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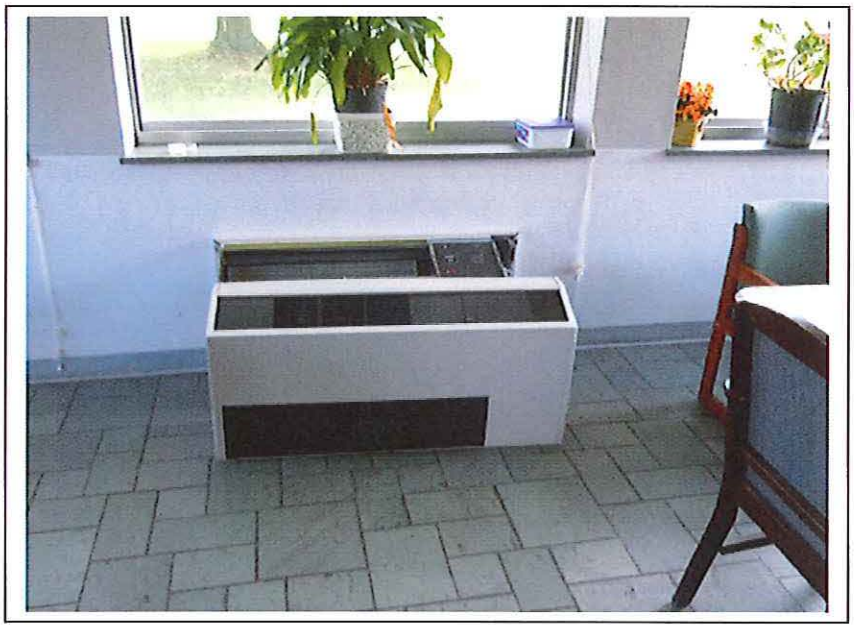
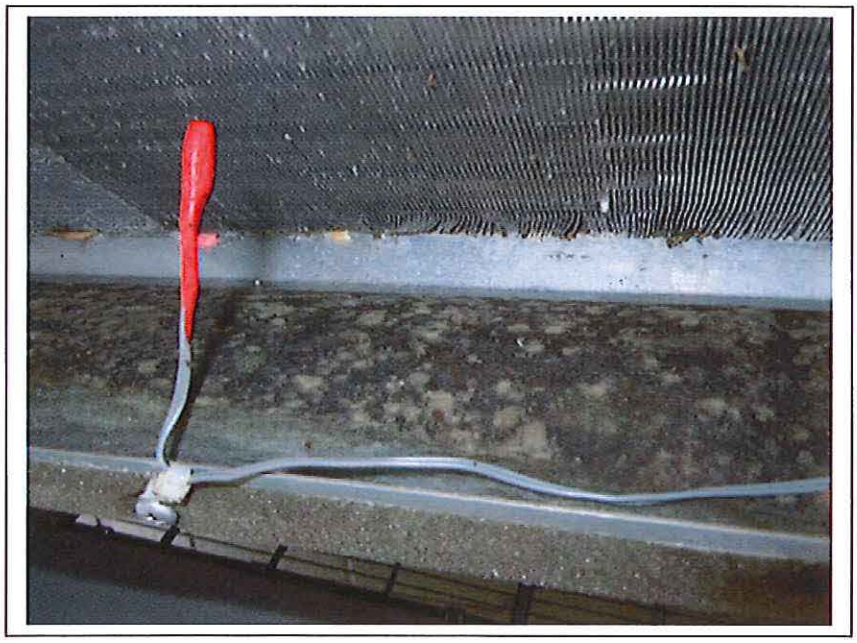
INDOOR MOLD ASSESSMENT REPORT

Vermont Veterans Home
325 North Street – Bennington, Vermont
September 27, 2012

At the request of Melissa Jackson, Home Administrator with the Vermont Veterans Home (VVH), Crothers Environmental Group, LLC (CEG) conducted indoor mold assessments and assisted with remediation of mold discovered growing on insulation inside Trane® heating and cooling heat pumps.





Executive Summary: The following report summarizes the activities that took place during August and September of 2012 at the VVH. The first section provides the conclusions and recommendations to allow the reader to get to the bottom line; followed by the rest of the report.

