containment, verify that it has a HEPA filtered exhaust, and has had an aerosol in-place leak test (commonly called DOP test). If the date on the test sticker will expire before the job is complete, consider retesting the vacuum cleaner now or replace with a different vacuum cleaner. Operate the vacuum cleaner to ensure that it is functioning and for

glove bags that it does not collapse the bag during use. If a vacuum cleaner is used on a system that contains fissionable materials, a nuclear safety review may be required to address nuclear criticality issues.

Provisions Have Been Made for Pneumatic Powered Tool Exhaust

If pneumatic powered tools will be used in the containment verify that the discharge will not interfere with the ventilation of the containment. A remote exhaust hose may be attached to the tool or for a glove bag; the vacuum cleaner could be operated while the tool is being used.

Containment ID Tag is Posted

The Containment Identification Tag must be completed and attached to the containment.

Introduction

In this segment we will discuss using containments to conduct work and removing the containments when the work is done. We will also cover good decontamination and ALARA techniques, as well as donning and doffing anti-contamination clothing.

Preparations for Using Containments

There are certain preparations and prerequisites for using radiological containments. In the following section we will discuss each in detail.

Prerequisites

The prerequisites for using a containment are that you be trained, inform the Rad Control group, discuss it at the pre-job, and conduct a visual inspection of the device.

Training

You must be trained to use a radiological containment device. Radiation Worker I or II training does not currently provide training on working with containment devices. As recommended in the 0749 manual, all personnel who work with containment devices in PHMC facilities MUST complete training. The specific courses that meet this requirement should be identified by your manager.

Before You Use It

- Be trained
- Inform Rad Control
- Discuss it at the pre-job
- Visual inspection

Notification

You must notify the Radiological Control Organization before working with a containment device.

Discuss it at the Pre-Job

As with all activities involving radiological work, using a containment should be discussed at the pre-job with all members present. For very complicated jobs a mock-up of the device may be used for a walk-down or mockup training.

Visually Inspect the Device

Visually inspect the device before using it. This applies to all containment devices, certified or non-certified. The inspection by the user is conducted in the same manner as the inspection conducted by the installer of the device with one addition. As discussed earlier, tents, partially roofed enclosures, and glove bags MUST be certified by Radiological Control. For these devices, as part of the user's inspection, you must *verify that the certification is current, as*

ALL containment devices
(even non-certified)
must be inspected before

evidenced by a current signed Containment Identification Tag. If the tag is missing or out of date notify Radiological Control immediately and DO NOT use the containment. A copy of the containment checklist may also be posted. The certification checklist contained in the work package is a good reference for conducting your inspection.

Hazards & Precautions

As with all industrial work, there are hazards associated with using radiological containments.

The major hazards are: spread of contamination; contamination of the workers; injuries, such as strains, cuts, etc.; health risks, such as heat stress.



What could possibly go wrong?

- Worker contamination
- Injuries
- Health risks
- Spread of contamination

DO's and DON'T's

Some of the things you can do to minimize the hazards are:

- If a containment support must be moved, ensure that it will provide the same support as the original location.
- Use only facility ventilation, high-efficiency particulate air (HEPA)-filtered vacuum cleaners, or portable HEPA ventilation units to exhaust from a containment.
- Do not overload containments. Install hooks, staging, or other supports to suspend or support heavy tools, materials or components.
- Additional protective gloves should be worn to protect hands from contamination if the containment gloves are at risk of being punctured or cut.
- Durable work gloves may be worn inside the containment over the containment gloves when needed to prevent puncturing of containment gloves.
- Sharp edges of unused tools and equipment should be covered to prevent puncturing of the containment.
- Wear the proper protective clothing.
- Potential health and safety issues associated with the use of anti-C clothing must be identified and addressed prior to the beginning of work.
- If the potential for heat stress is a concern, the supervisor planning the work should ensure that Industrial Hygiene is included in the job planning process.
- Individuals should express concerns and suggestions to their supervisors or to representatives of the appropriate health and safety discipline.
- Maintain Fire watch as needed.

DO's and DON'T's

- Check supports when you move device
- Only HEPA units for exhausting devices
- Don't overload, support heavy tools

DO's and DON'T's

- Use protective gloves inside and outside of containment gloves
- Pad sharp edges
- Wear PPE
- Think heat stress & fire

ALARA Techniques

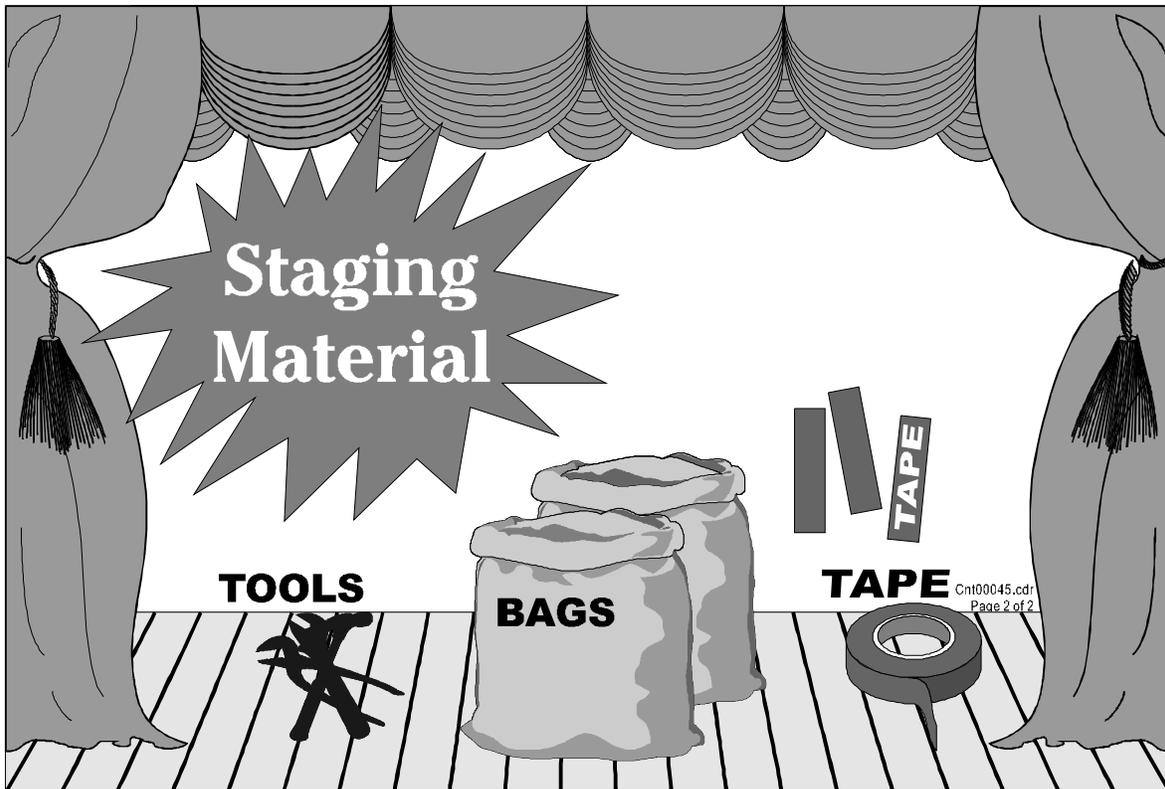
In this section we will discuss some ALARA techniques for preventing the spread of contamination and minimizing radiation exposure to personnel when using radiological containments. Being aware of the hazards is half the battle. The rest is being prepared, by having the right equipment and following the procedure.

ALARA Techniques



Staging Work Materials

Be prepared. A key ALARA technique is to stage all tools and materials in the containment prior to beginning the work. This may be performed under a different RWP with fewer controls than the one used for performing the work activity. The protective clothing and respiratory requirements may also be less restrictive. For example, supplied air may be required for entry into a tent. In addition to the tools and equipment needed for the job and small strips or patches of tape can be staged inside and outside the containment to provide patching material, and for covering sharp edges when needed.



Things to Remember

Procedures are great, but they can't contain ALL the things we should remember. Here are some things to keep in mind when working with containments.

All doors, sleeves, and roof hatches should be closed, before the start of work, unless specifically mentioned in the certification checklist (as with a partially roof enclosures). If the tent is certified with the hatch closed, get Radiological Control approval before opening it to move equipment. Gloves and glove sleeves should remain inside the glove bag after removing hands from glove bag gloves.

Things to Remember

- Seal the openings
 - Doors, Sleeves, Roofs
- Surveys
 - Pre-job, During work
- Use Drop Cloths
- Decon as you go
- Check for damage after each activity

Each job should have assigned contamination limits for both inside and outside the containment. Surveys should be performed during the job to ensure the contamination levels remain within the pre-job guidelines. Contamination levels inside the containment should be minimized by use of good work practices such as placing tools, and components onto a drop cloth instead of the containment floor. It may be necessary to stop work and decontaminate the containment in order to keep the contamination levels as low as reasonably

Things to Remember

- Check daily certification
- Control Waste
 - Take in only minimum
- Don't overload supports
- Keep drains open
- Leave glove sleeves in when not in use

achievable (ALARA). Surveying your hands each time they are removed from the glove sleeves is also a good practice, and can alert you to a pinch or cut in your gloves.

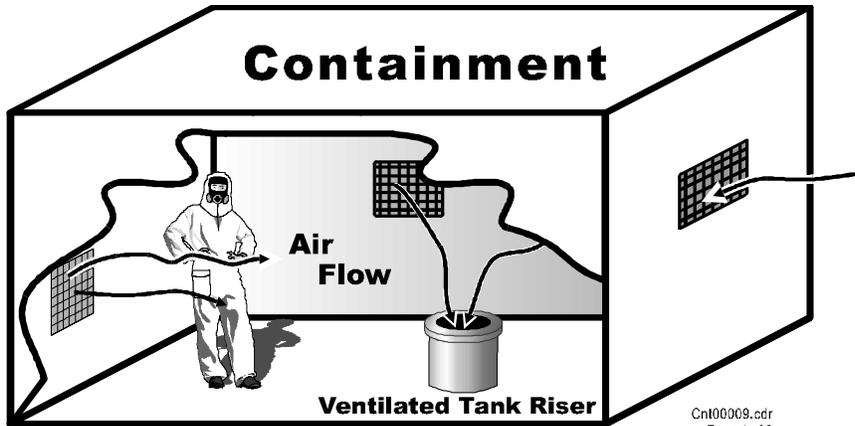
The containment should be inspected for wear, punctures, etc. by the user, after each activity. When containments are left in place, personnel, trained to certify them, must perform and document a daily inspection, by signing and dating the Containment Identification Tag. Use of chemicals in a containment should be evaluated carefully as some chemicals can cause the fabric to deteriorate.

Materials kept in the containment should be minimized to control the amount of waste produced and to eliminate tripping hazards in tents.

Do not step on temporary drains or drain collection systems. Do not step on containments or use them to support other equipment unless the containment or support device is specifically designed for this purpose.

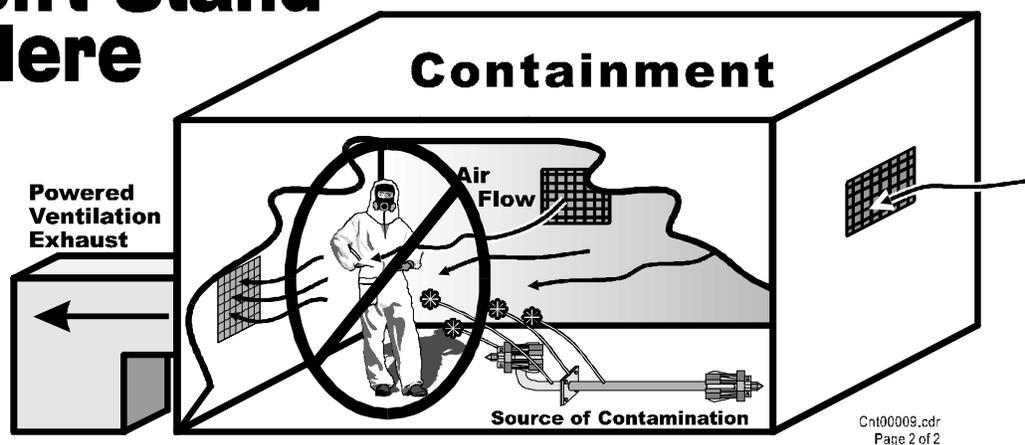
Consider Ventilation System Configuration

Tents over negatively ventilated equipment do not usually have powered ventilation systems to remove contamination, because the airflow is drawn through the foam filters of the tent into the equipment by the ventilation system.



On non-ventilated systems or when a tent is used as a temporary decon facility, a powered ventilation system may be required by the work package. If it is don't stand between the exhaust duct and the source of contamination.

Don't Stand Here



Review and Follow the RWP

ALWAYS review the RWP before you use a containment or make a tent entry. This is emphasized in Lessons Learned GI-96-03, which was issued following an evaluation of entries and exits of radiological controlled areas. The lessons learned quoted the verbiage from the HSRCM, Article 322.6, "RWP's are posted at access points to the radiological work areas where work is ongoing. (322.6)"

For work in tents, the RWP may be posted on the tent (in addition to being posted at the ACES station) or be readily available in the work package, if one is used. Whether setting up a glove bag, entering a tent to set up a job, or performing the work, always check the RWP before EACH entry, and wear the protective clothing as identified on the RWP. If the RWP is not posted, or readily available for review, contact the HPT, the PIC for the job, or your manager.



Apply Human Factors Techniques

Wear the protective clothing (PC's) listed on your RWP. It's for your protection. But PCs alone are not enough to protect you. Proper care must be taken while conducting the work. Applying Human Factors-Based Techniques while doing the job is a powerful technique for preventing skin or clothing contamination. You will recall from your Human Factors-Based Techniques training that the most common problems are:

-
- **Touching the face with contaminated gloves**
 - **Entering a Contamination Area (CA) without the proper PPE**
 - **Improper removing (doffing) of Anti-Cs.**
-

Complacency

One factor that influences our adherence to Human Factors-Based Techniques is complacency. The current tendency of using a full set of PCs for any entry into a contamination area, regardless of the activity, fosters a sense of complacency. Using a full set of PCs for routine surveillance activity can re-enforce poor work habits because the amount of contamination is small and the poor habits do not result in skin contamination. The poor habits may be carried over to higher risk activities that use the same level of PPE and lead to the spread of contamination.

Complacency...

...Effects human factors.

