



Mold Remediation Day 2 Exercise Guide

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Midwest Consortium for Hazardous Waste Worker Training

Table of Contents

	Page
Mold Remediation Methods	3
Moisture Meter	3
Infrared Camera	3
Don/Doff PPE	3
Wet Wipe	5
Wet Vacuum	5
HEPA Vacuum	5
Disposal of Solid Waste	6
Decontamination/Handwashing	6
Mold Remediation Exercise	7
Containment Methods	9
Containment Exercise	15

Objectives

When complete, you will be better able to:

- Don/doff personal protective equipment (PPE)
- Demonstrate wet wipe work practices
- Demonstrate disposal of solid waste
- Demonstrate use of a wet vacuum
- Demonstrate use of a HEPA vacuum
- Demonstrate setting up a containment area

Mold Remediation Methods

Today you will practice mold remediation methods. You will rotate through stations including: don/doff PPE, wet wipe, disposal of solid waste, wet vacuum, HEPA vacuum, moisture meter, and infrared camera. You will also help set up a containment area. Guidance can be found below as well as in the content from Day 1 of the course.

Moisture Meter

A moisture meter is a simple tool used to measure moisture content in carpet, drywall etc. Note there are probed and surface contact models.

Video: Using a moisture meter https://www.youtube.com/watch?v=na4_yVBLIjY

Infrared Camera

An infrared camera is a simple tool used to identify moisture issues. Wet surfaces are usually colder than dry surfaces and the camera uses colors to indicate different temperatures. Available as a dedicated camera or an app for smartphones.

Video: Using an Infrared camera - <https://www.youtube.com/watch?v=CfmaDlo17Eo>

Don/Doff PPE

The following PPE can be used for small mold remediation jobs: Gloves, long-sleeve shirts, and long pants protect the skin from contact with mold allergens/toxins and potentially harmful cleaning solutions. Goggles prevent the entry of dust and small particles to keep mold spores out of the eyes. An N-95 respirator will provide adequate protection for limited mold remediation. It should be properly fit. Please refer to Day 1 content for additional details on PPE for small, medium, and large remediation jobs.

PPE for small jobs should be donned in this order:

- N-95 respirator
- Gloves
- Goggles

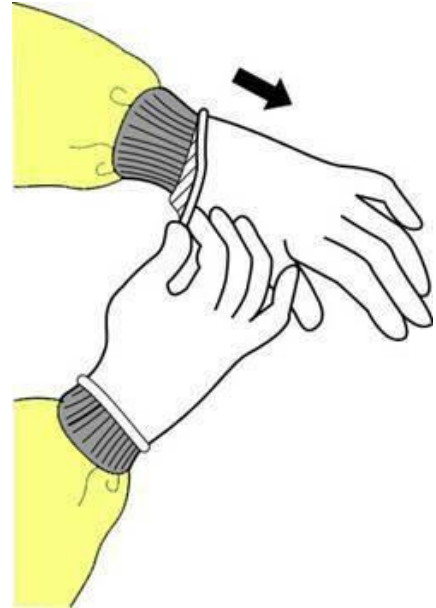
PPE for small jobs should be doffed in this order:

- Goggles (set aside for decon)
- N-95 respirator (disposed of)
- Gloves (disposed of)

To minimize the spread of contamination, gloves should be removed using one of two standard practices:

Method 1

1. Grasp one of the gloves at the cuff and pull it part of the way off. The glove will turn inside out. It is important to keep the first glove partially on your hand before removing the second glove. This protects you from touching the outside of either glove with your bare hands.
2. Leaving the first glove over your fingers, grasp the second glove near the cuff and pull it part of the way off. The glove will turn inside out. It is important to keep the second glove partially on your hand to protect you from touching the outside surface of the first glove with your bare hand.
3. Pull off the two gloves at the same time, being careful to touch only the inside surfaces of the gloves with your bare hands.
4. Dispose of the gloves by placing inside out in the trash.
5. Wash hands thoroughly.