Conclusions & Recommendations

1) The majority of water source heat pumps (WHPs) were/are plagued with internal mold growth due to condensation during the cooling season. Without proper climate control (i.e. keeping all windows closed), the problem will continue whenever the units operate in the cooling mode; especially when relative humidity levels are high.

There are numerous suggestions that can be provided for this issue; however, we are going to provide two of them at this point:

a) Redesign the HVAC systems to provide cooling to the occupied spaces via conventional roof top air-conditioning systems. This would do away with the need for the individual heat pumps and fan coil units. Unfortunately space limitations, installation, and design costs will likely be cost prohibitive to make this a viable option.
b) Based on recent research and the success of ultraviolet (UV) light technology in a State building in Burlington, Vermont, we suggest serious consideration be given to utilizing UV lights in both the individual room WHPs and FCUs as well as incorporating them into the existing ducted HVAC systems downstream of all cooling coils. It is not known if the UV lights will be visually irritating to the room occupants at night when the main lights are off. It may be prudent to install the UV lights in a few rooms at first to determine if they will be problematic to the occupants. After the first year of use, it may be a viable option to turn the UV lights off during the heating season; which would add to the life of the bulbs (though we recommend checking with the manufacturer first).

2) The basements have extensive mold growth. The basement areas should be kept under negative pressure from the occupied floors above. This will prevent mold spores from migrating out of the basement to the upper floors. Monitors should be installed (and preferably tied into the energy management computer system) to ensure that negative pressure is maintained in the basements (**note, negative pressure monitors were installed in August 2012**). There is no immediate health threat to the building occupants if the basements are under negative pressure; however, VVH staff and maintenance personnel should avoid these areas without personal protective equipment (proper respiratory protection). Funding should be sought to properly remediate and clean the basements. It will then be important to provide adequate mechanical dehumidification for the basements. This should include proper removal and cleaning of all basement wall and ceiling surfaces (excluding dry crawlspace areas) and the removal of gypsum board or other organic type wallboard materials. Only properly trained microbial remediation workers should be considered for conducting the remediation work. See a brief mold remediation work plan at the end of this report for your use as needed.

The crawl space area beneath the East Wing should be remediated and fire-retardant heavy polyethylene should be laid over the soil (once the remediation is complete) to act as a vapor barrier.

3) The 2nd floor Admin medical records area has been confirmed to have moderately elevated counts of airborne mold spore concentrations. This entire area should be properly remediated. This should include, but not limit, removal of all the fan coil units; "proper removal" and replacement of the moldy/water damaged flooring materials affected by the leaking fan coil units; followed by a thorough microbial cleaning of all rooms in this area. Only properly trained microbial remediation workers should be considered for conducting the remediation work. See attached brief mold remediation work plan for your use as needed.

Assessment

On August 10, 2012, James Kinney (JK) HVAC maintenance person with the VVH contacted CEG to arrange to have mold testing conducted in an area known as "The Club" located directly across from the C-Wing nurse's station. There had been a recent rise in upper respiratory ailments in some of the elderly occupants, and it was believed that a microbial type odor noticed in The Club may have been a contributor to the health issues.

On August 13, 2012, Chris Crothers (CC1) and Christopher Clement (CC2), mold consultants with CEG, arrived at VVH to conduct an initial assessment. JK directed the consultants to The Club area in C-Wing. The consultants immediately noticed a strong chlorine type odor (bleach) when entering the room. It was reported that the housekeeping staff had thoroughly cleaned the three water source heat pumps (WHP) and the entire room prior to our arrival. The consultants could not detect a microbial odor in the room. Subsequent air sampling in the room did not reveal elevated airborne mold concentrations.

JK brought the consultants down to the dining room at the east end of C-Wing in order to open up one of the WHPs in this area. This room was not being used by building occupants at that time. When the unit was opened up, elevated concentrations of *Cladosporium cladosporioides* type mold spores were released into the air (though this was not known until the air samples collected from the room had been analyzed at the laboratory the following day). It was immediately noticed that visible mold growth was present on the black fiberglass insulation inside the unit (see bottom photo on page 1 of this report). This was likely caused by condensation accumulating on the insulation (or more likely the dirt, dust and debris on the insulation) during the cooling season.

JK then brought the consultants to the basement area beneath the east end of C-Wing. A very strong microbial odor was immediately noticed when walking down the stairway. At the bottom of the stairs, the concrete walls were found to have significant mold growth. The basement area was also found to have significant mold growth on the ceilings and walls. We then visited the basement area beneath the lobby and discovered visible mold throughout the corridors and the electrical and maintenance shop offices. The basement areas are addressed in the Conclusions and Recommendations section of the report below.