Using full set of PCs for routine CA entries can reinforce bad habits that are carried over to higher risk jobs.



7 RadCon Rules to Remember

These 7 Rs (RadCon Rules to Remember) can help to reinforce your Human Factors training.

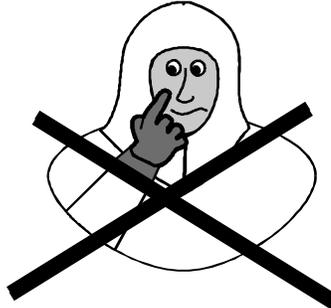
Rule #1

Don't touch your face when in a CA.

Rule #2

If you have to touch your face:

- * Remove your outer work gloves
- * Have your face and hand surveyed
- * If in doubt about contamination on work glove, change it out.



Rule #3

If rule #2 CANNOT be applied, see rule #1.

Rule #4

Reaching across the boundary of a CA is an ENTRY.

Rule #5

Decon as You Go

Workers at an internationally known chain of fast food/burger restaurants learn the Clean as you go method. They are taught to clean up the food preparation area at regular intervals rather than waiting until the end of the shift. This prevents unhealthy situations from occurring. This concept can be applied to radiological work too. Pausing to have surveys taken and to do decontamination as the job progresses can alert you to drastic changes in radiological conditions as well as preventing the spread of contamination.

The 7-R's

RadCon Rules to Remember

Rule #2

- If you **MUST** touch your face...
 - Remove your outer gloves
 - Have your face and hand surveyed first
 - Put on new glove if you think old one is contaminated.

Rule #3

- If you **CANNOT** apply Rule #2...
 - Then Rule #1 applies

Rule #4

- Reaching across the boundary of a CA is an **ENTRY** into the CA

Rule #5

- Survey/Decon as you go:
 - Alerts to changing conditions
 - Limits spread of contamination.

Rule #6

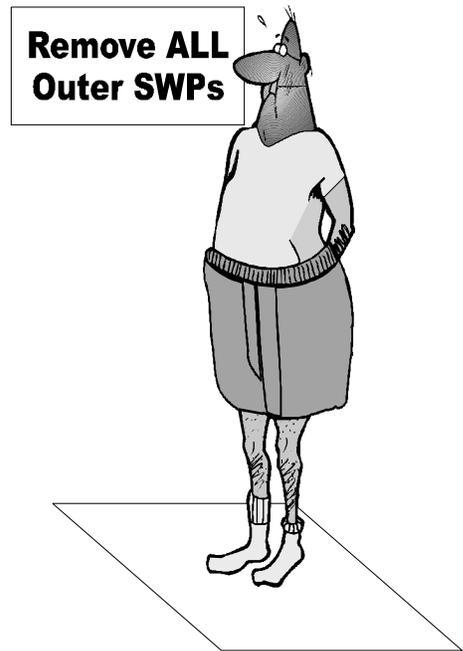
Instructions for removing protective clothing **MUST** be posted adjacent to the step-off- pad in accordance with the HSRCM, Article 325.6.

The removal of PCs following an established sequence will help prevent contaminating the skin or spreading contamination. A Hanford Site Standard in the HSRCM-1 exists for doffing a single set of PCs. Such a standard has not been approved for removal of a double set of PCs, because jobs involving highly contaminated areas may vary significantly. Instead a sequence comparable to the instructions in the HSRCM for removal of a double set of PCs must be developed to fit the specifics of the job and approved by the Radiological Control Organization.

Rule #7

You can have an undress assistant even if the RWP doesn't require one.

Use of an undress assistant **DOES NOT** allow the posted sequence for removal of the protective clothing to be altered.



Rule #7

- You can have an Undress Assistant even if the RWP doesn't REQUIRE one but...
- Still must follow posted removal steps

Dealing with Changing Conditions:

You should use a questioning attitude during the work activity too. Regardless of how carefully the work was planned or how thorough the pre-job brief, sometimes the conditions change after the work has started. Some changes can be predicted and planned for, but some cannot. Using a questioning attitude helps to spot the change quickly and implement the discussed response, or stop the job and regroup. For our job of removing the temperature probe, a glove bag could have been used, but because of the negative ventilation and working in a contamination area, a drape was selected for containment. If the ductwork had been in an RBA or clean area or there had not been negative ventilation, a glove bag would have been considered.

Containment Selection:

Glove bag or drape?

- **Negative Ventilation**
- **In a CA rather than an RBA**
- **Catch Drape is used.**

Predictable Change:

Our job is under way. The old probe has removed and replaced without incident.. A survey of the outside of the ductwork reveals removable contamination levels of 80,000 dpm/100cm². Our RWP calls for stopping the work and decontaminating the area. Because we discussed this at the pre-job, we have all the necessary decon materials available. If the values had exceeded 100,000-dpm/100 cm², the work would be discontinued because the void levels for the RWP would have been exceeded.

Predictable changes

- **Probe replaced**
- **Outside of ductwork is contaminated.**
 - **Action Levels in RWP.**
 - **Responses discussed at pre-job briefing.**
 - **Materials available.**

Unexpected Change:

Our job is under way. As the probe is unscrewed rust flakes fall into the catch drape under the probe, then water starts to drip out around the threads. Because this probe is close to the stack, and positioned

Unexpected changes

- **As old probe is being unscrewed.**
- **Water starts dripping out around threads**
- **What do you do?...**

Unexpected changes

- A. **Put on rain gear and continue?**
- OR
- B. **Stop the job and regroup?**

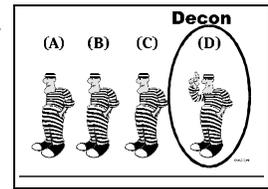
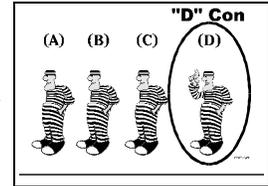
downstream of the system that removes the water from the exhausted air, we did not anticipate any liquid being present. What do you do? (A) Put on some rain gear for protection against the water, and finish removing the probe or, (B) Stop the job and regroup. Of course the answer is (B). You should not add or substitute articles of radiological protective clothing beyond what is listed on the RWP, unless it is approved by the radiological control organization. The use of PPE (including respiratory protection) beyond what has been authorized may detract from work performance and is contrary to ALARA principles and waste minimization practices. Just adding PPE may not address all the contamination issues such as preventing the spread of contamination or containing and collecting contaminated liquid. There may be more liquid than the catch drape can hold.

Unexpected changes

- Stop the job and regroup.**
- Just changing PPE may NOT address all concerns, such as spill containment.**

Decontaminating a Containment

To achieve our goal, a reasonable effort should be made to decontaminate facilities and equipment to ALARA. This includes containments. The containment should be decontaminated to acceptable levels while work is in progress and after completion of the work. Decontamination during the work helps minimize the spread of contamination and reduces the potential for contamination of workers. Decontamination of the containment prior to removing it should be considered whether the containment will be reused or disposed of. If decontaminated to acceptable levels, the containment can be reused, saving on waste disposal. Even if the containment will be disposed of decontamination can still reduce the amount of high-level waste generated. The decontamination done for the removal of the containment may be performed by the user or by the operations crew who will be removing the containment.

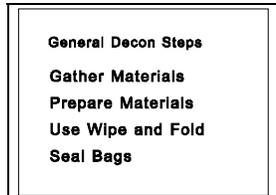


The decontamination process may vary from job to job, but the general process is outlined here.

General Decon Techniques

The general process consists of:

- Gathering the materials
- Preparing the materials
- Using the wipe and fold method
- Disposing of decon materials in poly bag



Gather Materials

Prior to decontaminating, obtain the materials and equipment you will need. Generally you will need some yellow poly bags to hold the waste, some cleaning solution, and some wiping materials. The cleaning solutions may vary from clean water to a chemical solvent. Any cleaning solution must be approved prior to use. Estimate the amount of wiping materials you will need. Cut or tear the materials into convenient sizes. 8 inches by 8 inch pieces are a good size to work with. Wiping materials may be absorbent towels, or rags, but should not produce lint, have ragged edges, or strings that could get caught on equipment being decontaminated.

Prepare Materials

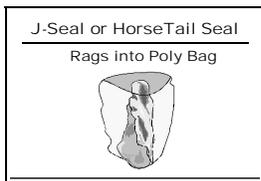
Prepare the materials by placing the wiping materials into a poly bag, and pouring in enough cleaning solution to dampen the material. Do not overly wet the material. Always notify the HPT before performing any decon work. Depending upon the work and the location, smears may be taken before deconning and wiping materials may be monitored during the process. Transfer the bag of damp rags and an empty poly bag into the containment.

Use Wipe and Fold Method

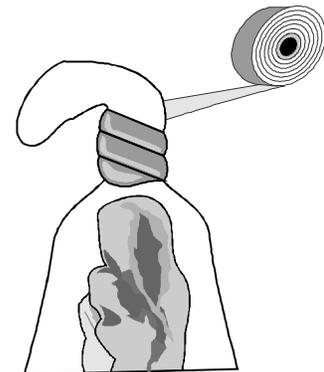
Lay the rag flat. Wipe the rag only in one direction. **DO NOT** use a scrubbing motion. Decontaminate from the lowest contaminated area to the highest. When decontaminating vertical surfaces, wipe from top to bottom, taking care **NOT** to allow cleaning solution to drip or run down the surface. Lift the rag in the center, folding in the contaminated side. Even though you are wearing rubber or latex gloves, and may even have multiple layers of gloves, **NEVER** touch the contaminated side of the rag. If the rag is large enough to keep the glove from getting contaminated you can repeat this process with one of the clean sides of the folded rag. If you do this **KEEP THE RAG FOLDED**. Place the rag in a poly bag for disposal.

Seal Bags

Seal the bags before removing them from the containment. A Horse Tail or J-seal is the best way to seal a bag containing liquids to prevent it from leaking.



(1) Twist the bag closed.



(2) Seal the neck with several wraps of tape.



(3) The neck of the poly bag is bent over and sealed with several additional wraps of tape.

Using Fixative

If a reasonable effort has been made to decontaminate a surface and it still exceeds the values of Table 2-2 for total contamination, it may be covered with a fixative coating to prevent the spread of contamination. A fixative coating shall **NOT** be applied without the approval of the Radiological Control Manager.

Using Fixative

- **Exceeds values of HSRCM Table 2-2 for total contamination**
- **Approval of the Radiological Control Manager**

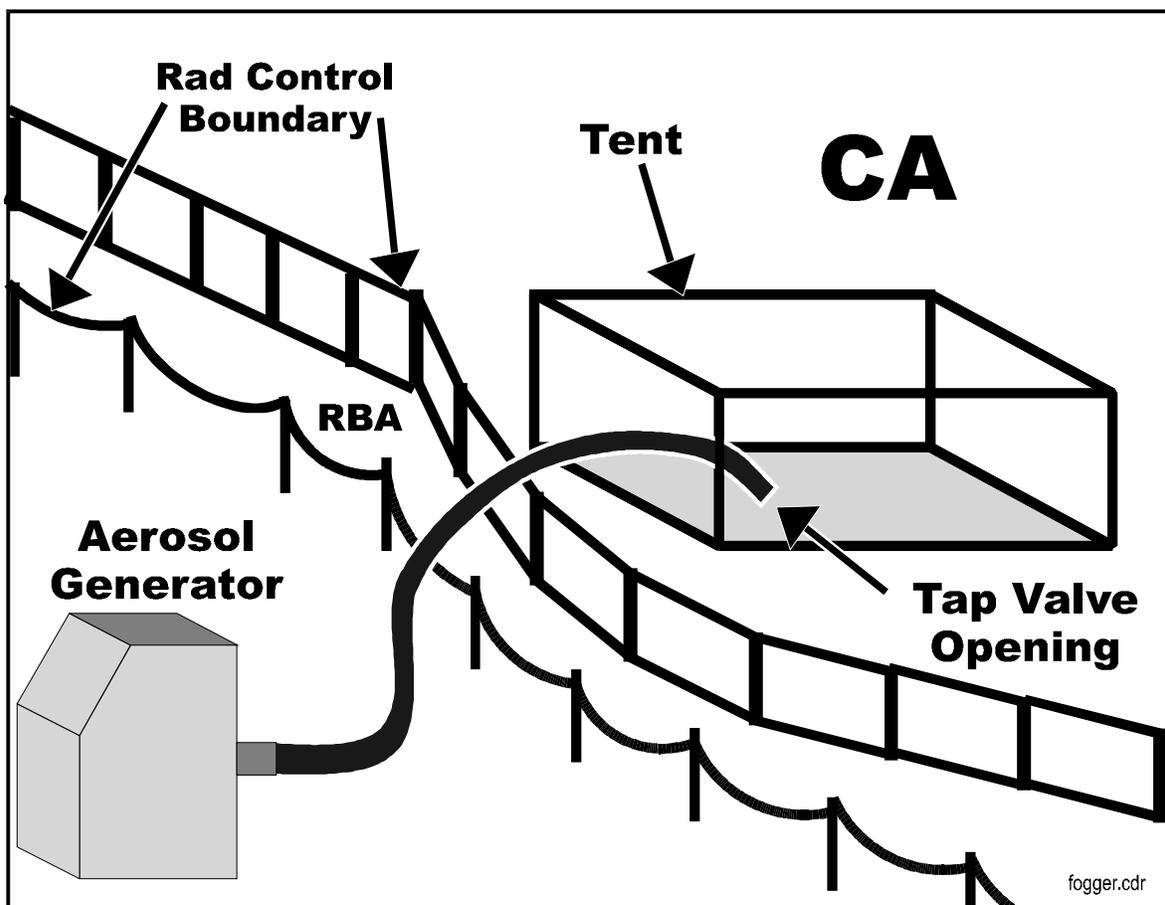
(Excerpted from HSRCM) *Table 2-2 Summary of Contamination Values*

<u>NUCLIDE</u>	TOTAL (FIXED + REMOVABLE) (dpm/100 cm²)
U-natural, U-235, U-238 and associated decay products	5,000 alpha
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-129	500 alpha
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-125, I-126, I-131, I-133	1,000 beta-gamma
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.	5,000 beta-gamma
Tritium organic compounds, surfaces contaminated by HT, HTO and metal tritide aerosols	10,000 beta-gamma

Temporary fixatives sometimes referred to as capture coatings can also be used to contain the contamination while work is being performed. One such coating was used for a job at the 244-A Lift Station pit. Previously a whirlwind had lifted contamination out of an open containment tent over the pit and spread it over three acres of land. Also the workers were continually decontaminating the tent to keep the levels in check.