Method 2

1. Grasp outside edge of glove near the wrist.
2. Peel away from hand turning glove inside-out.
3. Hold in opposite gloved hand.
4. Slide ungloved finger under the wrist of the remaining glove, be careful not to touch the outside of the glove.
5. Peel off from inside, creating a bag for both gloves.
6. Discard.
7. Wash hands thoroughly.

Wet Wipe

Mold can generally be removed from nonporous (hard) surfaces by wiping or scrubbing with water, or water and detergent (sometimes referred to as “amended water”). It is important to dry these surfaces quickly and thoroughly to discourage further mold growth. Porous materials that are wet and have mold growing on them may have to be discarded.

If a biocide, such as bleach, is used, the water/biocide must be in contact with the surface long enough to kill the mold. Usually, 15 minutes or longer is required. Wet wipe with bleach solution will require keeping the surface wet or damp for the specified amount of time, prior to wet wipe with clean water. A spray bottle filled with the biocide solution is the most efficient and effective way of keeping the surface damp.

Used rags and sponges can be discarded with gloves and similar waste. Wastewater can be disposed of down a sink or toilet.

Wet Vacuum

A wet vacuum is a vacuum cleaner designed to collect water from carpet and hard surfaces such as floors. It should not be used on porous materials such as drywall.

After use, solid waste and the filter from the vacuum can be wrapped in plastic, sealed with duct tape and disposed of. Wastewater can be disposed of down a sink or toilet.

Tanks, hoses, and attachments of vacuums should be thoroughly cleaned and dried after use since mold and mold spores may stick to the surfaces.

HEPA Vacuum

A vacuum with a High Efficiency Particulate Air (HEPA) filter is designed to trap small particles such as mold spores. It is used for final cleanup, after a space is stripped of contaminated contents and thoroughly dried.

Care must be taken to ensure that the filter is properly seated in the vacuum so that all the air must pass through the filter. When changing the vacuum filter, remediators should wear PPE to prevent exposure to the mold that has been captured. The filter and contents of the HEPA vacuum must be disposed of in well-sealed plastic bags.

Disposal of Solid Waste

Disposal is a continuous process at a mold remediation job.

Most of the waste generated from mold remediation will be considered ordinary waste. Waste should be completely sealed in plastic and excess air can be removed with a HEPA vacuum to reduce volume. When bagging materials, bear in mind that they may contain extra weight due to water content.

Double-bagging is recommended as the best work practice because it helps prevent ruptures in the plastic and minimizes the possibility of contamination. To double-bag, one worker inside the work area seals the waste in one layer of plastic. The worker then cleans the exterior surface and sets it inside a plastic bag held by a second worker who is past the airlock. This worker then seals the second layer of plastic.

To safely remove materials from the worksite:

- Bag all waste in 6-mil poly. You may store these bags in a temporary “waste load out” area.
- All materials which could puncture the plastic (glass, wood, drywall) must be double-bagged.
- HEPA vacuum or wet wipe the exterior of the plastic.

Decon/Handwashing

The extent of decontamination depends on the type/amount of exposure and the PPE worn. The lowest level of decon involves cleaning of goggles, disposal of N-95 and gloves, and handwashing with soap.

Mold Remediation Exercise

You will rotate through 8 stations. You do not need complete the stations in a certain order, but donning PPE should be first and doffing PPE/Decon should be last. Use the instructions below and checklist on the following page as a guide. Have your facilitator sign your completed checklist when finished all stations.

1. Don PPE. Don PPE in the correct order. Ensure proper fit.
2. Moisture meter. Use the meter to measure the moisture in some items provided.
3. Infrared camera. Use the camera to identify hot and cold spots in the room.
4. Wet wipe. Use the soapy water and rags to wipe some items provided. Dispose of wastewater and rags.
5. Wet vacuum. Use the wet vacuum to collect some water. Practice removing the filter.
6. HEPA vacuum. Use the HEPA vacuum. Practice removing the filter(s).
7. Disposal of solid waste. Break up “contaminated” wastes into pieces without generating dust. Wrap wastes in plastic sheeting and seal with duct tape. Carry wrapped materials to the assigned area.
8. Doff PPE and Decon. Doff PPE in the correct order and decon/trash as appropriate. Wash hands.