JK had previously purchased ten petri-dishes with an agar media at a local building supply company. He placed them in C-Wing rooms 506, 508, 512, 606, 607, 609, 611, and the Club. He also placed them in the B-Wing basement and the basement maintenance/electrical shops. Mold growth of varying species was present in all the petri-dishes. Unfortunately, molds common with water damage and molds that generally do not grow indoors were discovered in the samples. It was explained to JK that without a measurable amount of air flow applied to the media, there was no way to accurately determine the extent of airborne mold by this type of sampling.

On August 14, 2012, CC1 provided laboratory information to Melissa Jackson from the samples collected the previous day. It was conveyed that the C-Wing east dining room and basement area had significantly elevated airborne mold spore concentrations. CC1 stated that he would return to VVH the following day to conduct a more comprehensive assessment. Based on this information, Ms. Jackson felt it was prudent to relocate the occupants from C-Wing until the extent of contamination could be determined.

On August 15, 2012, CC1 arrived at the site to begin additional mold sampling. JK accompanied CC1 throughout the day and was instrumental in interacting with the staff and occupants during the

sampling event. CC1 provided a mobile laboratory for the rapid analysis of the collected spore trap air samples and tape lift surface samples. The first area tested was the "I.T." room on the first floor of the Administration (Admin) building. The WHP in this room had to operate continuously to maintain cooling for the computer equipment. An ambient air sample was collected while the WHP fan was operating. Laboratory analysis revealed that mold spore concentrations **were not** elevated in the "I.T." room at the time of sampling. The second location sampled was the C-Wing east dining room (this area had the elevated concentrations of airborne *Cladosporium cladosporioides* type mold spores two days prior). Laboratory analysis revealed that mold spore concentrations **were not** elevated in this dining room at the time of sampling; indicating that the spores had purged from the space and further suggesting that the *Cladosporium cladosporioides* spores were not releasing into the air without physical disturbance to the WHP. The following areas were also sampled on this date with laboratory analysis revealing that airborne mold spore concentrations **were not** elevated at the time of sampling:

- C-Wing rooms 506, 512, 606, and 607
- C-Wing west dining room
- B-Wing rooms 305, 400, and 411
- B-Wing Dirk's room (central dining area between "B" & "C" wings)
- B-Wing rooms 506, 512, 606, and 607
- B-Wing Namaste room
- B-Wing east and west dining rooms
- B-Wing Nurse's station
- Activities room
- Patriot hallway
- D-Wing dining room
- Admin building 1st floor office of the Executive Assistant to the Administrator
- A-Wing dining room
- A-Wing rooms 805 and 808

Though airborne concentrations of *Cladosporium cladosporioides* spores were nearly non-existent in the rooms/areas sampled, surface samples collected of visible growth on fiberglass insulation and on coils inside the WHPs revealed the presence of heavy concentrations of *Cladosporium cladosporioides* type mold.

Sampling was also conducted in the medical records area on the 2nd floor of the Admin building. Visible mold growth and rust were observed on the fan coil units (FCUs) in these areas. Air samples collected from the records storage room and medical records office #1 revealed elevated concentrations of airborne *Aspergillus/Penicillium* like mold spores. Surface samples collected of the visible growth revealed heavy concentrations of *Aspergillus/Penicillium* like mold growing on and inside the FCUs.

Based on the visual observations and analytical results of the samples collected on August 15th, a meeting was setup up with Melissa Jackson, CC1, JK and David Mack - Principal of Catamount Environmental, Inc. (remediation contractor) to discuss remediation options and costs. In short, the decisions were to leave C-Wing unoccupied for a couple weeks to give housekeeping an opportunity to perform a thorough cleaning of the entire wing. Catamount would have a crew come in the week of August 20 and begin removing insulation from the interior of the WHPs while using appropriate engineering controls to prevent the spread of mold spores. CEG would provide an onsite mold consultant and field laboratory to perform oversight and conduct air sampling in the

remediation work areas. CEG would also collect particle counts before and during remediation, to ensure the effectiveness of the engineering controls.

On August 21, 2012, Catamount arrived and began remediation activities in "The Club" and in the Dirk's dining area.