Capture Coatings

The capture coating, a sticky solution of sugar and starch compounds was applied to the contaminated pit. The coating was applied using a fogger machine that turns the solution into an aerosol. The aerosol permeated and covered all the surfaces with a thin film of sticky solution. Use of the capture coating drastically reduced the amount of decontamination work. The coating is a non-hazardous substance and can be flushed away with water.



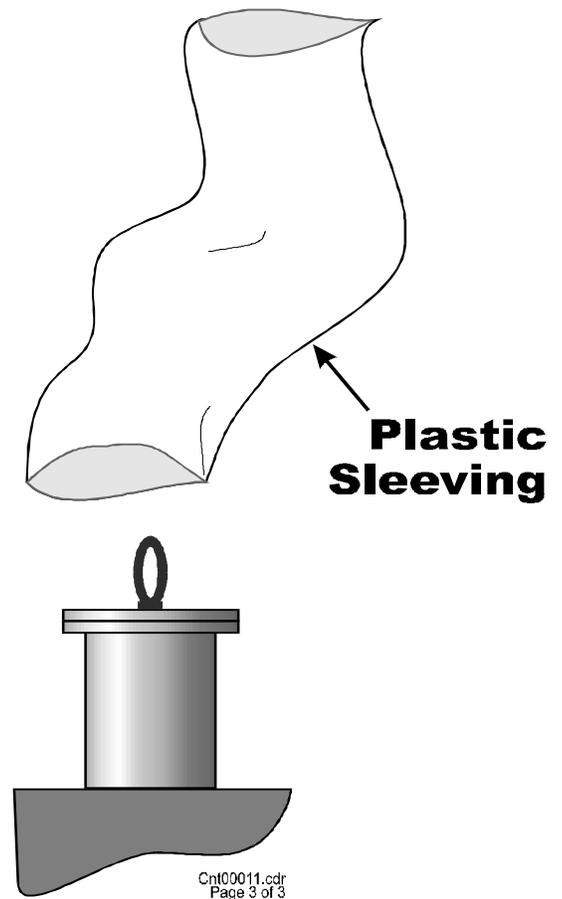
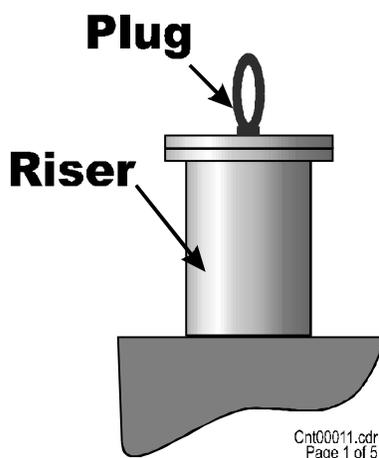
Using Sleeving as a Containment

Sleeving in various sizes is often used as a containment, for jobs like removing equipment from a system, around pipe connections, and to insert equipment into a system. When using sleeving it is important to ensure that the piece is large enough to allow for necessary movement within the sleeving to prevent any breach of containment from inside, and long enough to have extra for sealing the sleeve.

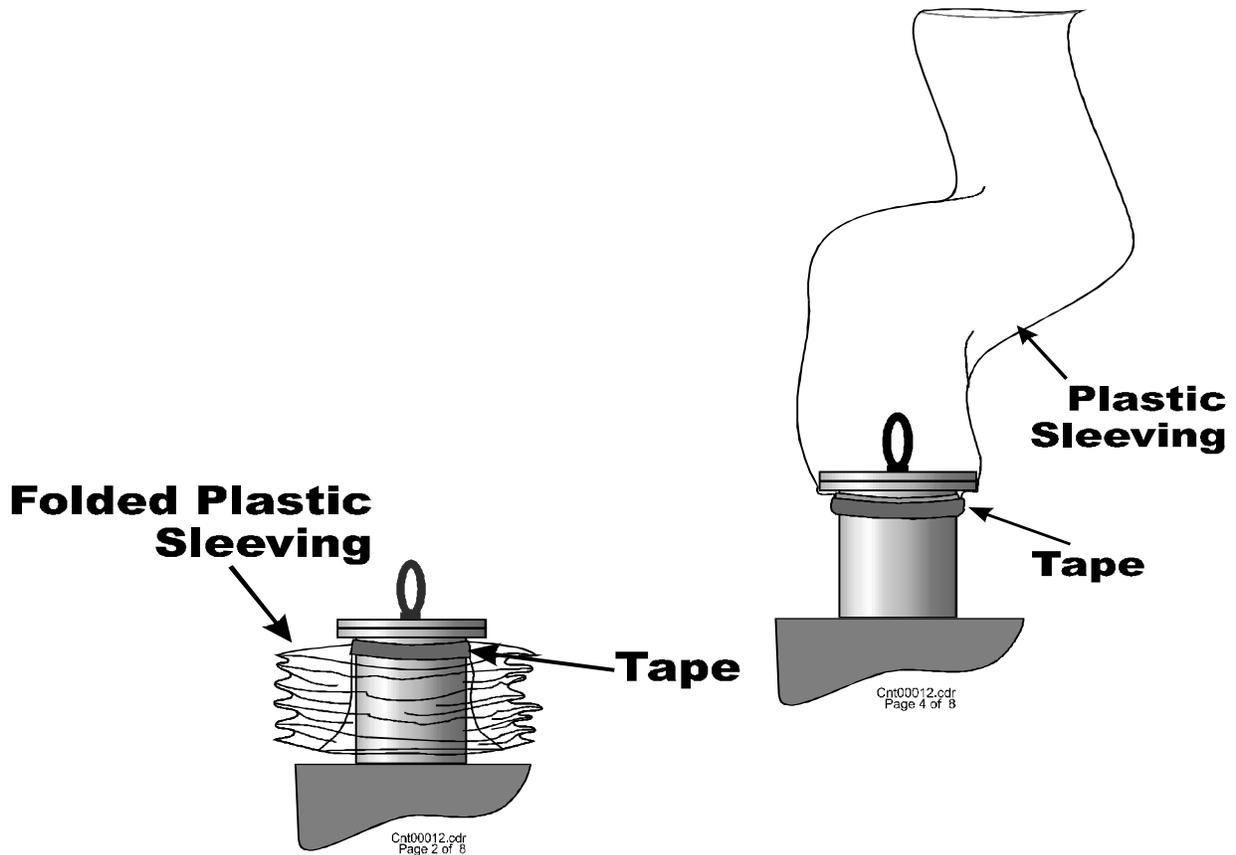
Removing Equipment From Tanks

Equipment such as plugs, and various monitoring devices are removed during maintenance activities. Each job will vary but the basic process is as follows.

- Prepare the work area. Use drop cloths and shielding as needed.
- Measure the correct length of sleeving plus extra for closing.

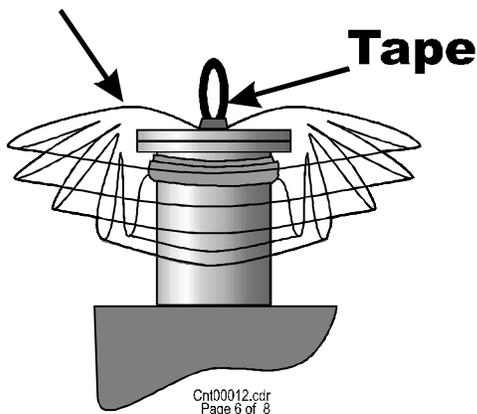


- ❑ Slide one end of the sleeving over the item being sleeved out.
- ❑ Fasten the sleeving to the adjacent piece of equipment (such as the riser) with tape forming an inside out seal, as previously discussed.

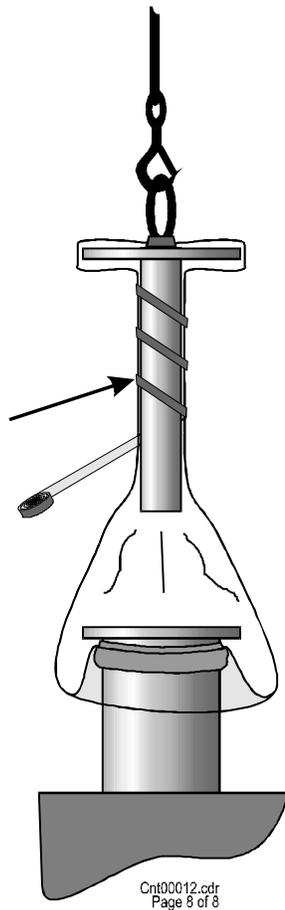


- ❑ Pull the open end of the sleeving down over the item being removed, gathering it in an accordion-like fashion.
- ❑ Tape the open end of the sleeving to a clean section of the item (such as the area where a hook will be used to lift the item) or pinch the sleeving together and wrap with tape, either way forming a seal.
- ❑ Pull the item carefully up or out and feed the gathered sleeving over the contaminated section of the item. Work as much air out from between the sleeving and the item as practical, using tape to keep the plastic collapsed if necessary. Removing excess air from inside the sleeving can help lessen spread of contamination if sleeving is breached.

Folded Plastic Sleeving

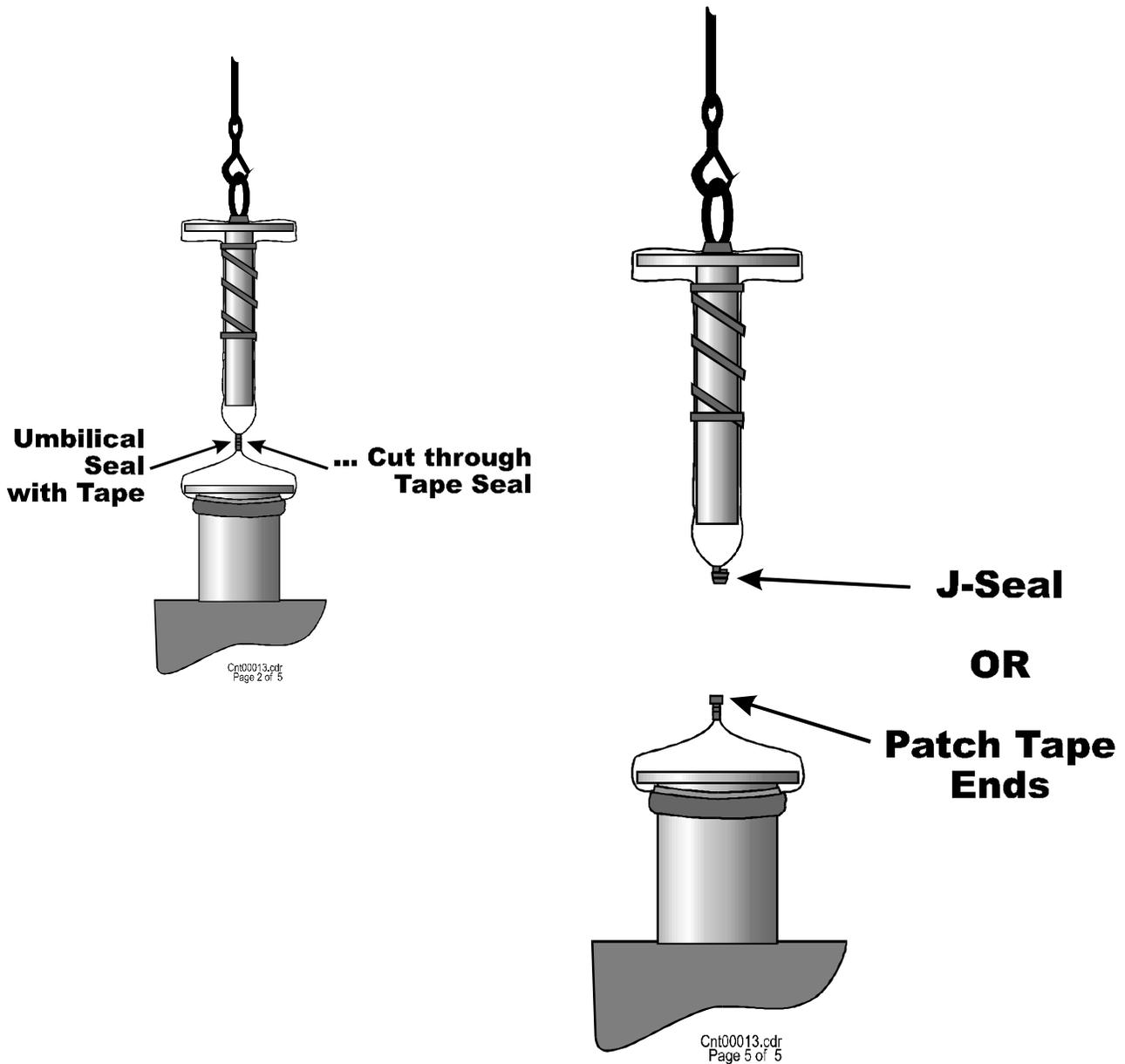


"Barber Pole" Style Taping



CAUTION: Radiation streaming can occur directly over the opening. Avoid placing any part of your body directly over the opening. If the work requires you to place your hands over or near the opening, consider using shielding for the opening, or shielded gloves. If this is not practical, at least minimize the amount of time your hands are placed in the radiation stream.

- ❑ Pinch the sleeving together at the end of the item and wrap with tape.
- ❑ Cut through the taped joint.
- ❑ Seal the ends of the cuts with either a J-Seal or a patch-taped seal. Taping the cut ends seals in the air trapped between the sleeving and the item and also prevents contamination that may be on the inside of the sleeving in the taped joint from spreading.



- ❑ Remove left over sleeving, by carefully cutting the tape and sleeving that was initially fastened to the component and remove it by rolling the sleeving into itself, only touching the clean outer side of it and dispose of it in a closely staged yellow poly bag.

Seals

The decision to make a J-Seal (also referred to as a Horse Tail Seal) versus a patch tape seal depends on many factors, such as but not limited to:

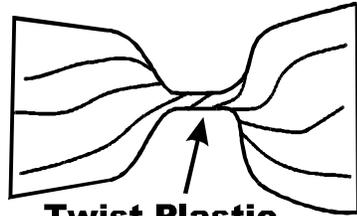
- Seal as primary barrier
- Liquids present
- Length of sleeving available to seal
- Type of containment ventilation

When liquids are present and/or no negative ventilation is used the J-Seal is sometimes preferred, but the effectiveness of each type depends on how well it is done. Either seal is safer and easier to perform if done by two people. Before making the seal and cut, prepare a damp rag to position under the tape joint when it is cut. The rag will catch contaminated particles or moisture that might fall out of the cut sleeving. Also prepare tape patches or lengths of tape and have them ready to seal the cut ends. Plan where the scissors (or other cutting device) will be placed when not in use, such as on a drop cloth, to avoid spreading contamination and injury to personnel.