Mold Remediation Checklist

Participant Name: _____

YES NO

Don/Doff PPE and Decon

1. Did you don PPE in the correct order?
2. Did you check PPE fit?
3. Did you doff PPE in the correct order?
4. If you wore a half-face APR, did you put it in the decon bin?
5. If you wore an N95 respirator, did you put it in the trash?
6. Did you put your goggles in the decon bin?
7. Did you put your gloves in the trash?
8. Did you wash your hands afterwards?

Wet wipe

9. Did you use soapy water to wash surfaces?
10. Did you collect wastewater?
11. Did you dispose of wastewater down the drain?

Wet and HEPA Vacuums

12. Did you use a wet vacuum cleaner?
13. Did you use a HEPA-filtered vacuum cleaner?
14. Did you practice safe removal the vacuum's filter(s)?

Disposal of solid waste

15. Did you seal waste in 6-mil poly without generating dust?

Moisture meter and infrared camera

16. Did you use the moisture meter and Infrared camera?

Instructor's Initials: _____

Containment Methods

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold.

The two types of containment recommended are limited and full. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment of the contractor. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Limited Containment

Limited containment, consisting of one or two chambers, is generally recommended for areas involving between 10 and 100 square feet. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. The sheeting should extend approximately 8 feet from the site of the contamination.

All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 square feet or in any situation in which it appears likely that the occupant space would be further contaminated without full containment.

Remove furniture and fixtures from the room. If an object cannot be removed (such as a large desk which cannot fit through the door) it should be cleaned and securely wrapped in plastic and sealed with tape. Warning signs must be posted outside of all entrances to the worksite.

Using plastic sheeting, create a walkway from the work area to the outside and to waste disposal areas. Use only this pathway to minimize contamination. Double layers of polyethylene sheeting (poly) should be used to create a barrier between the moldy area and other parts of the building.



A decontamination chamber or airlock should construct a single, combined entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry.



The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.



The floor of the containment area should be covered in several sheets of poly that are stuck together with spray adhesive. Multiple layers will guard against wear and tear. The poly should extend 24 inches up the wall. Staple the poly down at the edges of the floor and make sure that the poly is flush with the wall and floor. Do not cut the poly – this will increase the risk of contamination getting through the barrier.

Poly is slippery, particularly when wet. Use rubber mats or rubber-soled shoes to prevent slips, trips, and falls.

Cover uncontaminated areas of the wall with a single layer of poly, which extends from the ceiling down to within one inch of the floor. Seal seams with tape and/or spray adhesive.

Cover the floor with a second layer of poly using tape and spray adhesive so that the edges of this layer extend a few inches up the wall past the first layer. Seams on this layer should be offset from the first layer. Put a second layer of poly on the walls. Cover the ceiling with poly and secure with furring strips. The ceiling layer should extend several inches down the wall layer. Multiple layers on the walls and flooring will make final cleanup an easier process. After remediation, the first layer can be removed to dispose of the bulk of contamination, leaving the second layer for more detail-oriented cleanup.

Spray adhesive and duct tape and should be used to create seals at all seams in the poly. The ends of the duct tape should overlap.



Poly should fully cover the uncontaminated surfaces, including windows, vents, and extra doors and should extend 4-6 inches past the frames. This will help minimize the spread of contamination.

If doors and windows are part of the decontamination project, they should be covered on the outside surface for the initial cleaning. If necessary, a small follow-up cleaning effort can be initiated to remove mold from any surface not adequately cleaned (for example, the underside of a window sash).

Negative Air Pressure

A negative air machine (NAM) is a device which moves air and, in the process, filters all the airborne particulate matter out. The NAM will draw all mold-contaminated air out of the room, thus creating a negative pressure zone. This will draw clean air into the room, thus maximizing worker safety. The filters are rated using a Minimum Efficiency Reporting Value (MERV), an industry standard developed by the American Society of Heating, Refrigerating, and Air Conditioning Engineers. This value reports how efficient a filter is at removing particles between 0.3 and 10 micrometers in diameter. A filter with a MERV rating of 1 will work inefficiently, while a MERV 11 filter will work at an 85% efficiency rating.