On August 22, 2012, CC2 arrived at the site early to collect samples in the Dirk's dining area to determine if the occupants could return to the area for breakfast. The air samples did not meet the clearance criteria. The same result occurred in the CCC Office (adjacent to the Dirk's dining area). After recleaning and resampling numerous times, it was determined that CC1 should return to the site the next day and look at the effectiveness of the engineering controls and modify as necessary.

In the interim, CC2 conducted additional sampling in the medical records area of the 2nd floor Admin building. The sampling confirmed the presence of elevated mold concentrations discovered during previous sampling conducted in the area. Significant water damage was observed on the floor beneath the floor mounted cooling unit in the medical records storage room. It appeared that condensation from the unit had been saturating the floor for an extended period of time. A couple floor tiles were lifted and visible mold and a strong moldy odor were immediately noticed. {Note, as required by state and federal regulations, CC1 collected bulk samples of the floor tile and adhesive to determine if asbestos was present in the materials before they were disturbed by renovation. No asbestos was detected in the collected samples}. It was determined that a remediation plan should be developed for the entire medical records area.

On August 23, 2012, CC1 returned to the site to review the remediation effectiveness and work practices being employed. In order to get the Dirk's dining room cleared, CC1 instructed Catamount to build negative pressure containments around all the WHPs along the outside (west) wall and open up and reclean all the units. Catamount was requested to pull the metal covers and bring them outdoors to properly and thoroughly clean them. In addition, CC1 had them pull the blower fans out, bring them outdoors, and use a high velocity air compressor to blow out loose dirt, dust, debris and mold spores. CC1 then had Catamount thoroughly clean the units and when finished, had them use a leaf blower to blow out all the inaccessible nooks and crannies. When finished cleaning, the fans were reinstalled and the covers were put back on. JK was then asked to turn the units on to the heating cycle and let them operate with the blowers running while the heat was on. The intent was to dry out the units and disperse residual mold spores, if any, while purging residual spores to the outdoors through Catamount's filtration fans inside the negative pressure enclosure.

The added engineering controls and cleaning methods were found to be adequate and became the work practices employed for the majority of remaining WHPs. With only a few exceptions, subsequent containments met the airborne mold spore clearance criteria. Containments that did not meet the clearance criteria were recleaned and retested until the clearance criteria was achieved.

On August 27, 2012 CC1 arrived in the morning with a plan of monitoring the work throughout the week. JK assisted CC1 throughout the week. On this day, the majority of B-Wing was remediated along with the rooms neighboring the Dirk's dining area.

On August 28, 2012 the remediation continued with the physical therapy area (main area, out-patient area and PT office), front lobby, and the ground floor Admin board room.

On August 29, 2012 remediation continued in the A-Wing dining room and B-Wing art room. On August 30, 2012 remediation continued in the activities areas outside B-Wing, the B-Wing TV room/lounge, and the Chapel. The remediation crew wrapped up for the week with the intent of returning to finish the following week.

CC1 and JK collected samples in the west side of C-Wing basement before ionization equipment was placed in the area. This basement had significant mold growth on the walls and ceilings. Air samples revealed significantly elevated mold spore counts, ranging from 39,000 to 56,000 spores per cubic meter of air. The manufacturer of the ionization equipment stated that this equipment would kill the mold within 72 hours (+/-) and the mold would turn to dust for easy cleanup. CC1 was very skeptical, but the equipment was being provided at no cost. Upon returning on 9/4/12, it was observed that the mold on the walls and ceilings had not lessened. Air samples were collected from the same locations as the pre-air samples which revealed higher mold spore counts, ranging from 74,000 to 88,000 spores per cubic meter of air. Based on visual observations and the results of the collected air and surface samples, the results suggest that the ionization equipment was not effective for this basement area.

On September 4, 2012 the administrators vacated the Admin wing for the day and remediation was started and completed throughout this area.

September 5, 2012 was the last day of this round of remediation. The work included the Chapel hallway, D-Wing solarium/TV room, the library, and the large area outside the library (lounge).