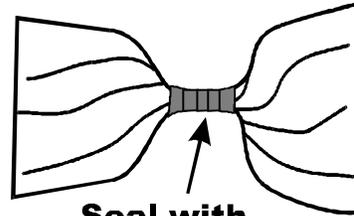
If possible twist the sleeving, or pinch it closed and secure with tape. This umbilical seal is sometimes referred to as a pigtail seal. Hold the damp rag under the seal and cut through the tape and plastic. There is potential for spread of contamination and worse, of cutting your hand (or your partner's hand) with a contaminated implement. BE CAREFUL.

For a patch seal place the prepared patches over the cut ends and seal. Apply a wrap of tape to finish sealing the edges of the patch. For a J-Seal bend the ends back, and seal with several wraps of tape. Depending upon the application, a patch seal may be used on one end and a J-Seal on the other.

Making an Umbilical Cut and Seal



Twist Plastic Sleeving

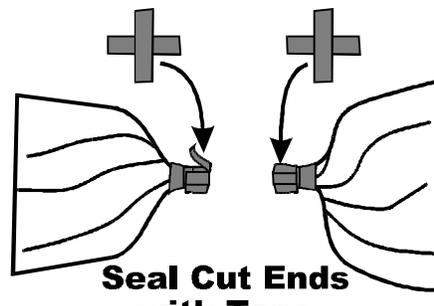


Seal with Tape



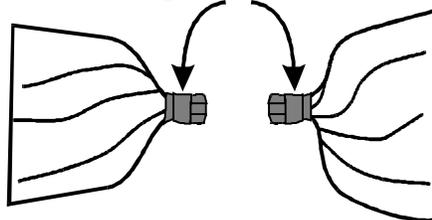
Cut Through Tape and Plastic

Damp Rag



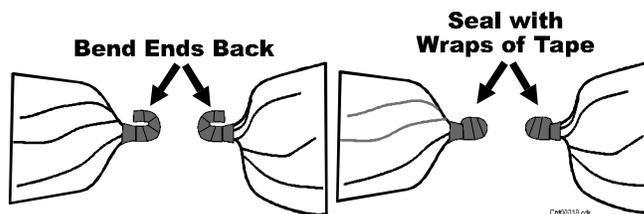
Seal Cut Ends with Tape

Secure Edges of Tape Patches



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Page 3 of 3

Making an Umbilical Cut & J-Seal



Bend Ends Back

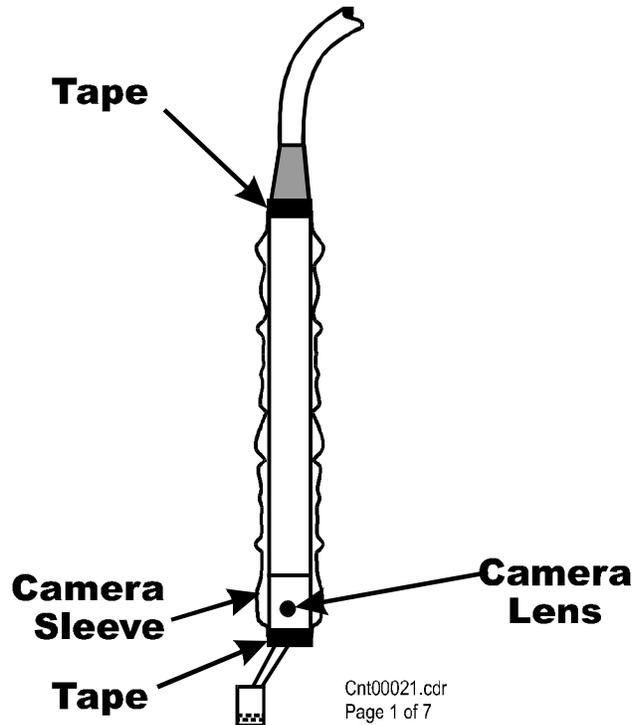
Seal with Wraps of Tape

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Page 3 of 3

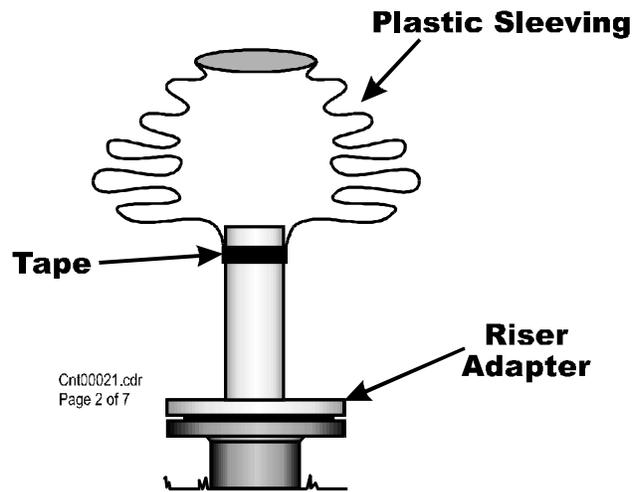
Sleeving Camera Equipment

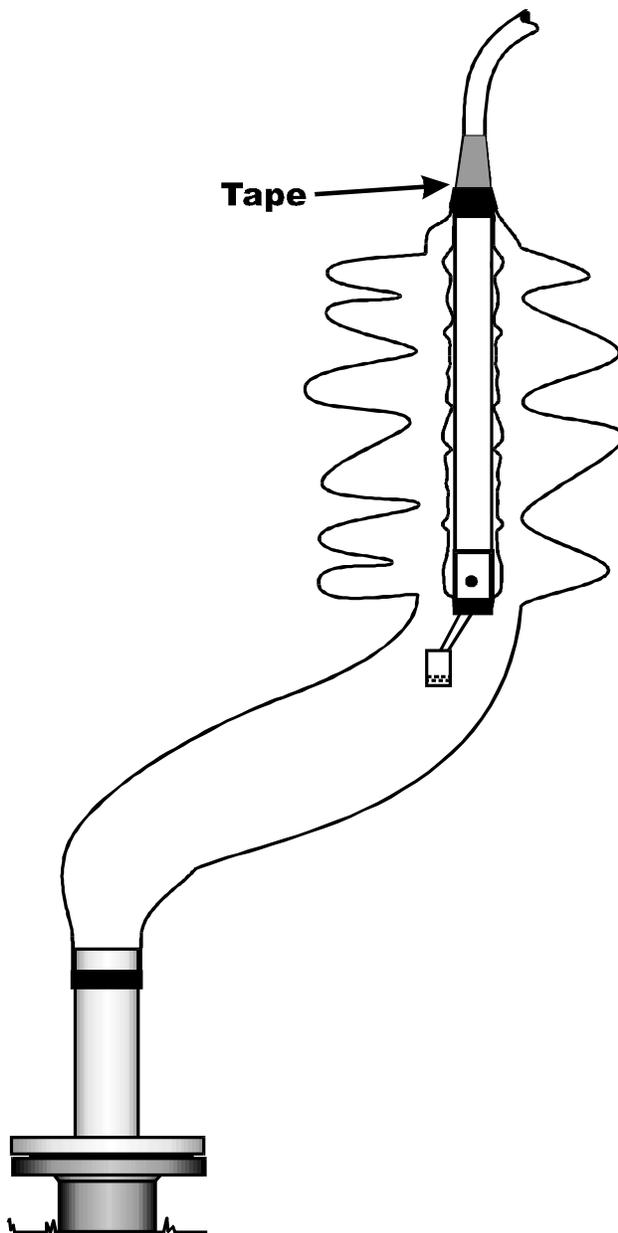
Camera, still and video are used for inspection of pit and waste tank interiors. Sleeving can be used to prevent the equipment from becoming contaminated. The following is a description of some methods that may be used for this type of work.

The camera body is sealed inside some clear sleeving. Care should be taken to ensure that any lights will not come in contact with the sleeving.



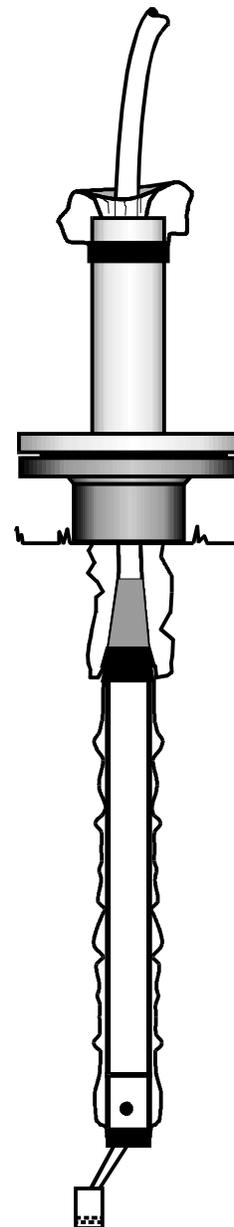
A riser adapter may be used. The sleeving may be added to the adapter before or after it is installed, depending on the risks associated with the particular job. The sleeving should be attached with an inside out seal. The sleeving should be longer than the depth to which the camera will be inserted plus extra for closing the sleeving when the camera is removed.



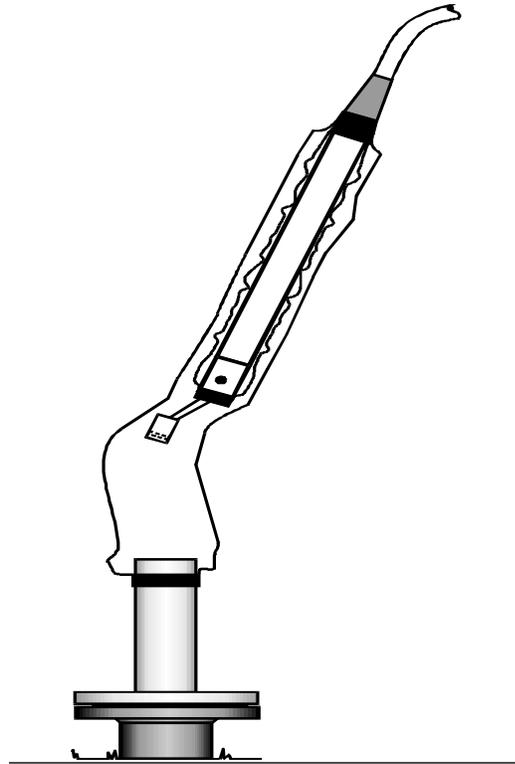


The sleeving is taped to the camera. If there is a swivel mechanism on the camera care should be taken to affix the sleeving to allow for this movement.

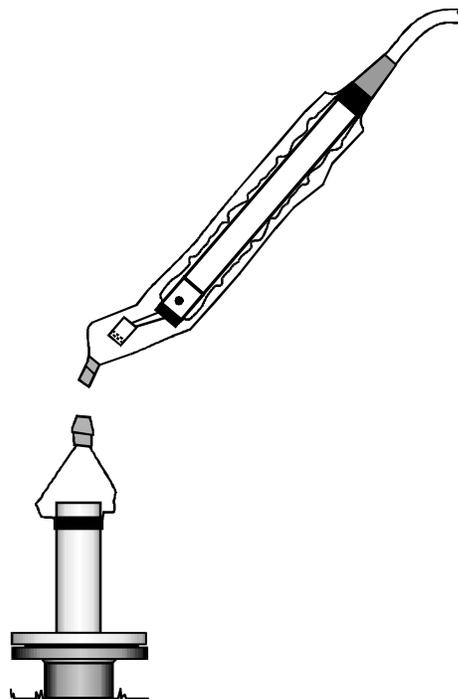
As the camera is lowered into the tank the camera and cable is protected, by the sleeving that is feed down through the riser (and adapter).



As the camera is withdrawn, the sleeving that was exposed to contamination in the tank is inverted. This placed the contaminated side on the inside.

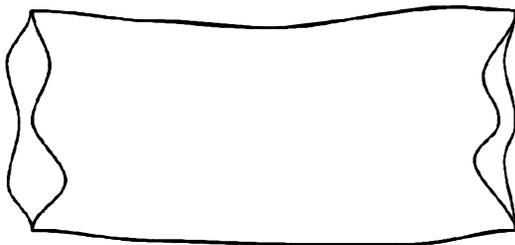


Once the camera is fully withdrawn the sleeving can be sealed and cut. The camera can be moved to a better location for removal from the plastic. The adaptor is removed into a poly bag, as the riser cover is replaced, surveyed, the remnant sleeving removed, and the adaptor decontaminated as necessary. These techniques are not procedure steps. They are concepts that should be applied and modified for the best application at each job.

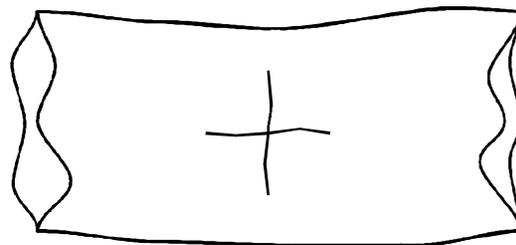


Sleeving-with-Glove

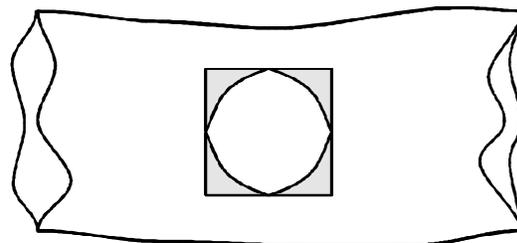
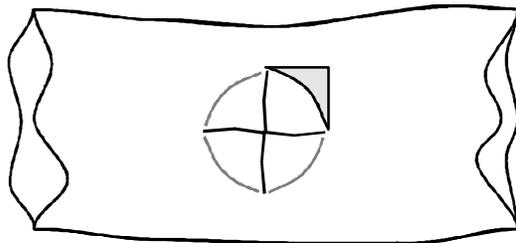
Sometimes the situation does not require a glove bag, but trying to manipulate items through the sleeving can be difficult, and could result in puncturing the sleeving. For these situations a sleeving-with-glove containment may be used. This type of containment does not require certification, but should not be used instead of a glove bag just to eliminate the certification step. If a glove bag is needed use a glove bag. If you install any additional items beyond the glove, such as a HEPA filter, transfer cylinder, etc., the containment becomes a glove bag and must be certified.