Negative air machines typically use three filters:

- Front pre-filter (at least MERV 8)
- Second, finer filter (at least MERV 10)
- HEPA filter

Change-out schedules must be established and followed for these filters.



When setting up the work area, place the NAM so that it can preferably vent to the outdoors. Set it up so as to maximize the amount of air flow in the work area and minimize the amount of dead air. Cover the NAM with plastic and use disposable plastic ducts to keep cleaning time to a minimum. Typically, mold remediators will begin work as far from the NAM as possible and work towards it. The NAM should run

constantly throughout the duration of the mold remediation work, even during off-work hours.

The pressure should remain at 0.02" of water. Before each shift, the negative pressure zone should be inspected for leaks or breaches. Any problems should be fixed immediately.

NAMs come with a variety of optional features. You may find these useful:

- Auto-shutdown if the exhaust becomes clogged or the HEPA filter breaks.
- Warning lights to indicate problems in pressure (too high, too low).
- Time-keeping device which shows how long the unit (and its filters) have been running.

If the power shuts down while a NAM is in operation, work should stop and not restart until the power returns and the NAM is operating once more.

At the end of a remediation project, shut down the negative air machines, bag them, and remove them from the area. This will prevent recontamination. Only after the NAM has been removed should you remove the final layers of poly. After these layers have been removed, wet wipe the surfaces underneath with an alcohol solution and allow to dry.

Containment Exercise

You will be working in groups to assemble a containment area. Use the directions below as guidance and complete the checklist on the following page.

Instructions:

- Turn off power at the source. Lock out/tag out.
- Remove furniture & light fixtures from room.
- In real life, these should be HEPA vacuumed & wet wiped before removing. Skip this for now.
- If items cannot be removed, they should be dried and covered in plastic.
- In real life, the entire room should then be HEPA vacuumed. Skip this for now.
- Seal all vents, windows, and extra doors with two layers of 6-mil poly and duct tape.
 - There should be only one entrance to the work area.
 - Overlap the tape.
 - Extend the poly 4 to 6 inches past the frame of vents, windows, and doors.
 - The first layer must not be removed until the room has passed inspection.
- Floors
 - Cover floors with several layers of poly that are glued together with spray adhesive. This will guard against wear and tear.
 - Be aware of possible fumes from the spray adhesive. Read the label carefully.
 - Cover any seams in the floor layer with duct tape.
 - The floor covering should extend 24 inches up the wall.
- Walls
 - Cover uncontaminated walls with a single layer of poly.
 - Cover all seams with duct tape.
- Floors
 - Put a second layer of poly on the floors using duct tape and spray adhesive.
 - The edges of this layer should extend up the wall a few inches past the first layer.
 - Seams of the second layer should be offset from the first layer.
- Walls
 - Put a second layer of poly on uncontaminated walls.
- Ceiling
 - Put a layer of poly on the ceiling and secure with duct tape and furring strips.

- Create a doorway/airlock
 - Cover the doorway with a sheet of 6-mil poly, extending the edges of the poly 4-6 inches past the frame.
 - Duct tape the edges down, overlapping the ends of the tape.
 - Cut a slit in the center of the poly.
 - Tape a second sheet of poly on one side of the doorway, with tape extending along the top of the poly and on the left-hand side (when facing doorway).
 - Move to the other side of the doorway.
 - Tape a third sheet of poly on one side of the doorway, with tape extending along the top of the poly and the right-hand side (when facing doorway).
 - This will create an S-shaped entryway.
 - Carry poly to disposal area when job is complete

Containment Checklist

Participant Name: _____

YES NO

1. Did you help set up a containment area?
2. Did you seal all vents, windows, and extra doors with two layers of poly and duct tape?
3. Did you extend the poly 4-6 inches past all vents, windows, and doors?
4. Did you cover the floor with several layers of poly?
5. Did you cover the walls with two layers of poly?
6. Did you cover the ceiling with a layer of poly?
7. Did you use furring strips?
8. Did you create a doorway or airlock?
9. Did you overlap the ends of all duct tape you used?

Instructor's Initials _____