In addition, the WHP in the A-Wing hall (Climate Master unit) was contained and opened up to determine if mold growth was prevalent on these types of WHPs as well. Once the unit was opened up, extensive mold growth was found. As a precaution for the occupants, CC1 and JK conducted sampling inside residential rooms that had the Climate Master WHPs. An ambient air sample was collected first in each room, followed by a second air sample after the heat was turned on and blower fans were operating. To evaluate the room under worst case conditions while the unit was operating, CC1 pounded on the unit to dislodge any mold spores that may be present. Very few mold spores were discovered in the collected air samples from these rooms, suggesting that the rooms are safe for occupancy.

CC1 collected air and surface samples in the East-Wing residents' rooms and in the basement crawl space. The 1st floor rooms and halls were not found to contain elevated airborne mold spore concentrations. The crawl space areas below did have elevated airborne mold spore concentrations.

Mold Spore Trap Air Testing

Spore Trap Air Sampling Methodology

The air samples were collected onto Micro5™ Microcell spore trap cassettes. Upon receipt by the laboratory, the slide is removed from the cassette for the enumeration and identification of fungal spores. The deposition trace is analyzed at 600X and/or 1000X magnification using Kohler Illumination.

Spore Trap Air Sample Data Interpretation

Because of the ubiquity of fungi, samples collected from suspect areas need to be evaluated against samples collected from outdoors and non-suspect areas for comparison. As a general rule of thumb, the genus of fungi collected from indoor air should match outdoor air and typically should be present at levels less than outdoors. Lower or higher levels of fungi indoors of different genera from outdoors can indicate contamination of interior substrates.

Surface Sampling

Tape lift surface samples were collected of visible mold to determine the types of mold present. Surface samples revealed the presence of *Cladosporium cladosporioides* mold in heavy concentrations on the WHP internal insulation. *Aspergillus/Penicillium* like mold in heavy concentrations in/on the FCU's in the 2nd floor Admin Med Records area. Refer to the attached laboratory sheets for analytical results of all the collected surface samples.

Please call our office at 802-888-1936 if you have any questions regarding this report or if you need further information.

Signed,

R. Chris Crothers, CMC
Certified Microbial Consultant, Board Certified by the American Council for Accredited Certifications

Attachments: Recommended Mold Remediation Work Plan - 2nd floor Admin Building
Mold Laboratory Analytical Sheets

cc: CEG888245

Recommended Mold Remediation Work Plan for Basements & The 2nd floor Admin Building Medical Records Area Throughout

The Mold Remediation Contractor (hereinafter referred to as **"Contractor"**) should be responsible to furnish all labor, equipment, materials, services, insurance, permits, licenses/certificates, etc., for the proper remediation of affected building materials, surfaces, and objects at the Vermont Veterans Home in Bennington, Vermont (hereinafter referred to as the **"Work"**). Work practices for mold remediation/cleaning should be performed utilizing a combination of recognized standards that includes but does not limit:

- AIHA, "Recognition, Evaluation, and control of Indoor Mold" 2008;
- ACGIH, "Bioaerosols Assessment and Control," 1999;
- IICRC, "S520 Standard and Reference Guide for Professional Mold Remediation," 2003;
- OSHA, "A Brief Guide to Mold in the Workplace;"
- USEPA, "Mold Remediation in Schools and Commercial Buildings," March 2001.

Inclusive of or in addition to the recognized standards, the following recommendations are provided:

Basements/Crawl Spaces

- Post microbial hazard warning signs at entrances to the affected areas.
- Install a poly critical barrier over doorways leading down to the basements. Make sure the barriers can be easily removed in case the doorway must be used as an emergency egress.
- A worker change station should be placed in an appropriate location.
- Mobilize negative pressure filtration units (NPFU - also referred to as AFDs and NAMs) into the basements, install poly vent tubing from NPFU's to windows, then energize the machines. Provide a sufficient quantity of NPFUs to provide a minimum of four air changes per hour.
- Once negative pressure has been established, pre-clean and relocate all movable personal items from the basement. Once cleaned, turn over salvageable items to the Owner for temporary storage. Remove and dispose of all loose debris, trash and other associated non-salvageable items from the basements.
- Remove all gypsum board from work areas.
- Lightly sand water stained partition studs, floor plates, stair components and overhead floor joists/decking to remove historic mold growth where applicable.
- Aggressively scrub the concrete walls, ceilings, supports, etc. until no visible mold remains.
- Once the above activities have been completed, thoroughly scrub all surfaces utilizing warm water and a detergent.
- Continue remedial cleaning operations on all basement surfaces until no visible mold, dirt, dust or debris remains on the affected surfaces.
- Prepare area for visual inspections and post remediation mold air sampling.
- In dirt crawl spaces, install fire retardant 6 mil poly over the floor surfaces for use as a vapor barrier.