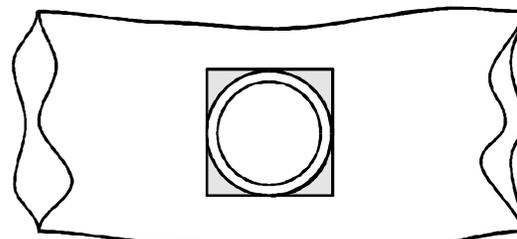
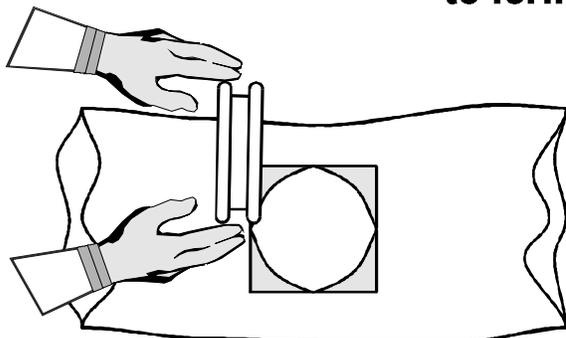
Sleeving



Cut X in sleeving



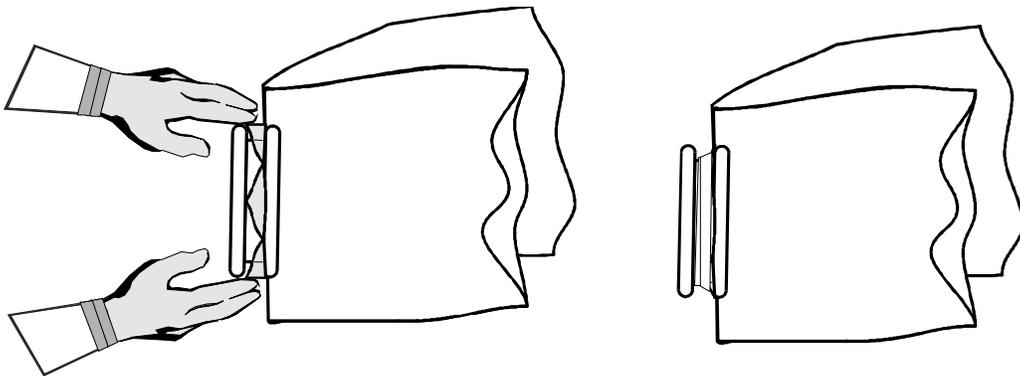
Pull triangular pieces out to form opening.



Insert glove ring.

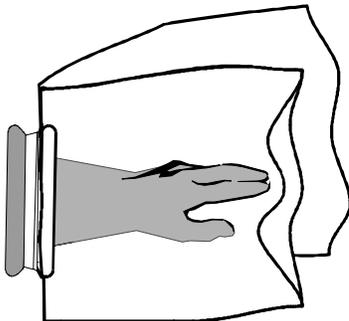
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Ensure there are no gaps where the glove ring is taped to the sleeving. This is area that is most likely to leak. Make sure that the glove is oriented in the direction it will be used when the sleeving is installed, and that the correct glove for the hand that will be used (left hand or right hand) is installed.

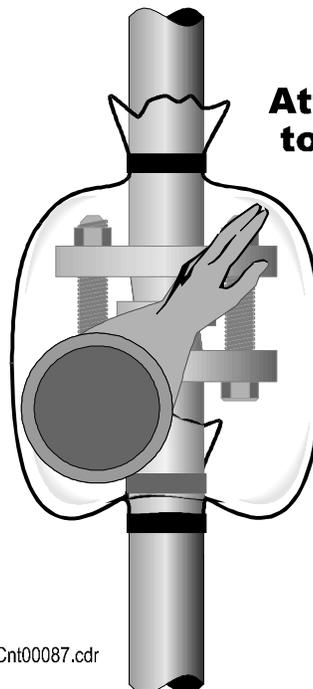


Pull flaps around glove ring.

Tape glove ring in place.



**Insert glove and
tape in place.**



**Attach sleeving
to component.**

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Small Item Transfers

The Transfer Sleeve should be used to insert or remove small items from containment whenever it is practical, especially when high levels of contamination are expected. Examples include but are not limited to passing a tool into a glove bag, removing a small sample from a containment tent, removing a damaged glove or other waste from a glove bag.

Small Item Transfer

- **Transfer Sleeve**
- **Pass out box**
- **Zipper or Velcro opening**

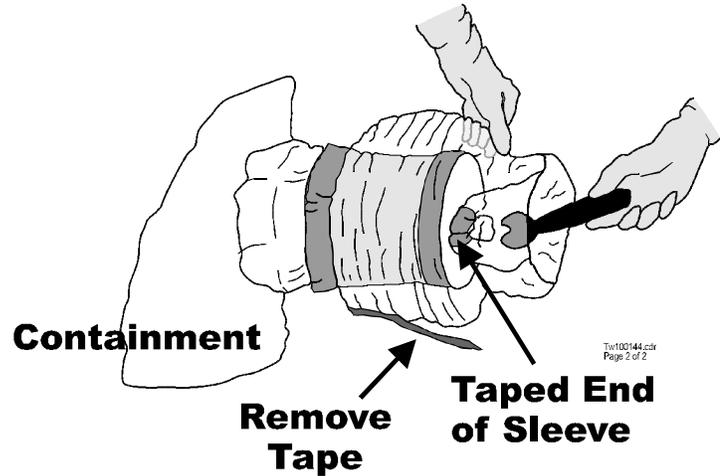
Pass Out Boxes may be used in lieu of transfer sleeves for transferring small items where low levels of contamination exist.

Zipper or Velcro Openings can also be used for transferring items, however a contamination survey should be performed to ensure contamination is within acceptable limits prior to using these openings, and if a negative ventilation system is installed it should be in operation.

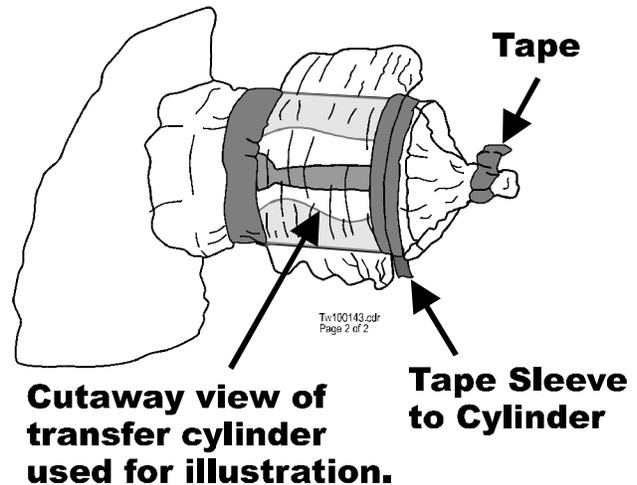
Using a Transfer Sleeve to Insert Items

To pass a tool or item into the containment through a transfer sleeve:

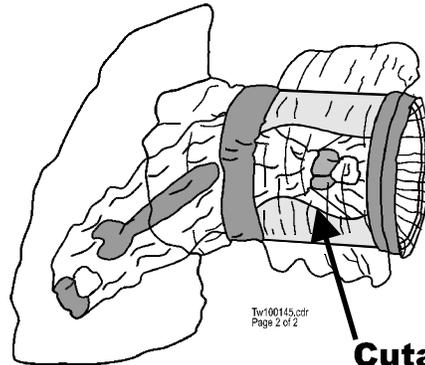
1. Hold the end of the transfer sleeve open.
2. Remove the tape holding the gathered sleeving.
3. Push the item and the end of the transfer sleeve into the transfer ring or cylinder.



4. After pushing the item and sleeve into the cylinder, gather the open end of the sleeve and securely seal it with sturdy tape.
5. Tape the sleeve around the ring to secure it.



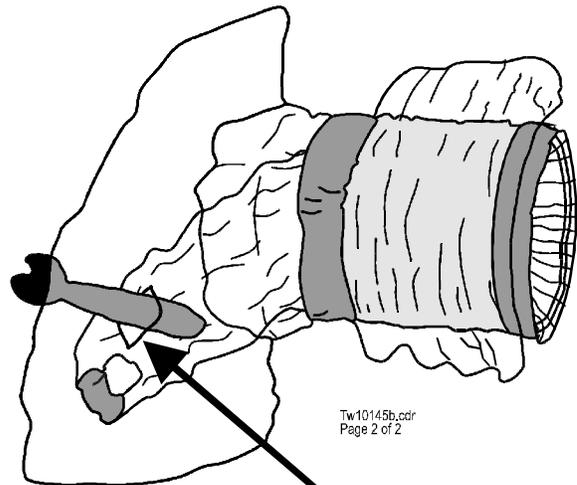
6. Push the tool and sleeve into the containment so it can be reached from inside the containment.



Cutaway view of transfer cylinder used for illustration.

7. From inside the containment cut an opening in the transfer sleeve and remove the item.

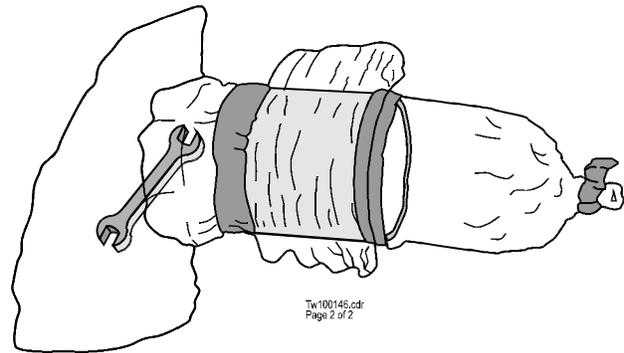
After completing this transfer disregard the portion of the transfer sleeve that was cut open to remove the item. The transfer sleeve is ready for the next insertion or removal of items.



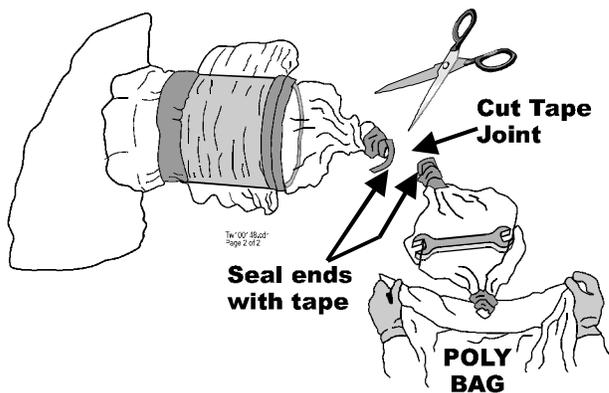
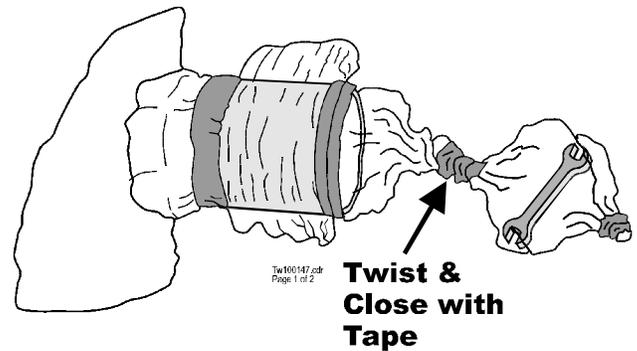
**Cut Sleeve,
Remove Tool.**

Using a Transfer Sleeve to Remove Items

1. Pass the item out from the containment through the plastic ring or transfer cylinder into the transfer sleeving.
2. Make an umbilical cut between the item and the cylinder.



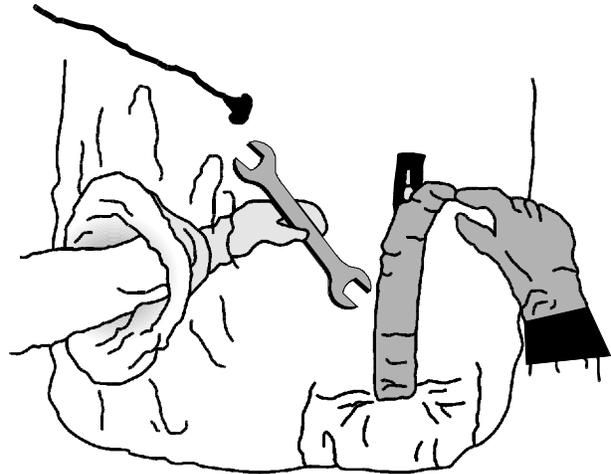
Twist the sleeving between the item and the cylinder.
Pinch the twisted sleeving and tightly tape it.
Cut in the center of the tape joint with a sharp instrument.
Seal both cut ends with tape.



3. Place the sleeved item into a poly bag for removal or disposal.

Removing Items Through a Zipper or Velcro Opening

1. If a vacuum cleaner or other device is used to ventilate the glove bag, ensure that it is turned on. Carefully untape the zipper or Velcro and open it only to the minimum width needed to accommodate the item being removed.



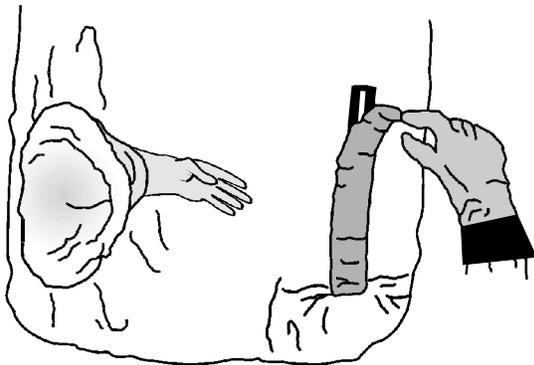
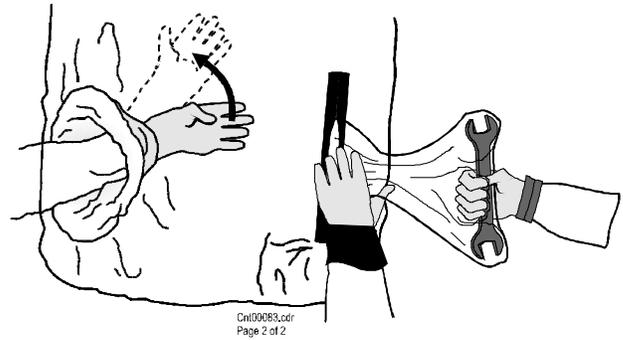
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2. Invert a poly bag about halfway and place it over the opening to prevent any contamination spread. Slip one hand into the inverted bag while the other hand holds the bag in place. Grasp the item with hand that is in the poly bag.