2nd floor – Admin Building - Medical Records Area

- Post microbial hazard warning signs at entrances to the affected areas.
- Install a poly critical barrier over doorways leading to the 2nd floor.
- A worker change station should be placed at one end of the work area.
- Mobilize NPFU's into the area, install poly vent tubing from NPFU's to windows, then energize the machines. Provide a sufficient quantity of NPFUs to provide a minimum of four air changes per hour.
- Once negative pressure has been established, pre-clean and relocate all movable personal items from the basement. Once cleaned, turn over salvageable items to the Owner for temporary storage. Remove and dispose of all loose debris, trash and other associated non-salvageable items from the basements.
- Remove all fan coil units (if they haven't already been removed). Wrap them in poly and store them in an area designated by VVH.
- Remove all water damaged flooring and sub-flooring at least 3 feet beyond visible water staining and/or mold.
- Where gypsum wall board has been affected, remove wallboard (and wall insulation if present) up 2' above the finished floor or 2' above water staining and/or mold; which is ever higher.
- Lightly sand water stained partition studs, and floor plates to remove historic mold growth where applicable.
- Once the above activities have been completed, thoroughly clean all surfaces utilizing warm water and detergent along with HEPA vacuuming. Continue remedial cleaning operations until no visible mold, dirt, dust or debris remains on work area surfaces.
- Prepare area for visual inspections and post remediation mold air sampling.

GENERAL REQUIREMENTS/RECOMMENDATIONS

The following are general requirements and/or recommendations to be employed for the remediation project:

Warning Signs

Microbial warning signs should be displayed at all approaches to the work areas (i.e. all doorways leading into the facility). If preferred, signs can be placed inside the facility as long as any unauthorized person entering the building can see the sign immediately upon opening the door(s) leading into the remediation area.

Worker Decontamination / Change Station Enclosure System

A worker decontamination enclosure system consisting of a clean room and equipment/dirty room, separated from each other and from the work area by airlocks, accessible through doorways protected with at least two (2) overlapping polyethylene sheets should be provided. Except for the doorways, the worker decontamination enclosure system should be airtight. All entry and exit from the work area should be through this system. The sequence of entering and exiting the worker decontamination enclosure system should be as follows:

A. Entry and exit - All persons should enter and exit the work area through the worker decontamination enclosure system.

B. Knowledge of procedures - All persons, before entering the work area, should read and be familiar with all posted regulations, personal protection requirements, including work area entry and exit procedures, and emergency procedures.

C. Personal Protective Equipment - All persons should proceed first to the clean room, remove all street clothing, store these items in clean sealable plastic bags or lockers and don protective clothing. All authorized visitors should also don NIOSH-approved respiratory protection. Clean respirators and protective clothing should be utilized by each authorized visitor for each separate entry into the work area. Respirators should be inspected prior to each use and tested for proper seal using qualitative or quantitative fit checks.

D. Removal of personal protective equipment - After the workers have finished their work, they should remove any gross debris from their disposable work suit using a HEPA vacuum. They should remove their disposable suit and place in waste bag, then immediately enter the equipment/dirty room. Utilizing a bucket of clean warm water, they should wet wipe their respirator and body.

E. Clean room/clothing - After removal of disposable suits and cleaning of respirators, all persons should proceed to the clean room and don clean personal protective equipment if returning to the work area or street clothing if exiting the enclosure.

Critical Barriers

All openings between the work area and outdoors, including but not limited to; windows, doorways, corridor entrances, drains, radiators, grates, skylights, etc., should be sealed airtight with a minimum of one layer of 6 mil. polyethylene sheeting. All HVAC systems, including but not limited to; air ducts, diffusers, grills, etc., should be sealed airtight with a minimum of one layer of 6 mil. polyethylene sheeting. Critical barriers should be installed in a manner which prevents mold spores from migrating outside the containment area boundaries.

Negative Pressure Enclosure

NPFU's with HEPA filtration should be provided in sufficient quantities to provide an air change in the work area(s) every 15 minutes. The filtered NPFU exhaust should be vented to the outside of the facility, configured in such a manner to prevent the exhaust air from being entrained back into the facility. Before beginning work within the enclosure, and at the beginning of each shift, the negative pressure enclosure should be inspected for breaches. Any leaks found must be immediately sealed before further work can occur. The NPFU's should run when workers are in the work area and for additional 15 minutes after the work shift is through.