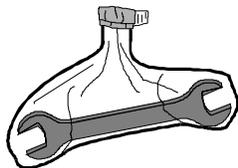


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3. While holding the open end of the poly bag against the zipper or Velcro opening with one hand, slowly pull the other hand, the item and the bag out and down, until the bag is right side out and the item is inside the bag.



4. Reseal the zipper or Velcro opening and cover with a new piece of tape. Seal the poly bag with tape and remove or dispose of the item.



Removing items from sleeving

Potentially contaminated items are often enclosed in plastic sleeving to sheeting to contain the contamination for storage, or transportation. When the sleeving is removed it is done in a manner that minimizes spreading the contamination. This activity normally requires an RCT to be present for evaluation of the dose rates prior to starting and the contamination levels throughout the job.

**Removing Items
from Plastic
sleeving.**

If the item is small enough, place the sleeved item into a yellow poly bag. Make a small cut in the sleeving just large enough to take a smear of the surface of the item to determine contamination levels. If the contamination levels exceed the limits of the RWP, close and tape the cut in the sleeving. (Sleeving removal and decontamination of the item may need to be done within a glove bag.)

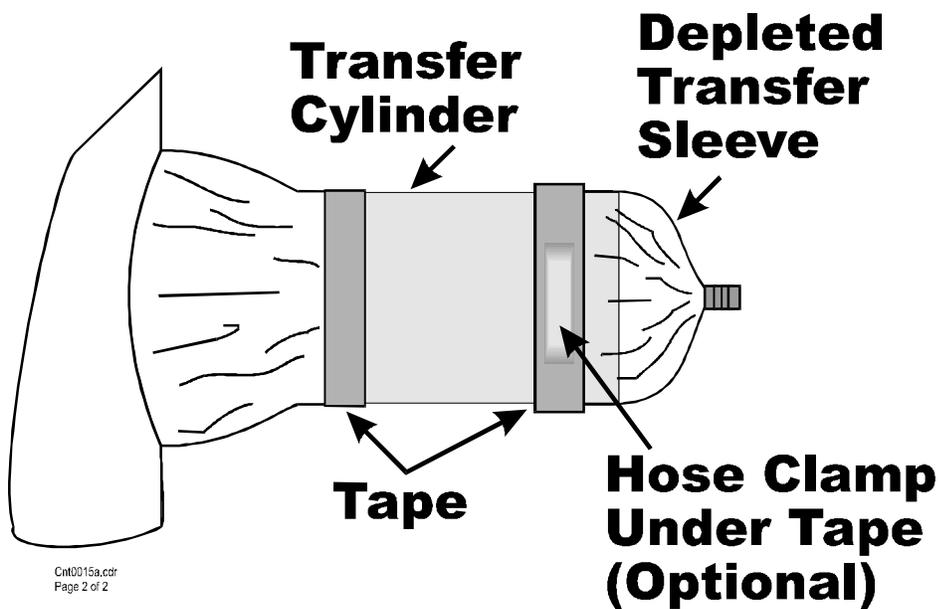
If contamination levels are within the RWP limits, cut the sleeving enough to allow the item to be pulled out. Pull it out, wiping it with a damp rag if necessary. If the item is too large to place into a bag for sleeving removal, place a drop cloth under the item to catch any falling particles. Again make a small cut and take a smear sample to determine the contamination levels. If the levels are within the limits of the RWP, cut the sleeving open. Roll the sleeving inward, touching only the clean outer side of the sleeving. Wipe the item down with a damp rag if necessary.

Replacing Depleted Transfer Slewing

Frequently, transfers into and out of a containment, particularly for glove bags, will deplete the supply of transfer slewing initially installed. The following are three methods that may be used to replace the transfer slewing.

Replacing depleted transfer slewing

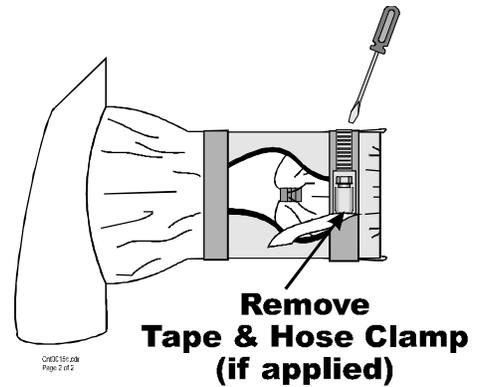
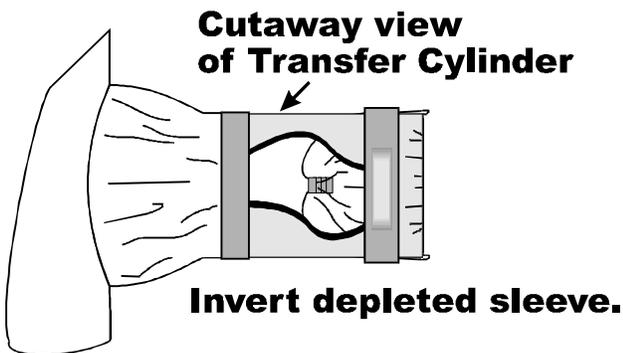
- Method 1
- Method 2
- Method 3



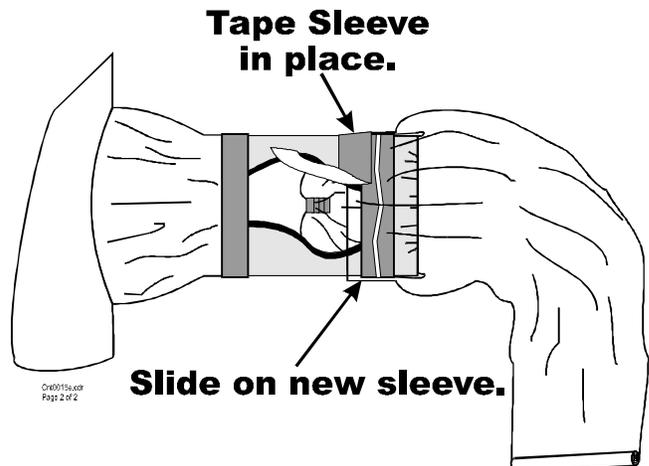
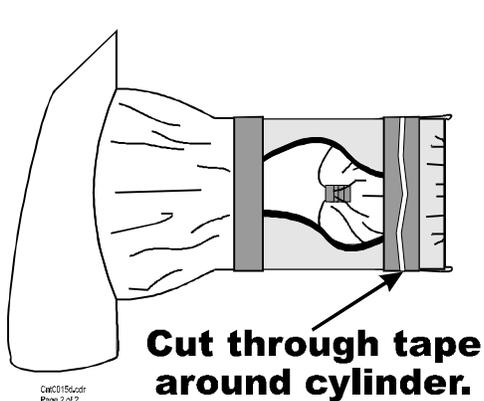
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Method 1

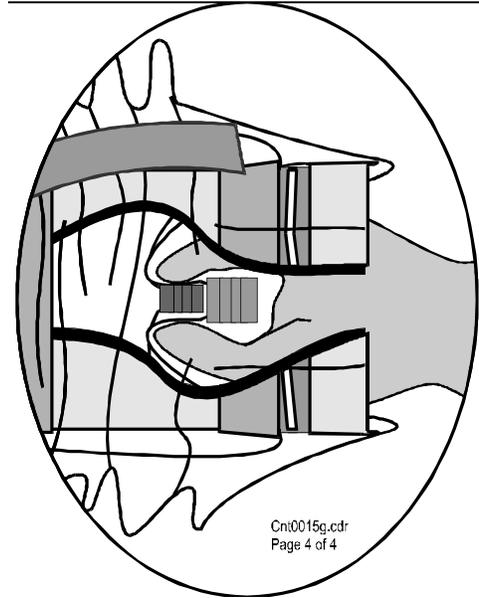
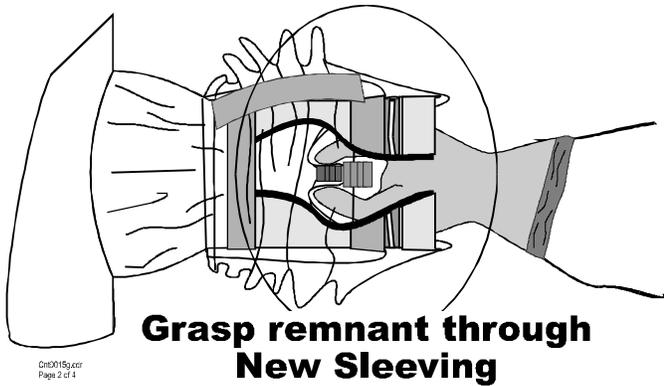
Invert the remnant of the depleted sleeve into the transfer ring. If a hose clamp was used to hold the first sleeve in place, remove the tape over the hose clamp and remove the hose clamp.



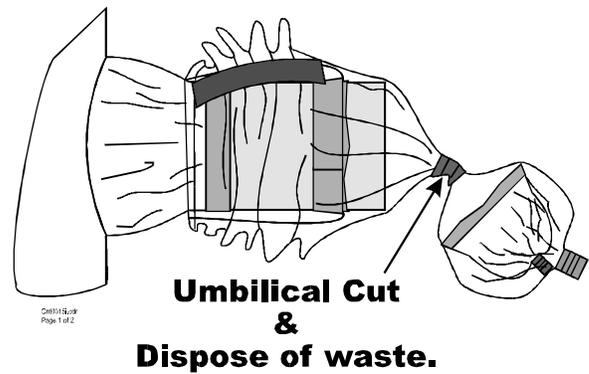
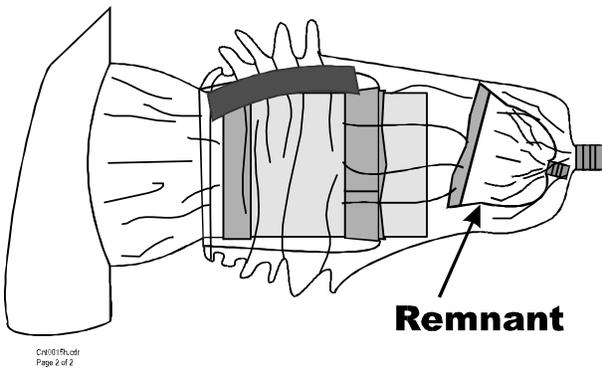
Cut through the approximate center of the tape securing the old transfer sleeve in place around the transfer ring. Leave the sleeve remnant intact at this time and leaving it inside the transfer ring. Open one end of the new transfer sleeve and slide it approximately 1.5 inches past the securing point of the previous sleeve. Tape the new sleeve to the transfer ring.



Gather the new sleeve, in accordion fashion, onto the transfer ring, and tape the other end of the new sleeving closed. Push the taped end of the new sleeve into the transfer ring, and grasp the remnant of the old sleeve.

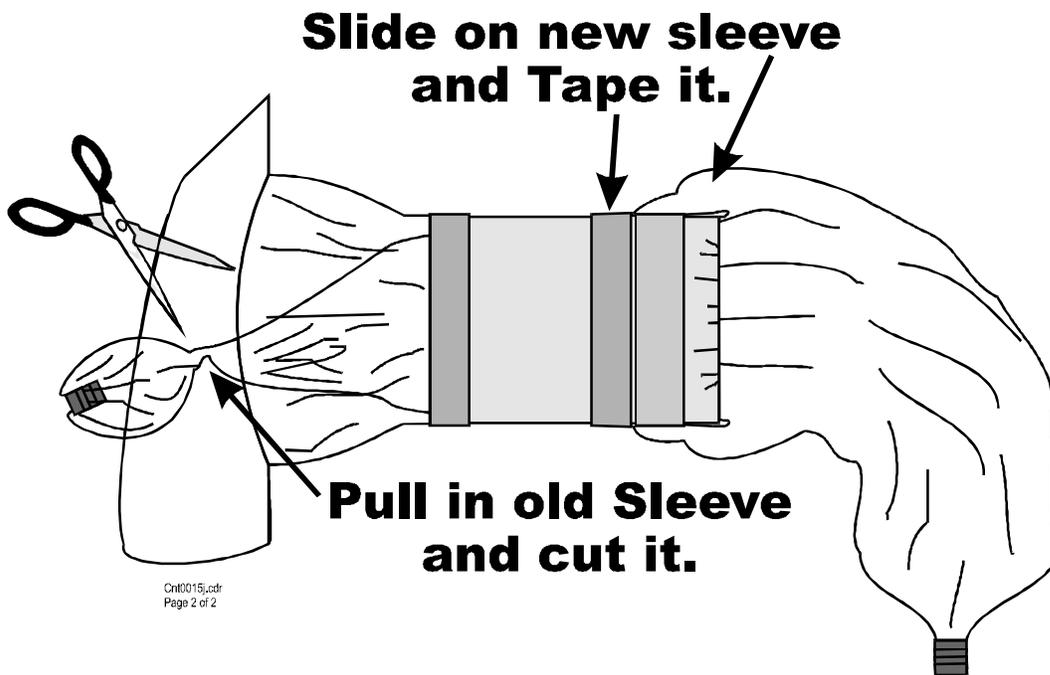


Pull the remnant out and off of the transfer ring into the new sleeve. Perform an umbilical cut of the transfer sleeve, and dispose of the waste material.