Personal Protective Equipment (PPE)

Any remediation work that disturbs mold, and causes mold spores to become airborne, increases the degree of respiratory exposure. Actions that tend to disperse mold include: breaking apart moldy porous materials such as wallboard; destructive invasive procedures to examine or remediate mold growth in a wall cavity; removal of contaminated wallpaper by stripping or peeling; using fans to dry items or ventilate areas.

The primary function of personal protective equipment is to prevent the inhalation and ingestion of mold and mold spores and to avoid mold contact with the skin or eyes. The following paragraphs discuss the various types of PPE that should be utilized during remediation activities.

Skin and Eye Protection

Gloves protect the skin from contact with mold, as well as from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of substance/ chemical being handled. If a biocide such as chlorine bleach or a strong cleaning solution is being utilized, Contactor should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or PVC. If you are using a mild detergent or plain water, ordinary household rubber gloves may be used.
For protection of worker's eyes, properly fitted goggles or a full face respirator should be utilized. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not appropriate in mold remediation.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold spores, contaminated dust, and other particulates that are released during the remediation process. Either a half face air-purifying respirator or full face air-purifying respirator can be used. A full face respirator provides both respiratory and eye protection and is RECOMMENDED for this project. Respirators used to provide protection from mold and mold spores must be certified by the National Institute for Occupational Safety and Health (NIOSH). As specified by OSHA in 29 CFR 1910.134 individuals who use respirators must be properly trained, have medical clearance, and be properly fit tested before they begin using a respirator. In addition, use of respirators requires the employer to develop and implement a written respiratory protection program, with worksite-specific procedures and elements. The Contractor's written respiratory program shall be present and available at the Work Site at all times. All of the Contractor's personnel shall strictly abide by this program. At a minimum, the Respiratory Protection Program shall include:

- ◊ medical monitoring program
- ◊ selection of respirators
- ◊ fitting of respirators
- ◊ qualitative and/or quantitative fit check requirements

Protective Clothing

While conducting remediation work, individuals will likely encounter hazardous biological agents as well as chemical and physical hazards. Consequently, appropriate personal protective clothing (i.e., disposable Tyvek® suits or similar) is required to minimize cross-contamination between work areas and clean areas, to prevent the transfer and spread of mold and other contaminants to street clothing, and to eliminate skin contact with mold and potential chemical exposures.

Disposable PPE should be discarded after each use. They should be placed into impermeable bags, and discarded. Appropriate precautions and protective equipment for biocide/chemical applicators should be selected based on the product manufacturer's warnings and recommendations (e.g., goggles or face shield, aprons or other protective clothing, gloves, and respiratory protection).

Removal of Affected Building Materials

Where called for in the Work Plan, building materials scheduled for removal should be removed intact where possible. All fasteners should be removed from the component (i.e. sheetrock screws, nails, etc). The back sides of the removed components should be inspected for signs of visible water staining and/or mold growth. The removed components should be wrapped air tight with one layer of 6 mil polyethylene (or contractor quality polyethylene bags) and sealed with industrial grade duct tape. The wrapped/bagged waste should then be removed from the Work Area and discarded.

Disposal of Waste

The Contractor should be responsible for containerizing and disposing of all waste generated by the remediation activities. The waste materials can be disposed of as typical construction waste.

Cleaning/Treatment Methods

The purpose of mold remediation is to remove moldy and contaminated materials and to prevent human exposure and further damage to building materials and furnishings. A variety of cleanup methods are available for remediating damage to building materials and furnishings caused by moisture control problems and mold growth. The specific method or group of methods used will depend on the type of material affected.

It is important to perform cleaning in a methodical fashion. The workers should clean from the highest location in the work areas, working their way down to the floor area. Once on the floor, the workers should work from the farthest side of a room and clean towards the negative pressure filtration unit(s). In all cases, the workers should keep the cleaning activity between their breathing zone and the negative pressure filtration units.