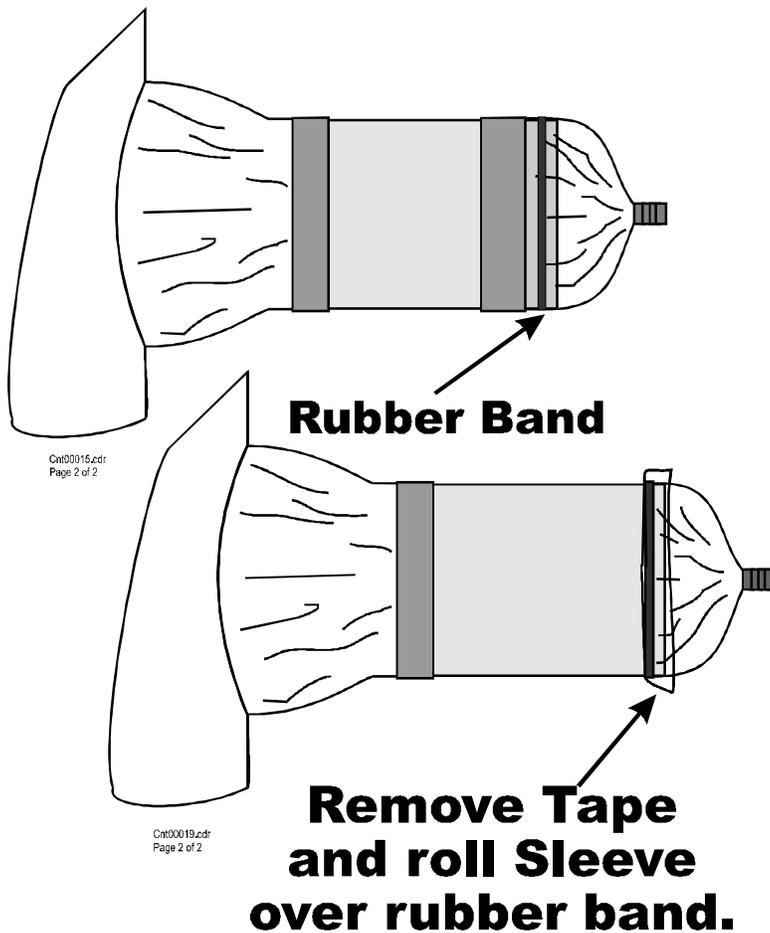
Method 2

As in **Method 1**, if a hose clamp or cable ties was used to install the first sleeve, remove it, but **DO NOT** cut or remove the tape holding the sleeving in place. Install the new sleeving over the depleted sleeve and tape it in place. From inside the containment reach through the transfer cylinder and pull the depleted sleeve into the containment. Cut off the remanent of the depleted transfer sleeve. **EXERCISE EXTREME CAUTION** to prevent cutting, yourself, your gloves, the new sleeving or any part of the containment. The depleted sleeve can then be removed as waste.

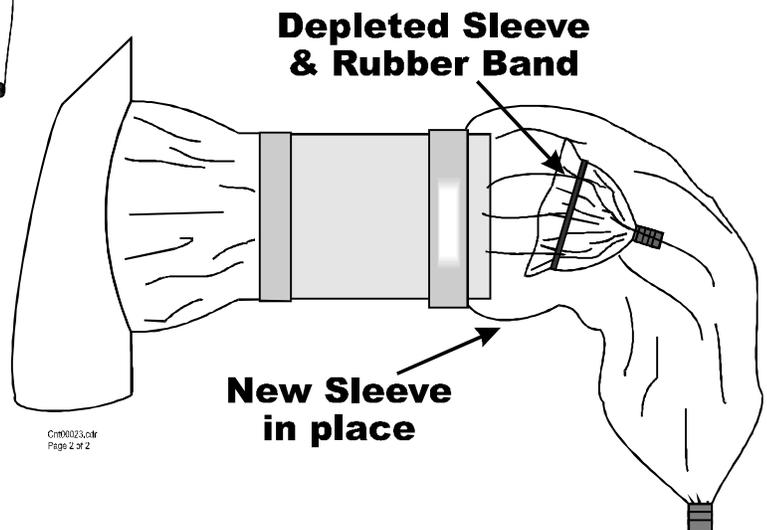
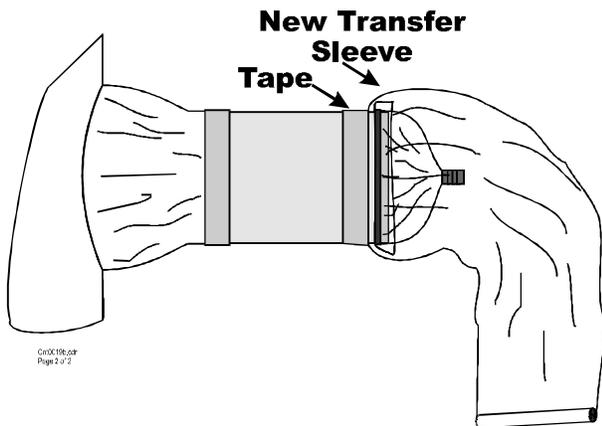


Method 3

As in **Method 2** remove any previously installed hose clamp or cable ties holding the depleted transfer sleeve in place, and **DO NOT** remove or cut the tape holding the old sleeve. Place a large rubber band near the end of the transfer sleeve to hold the depleted sleeve in place. An appropriate length of 3/16 or 1/4 inch surgical tubing may be substituted for a rubber band. Remove the tape from the depleted transfer sleeve. Roll the edges of the sleeve over the rubber band.

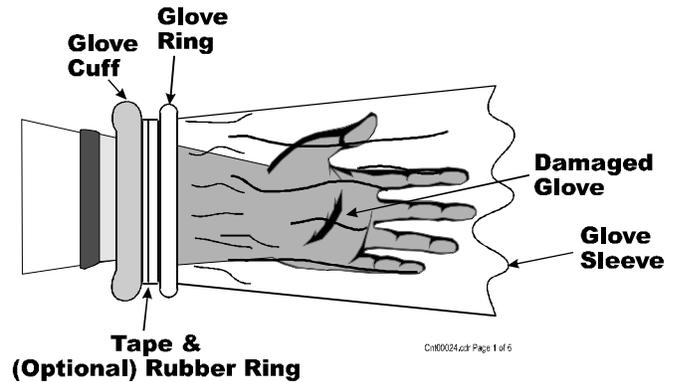


Open one end of the new sleeve, and slide the sleeve onto the transfer ring, past the rubber band secured end of the depleted sleeve. Tape the new transfer sleeving to the transfer ring and re-install the hose clamp or cable ties. Cover the clamp/ties with tape. Working through the new transfer sleeve, grasp the depleted transfer sleeve remnant and pull it free of the transfer ring. Remove the remnant and the rubber band in the same manner as **Method 1**.



Damaged Glove Replacement

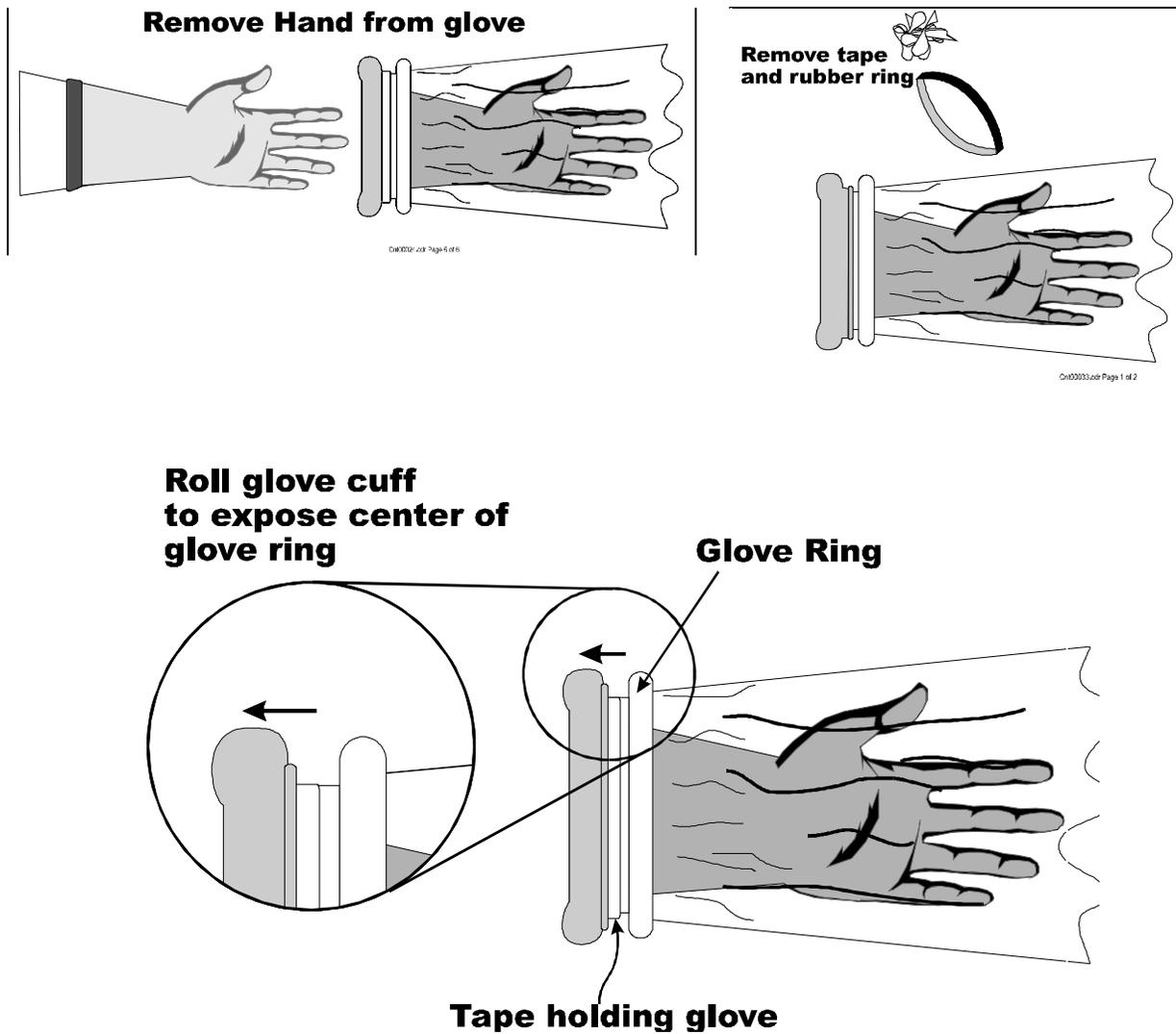
The containment gloves may become damaged while working in the containment. The damage may be noticed as soon as it occurs, but a small punch-type tear or cut could occur without the wearer becoming aware of it. For this reason it is important to inspect the gloves before using them. It is also important to discuss at the pre-job the actions that will be taken if a glove is damaged while it is in use and how a damaged glove will be replaced, so everyone will understand what to do should this occur.



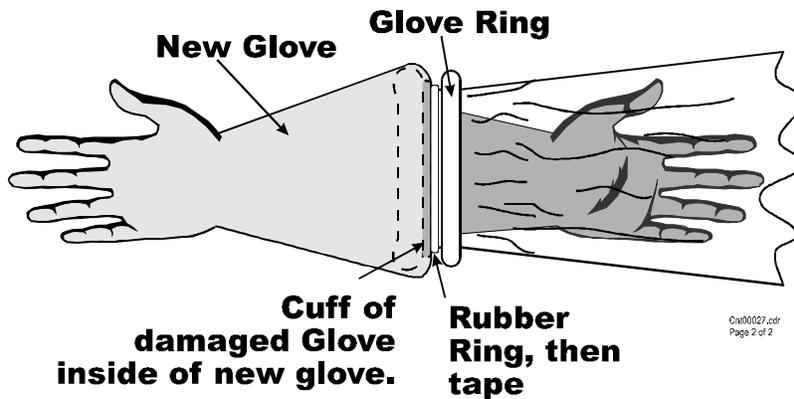
The most important factor to consider is preventing contamination of the glove wearer through the damaged glove, and spread of contamination when replacing the glove. To accomplish this, replacement of the damaged glove should not be attempted alone by the worker whose glove is damaged. It is also important to ensure that the new glove is properly oriented when it is being installed. This step is most easily missed in methods where the glove is installed inside out then inverted after installation. The method used may vary depending on such factors as level of contamination, severity of damage, injury to personnel, etc. Three methods of replacing damaged gloves while working in a containment are provided in this text.

Method 1

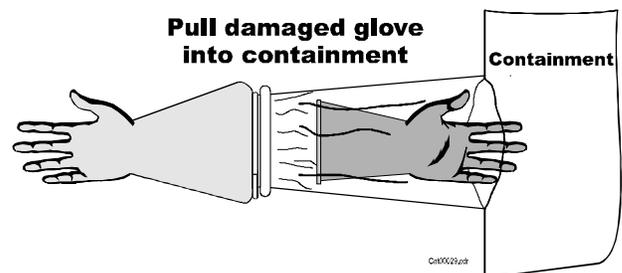
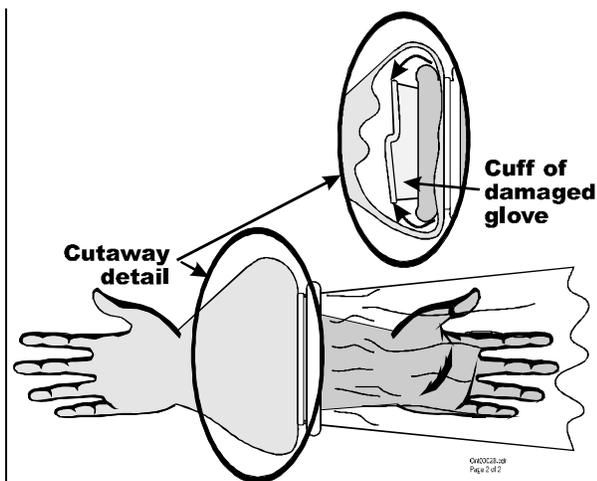
Pull the damaged glove hand up and out until just the glove is in the sleeve. Carefully remove your hand from the glove, leaving the glove inside the sleeve. Remove the tape and/or rubber ring from the glove ring. Carefully roll the damaged glove cuff lip away from the sleeve to expose the center of the glove ring.



Place the replacement glove cuff lip over the glove ring. Secure the glove in place with tape (or by reinstalling the rubber ring, if used). Take care **NOT** to catch the damaged glove between the new glove and the glove ring when taping down the new glove.



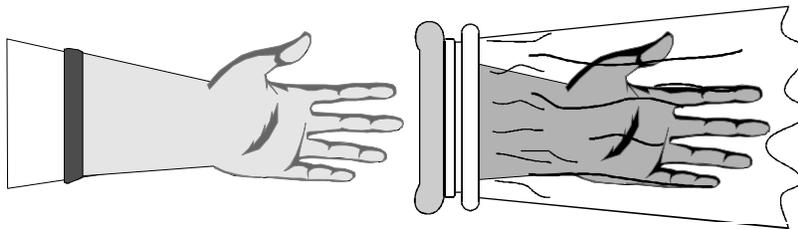
With the replacement glove in place, and working through the replacement glove, cautiously roll or lift the damaged glove cuff lip over the end of the glove ring. Pull the damaged glove free and draw it into the glove bag for transfer sleeve removal.