The Contractor should employ one and/or a combination of the following cleaning methods:

Wet Vacuuming

Wet vacuums are vacuum cleaners designed to collect water. They can be used to remove water from floors, carpets, and hard surfaces where water has accumulated. They should not be used to vacuum porous materials, such as gypsum board. Wet vacuums should only be used on wet materials, as spores may be exhausted into the indoor environment if insufficient liquid is present. The tanks, hoses, and attachments of these vacuums should be thoroughly cleaned and dried after use since mold and mold spores may adhere to equipment surfaces.

Damp Wiping

All nonporous surfaces should be cleaned by wiping and/or scrubbing with water and a detergent solution. It is important to dry these surfaces quickly and thoroughly to avoid further mold growth.

HEPA Vacuuming

HEPA (High-Efficiency Particulate Air) vacuums should be utilized for final cleanup of remediation areas after materials have been thoroughly cleaned, dried and contaminated materials removed. Care must be taken to assure that the filter is properly seated in the vacuum so that all the air passes through the filter. When changing the vacuum filter, the Contractor should wear respirators, appropriate personal protective clothing, gloves, and eye protection to prevent exposure to any captured mold and other contaminants. The filter and contents of the HEPA vacuum must be disposed of in impermeable bags or containers in such a way as to prevent release of the debris.

POST REMEDIATION VERIFICATION

Visual Inspections

Once the final cleaning has been completed and the Work area has dried, an independent qualified microbial consultant along with the Contractor's Supervisor/Competent Person will perform a visual inspection of all surfaces in the Work areas, (including Contractor's equipment). The Work area shall be free of all dust, dirt and debris. The Contractor will be required to re-clean areas where accumulated dirt, dust and debris are discovered during the visual inspection.

Final Air Sampling

The independent qualified microbial consultant should collect spore trap air samples in the same locations where pre-remediation samples were collected.

Spore Traps

The spore trap air samples will be collected onto Micro5™ Microcell spore traps or Zefon™ Air-O-Cell spore traps. Spore traps are a sampling device designed for the rapid collection and analysis of a wide range of airborne aerosols. These include fungal spores, pollen, insect parts, skin cell fragments, fibers, and inorganic particulates. Air enters the cassette, the particles become impacted on the sampling substrate, and the air leaves through the exit orifice. The cassette housing is designed in such a way that the particles are distributed and deposited equally on a special glass slide contained in the cassette housing called the "trace."

Air Sampling Protocol

Sampling pumps will be located in the work area and outdoors so that they are not unduly influenced by the configuration of the space or by each other. Sampling pumps should not be placed in room corners, under shelves, or in other locations where airflow is restricted. The indoor air space should be moderately agitated by fans to mimic actual occupied conditions.

Once the sampling equipment is in place, the location, time, filter number, pump number, and other pertinent information should be recorded by the industrial hygienist. When the requisite sampling volume has been reached, the time, intermediate flow rate checks, and the final flow rate should be

recorded. Samples should be hand delivered or shipped to the laboratory for analysis without further treatment.

Calibration

The sampling pumps should be calibrated before and after each use to determine the actual flow rate of the pump. The flow rates should then be averaged and recorded. A field rotometer should be used to calibrate the pumps in the field before and after each use. The rotometer should be calibrated by a primary standard so that an accurate flow rate is reported.

Interpretation of Analytical Results

Because of the ubiquity of fungi, samples collected from the work areas need to be evaluated against samples collected from outdoors. The genus of fungi collected from indoor air should match outdoor air and typically should be present at levels less than outdoors. Lower or higher levels of fungi indoors of different genera from outdoors can indicate that contamination remains on interior surfaces.

The fungal concentrations indoors should not significantly exceed concurrent outdoor concentrations. The Rank Order of magnitude should also be similar for concurrent indoor and outdoor levels. For an example of the term Rank Order – if outdoor samples contain predominantly *Cladosporium* followed by Basidiospores in Rank Order, it would be reasonable to anticipate finding the indoor samples containing predominantly *Cladosporium* followed by Basidiospores. However, if the indoor samples contain predominantly *Fusarium,* or a mold other than *Cladosporium* or Basidiospores (a difference in Rank Order), the results would suggest that contamination remains on interior surfaces.

Post Remediation Air Clearance Criteria

The work area would be deemed acceptable when indoor mold spore concentrations are similar to outdoor mold spore concentrations, including Rank Order. The presence of elevated concentrations of airborne *Aspergillus/Penicillium* like mold spores inside the dwelling may require re-cleaning and retesting.