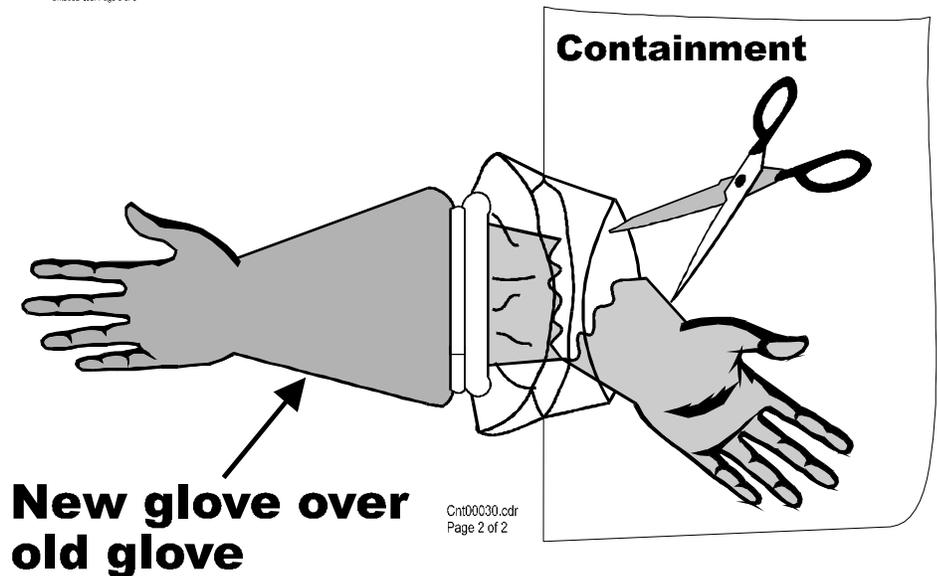
Method 2

This method is similar to Method 1. Remove your hand and leave the glove in the sleeve. If a hose clamp or cable ties was used to secure the glove remove it. **DO NOT** remove or cut tape holding the glove in place. Install the new glove over the damaged glove and tape in place as in method one with the glove turned inside out. From inside the containment pull the damaged glove into the containment and cut it off. Again **EXERCISE EXTREME CAUTION** when cutting or using sharp implements in a containment.

Remove Hand from glove



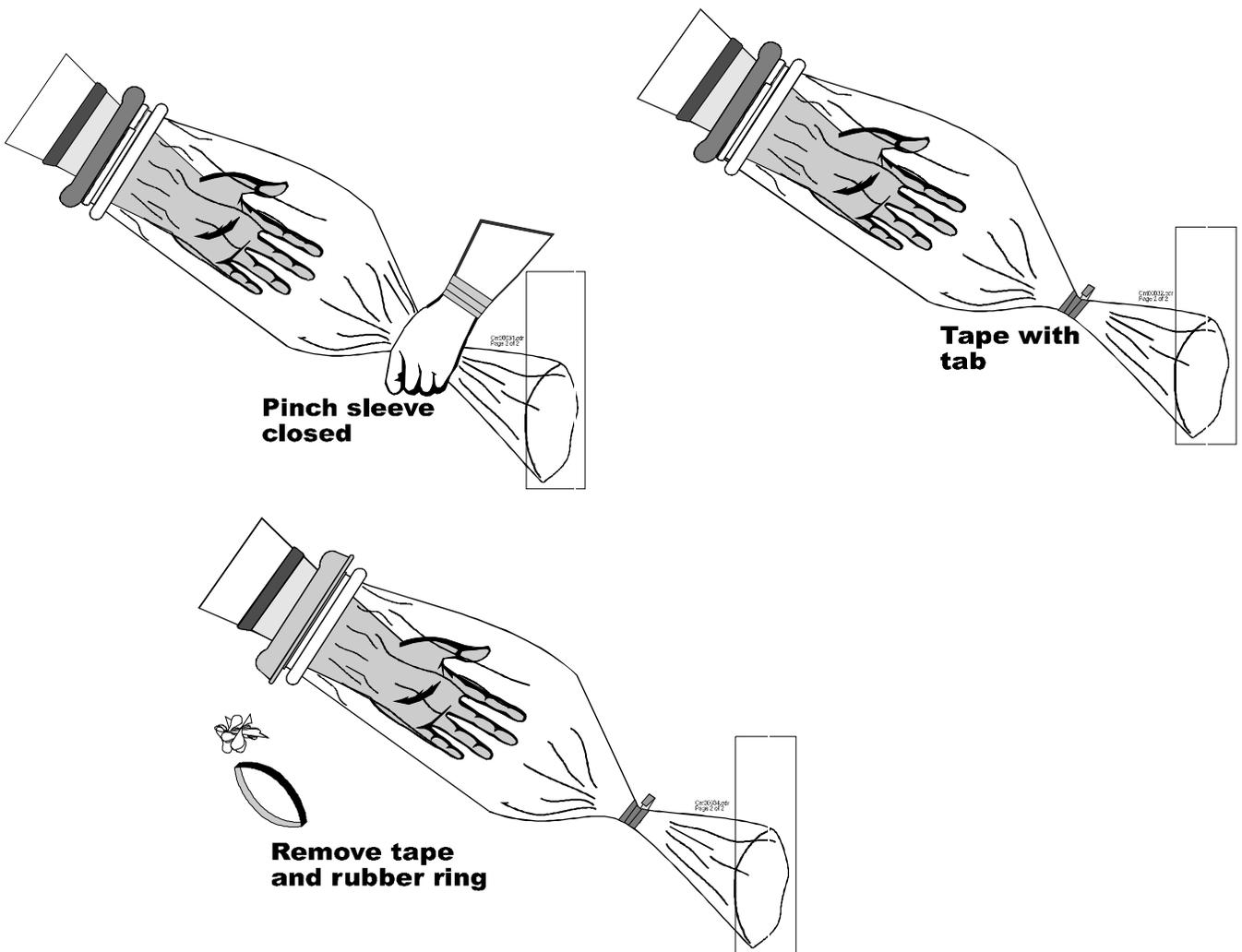
Cnt0002.cdr Page 9 of 6



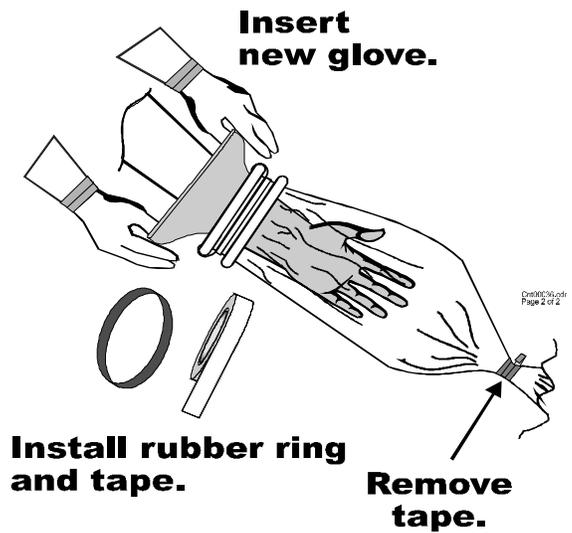
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Page 2 of 2

Method 3

Pull the damaged glove hand up and out until just the glove is in the sleeve, but **DO NOT** remove your hand from the glove. Pinch and tape the glove sleeve closed isolating the damaged glove. Leave a tab on the end of the tape to facilitate removal of the tape when the new glove has been installed. Remove tape (and hose clamp and rubber ring if used) from the damaged glove.



Over an open poly bag, remove your hand and the glove. Allow the glove to fall into the bag. Do not touch the damaged glove. Insert your hand into the new glove and then into the glove bag sleeve. Place the glove lip over the glove ring. Reinstall the rubber ring (optional) and re-tape. Remove the tape isolating the glove from the containment.



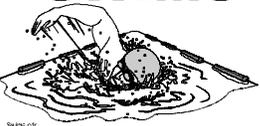
Emergency Response

Emergency situations and abnormal conditions can occur while working with containments. On such a situation, if the containment fails and a release or spill occurs. The actions for responding to a spill during work in a radiological containment are similar to responses to other spills. Remember the acronym SWIMS

Emergency Response

SWIMS

- **Stop work**
- **Warn others**
- **Isolate spill**
- **Minimize exposure**
- **Secure unfiltered ventilation**



The illustration shows a hand pouring liquid from a container into a spill kit. The spill kit includes a spill pad, a spill bucket, and a spill brush. The liquid is being contained within the spill pad. The text 'SWIMS' is written in large, bold letters above the illustration.

For highly toxic chemicals, workers should immediately exit the area without attempting to stop or secure the spill.

Holes/Tears in a Containment



A small puncture in a containment is not necessarily a spill. Only if there is evidence of loss of material (liquid or solid) or if the puncture is major, such as a large gash, or split seam, would it be classified as a spill. Regardless of the size, holes or tears discovered in a glove bag should be patched immediately. For small holes, stop work, and tape over the hole or tear on the inner and outer surfaces. Upon evaluation and concurrence of a Radiological Control Technician, work

may continue in the glove bag. The hole should be permanently patched as soon as practical. For major damage, apply SWIMS, and do not attempt to repair the containment. Wait for assistance from the radiological control personnel.

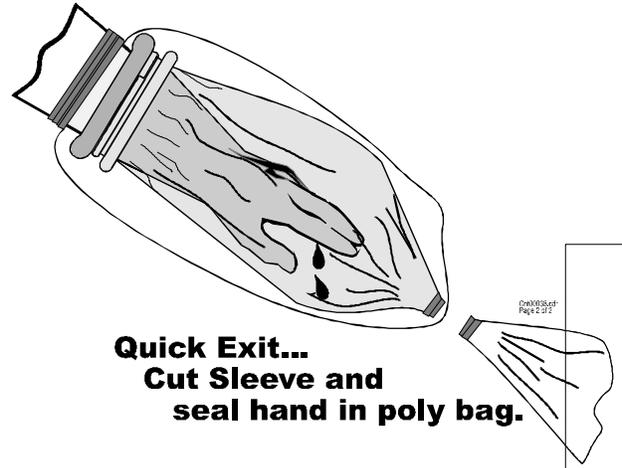
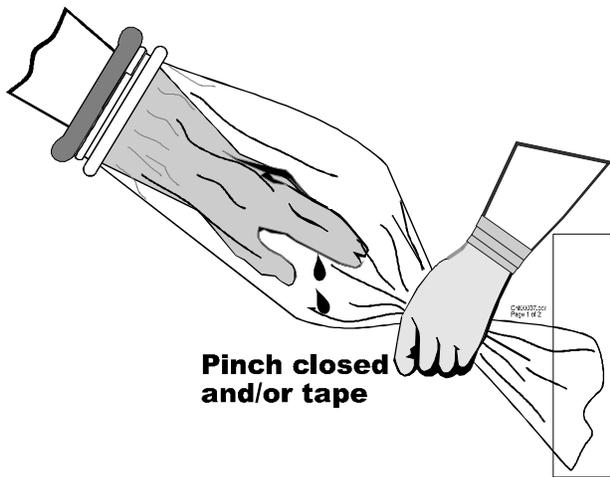
Tear in a Containment Glove with Injury to Hand

A tear in a containment glove could result in the user becoming contaminated and the release of radioactive material from the containment. The worker should take prompt action to minimize this possibility. If an injury is sustained the most important thing is the health of the individual. Each case would dictate the employee response based on the radiological conditions and the severity of the injury. The possible responses should be discussed at the pre-job briefing, so everyone understands what to do. If an injury occurs, **DO NOT PANIC!** but get assistance immediately. The following are some **EXAMPLES** of responses.

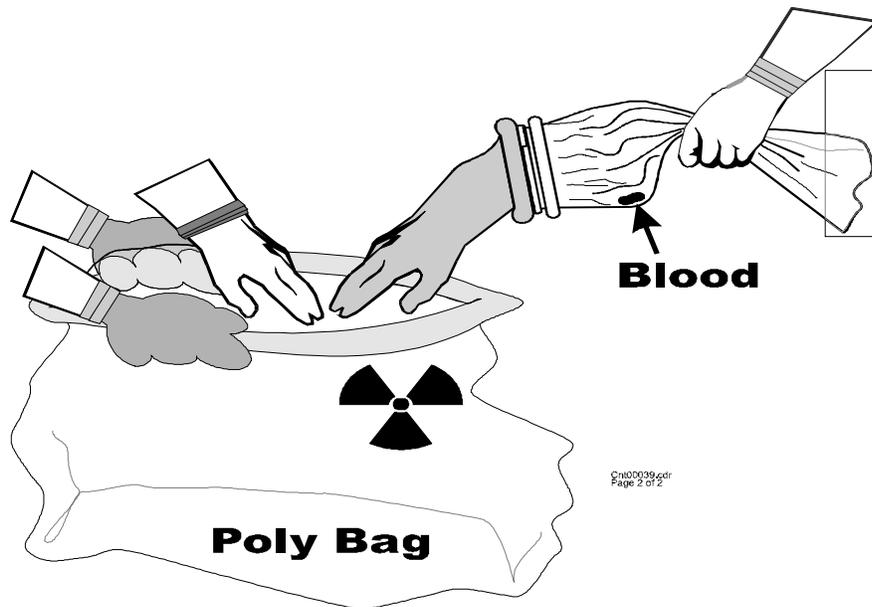


Regardless of the method used, it is important to quickly turn the damaged area down to prevent liquids from entering the tear. One method of removing the glove and hand is to pull the damaged glove upward and out until just the glove is in the sleeve. Pinch or tape the sleeve together to isolate the glove from the rest of the containment, while the hand is being withdrawn from the glove.

If personnel need to exit quickly the sleeve can be cut at the tape, then the damaged glove hand, with glove and attached sleeve can be placed in a bag for exiting. This is similar the previously discussed method 3. The major difference is bagging of the hand and of the damaged glove.



If a rapid exit is not required, then a poly bag should be held under the sleeve and hand. The hand is withdrawn from the glove, letting the glove and sleeve fall into the poly bag. Slip the hand into another poly bag for exit or to await survey. The RCT may provide additional instructions.



Bring the first poly bag up over the damaged glove and tape it to the sleeve. The RCT should check the glove sleeve for contamination before replacing the damaged glove. Because of the risks associated with of blood born pathogens, any materials contaminated with blood should be discarded appropriately.

