

**MICROBIAL REMEDIATION
SCOPE OF WORK (SOW) FOR:**



**SOLDAN INTERNATIONAL STUDIES HIGH SCHOOL
LIBRARY RENOVATIONS
918 UNION BOULEVARD
ST. LOUIS, MISSOURI 63108**

Prepared For:

**ST. LOUIS PUBLIC SCHOOLS
801 NORTH 11th STREET
ST. LOUIS, MISSOURI 63101**

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DOCUMENT TO BE RETAINED INDEFINITELY

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1.0 INTRODUCTION

This Remediation Scope of Work (RSOW) describes the general specifications that should be followed for the remediation of microbial contamination of moisture-damaged and microbially impacted building materials within the building. In addition to the specifications set forth in this RSOW, the Contractor is expected to abide by applicable local, state, and federal laws and regulations.

No changes to this Work Plan will be allowed during this project without prior written approval from the Owner. EC does not have the authority to approve change orders in the project scope or the project costs. The contractor shall submit all change orders in writing to the Owner and receive authorization in writing for any and all change orders.

1.1 General Project Information

Site: Soldan International Studies High School
Library Improvements
918 Union Boulevard
St. Louis, Missouri 63108

Owner: St. Louis Public Schools
801 North 11th Street
St. Louis, Missouri 63101

1.2 Remediation Scope of Work

Contractor shall furnish labor, materials, services, permits, insurance, and equipment that is specified, shown, or reasonably implied for remediation activities specified in the RSOW or applicable industrial standards. The RSOW includes, but is not limited to, the following major tasks:

- 1) Demarcation of work area.
- 2) Establishment of critical barriers and preparation of the work areas.
- 3) Installation of a negative pressure containment system including the use of HEPA filtration units and commercial grade dehumidifiers. Maintain a relative humidity level not to exceed 50%.
- 4) Removal of contaminated building materials or contents in designated areas. These materials may include carpet, drywall systems, paneling, vinyl cove base, and possible insulation behind the walls. The remaining building materials (such as wood studs, joists, etc.) that contain visible mold will be cleaned and remain in place.

- 5) Removal and cleaning of non-porous items in designated work areas.
- 6) Fine cleaning of all surfaces in the designated areas.
- 7) Cleaning of the heating, ventilation, and air conditioning system – *refer to NADCA ACR 2002.*
- 8) Project monitoring and post-abatement efficacy certification.
- 9) Remediation work shall not include replacement of all contaminated building components removed during abatement.

Note: This scope of work only includes the areas of the building that exhibited demonstrable water damage or microbial contamination at the time of EC's assessment. (Destructive or invasive inspection was limited or not performed prior to the development of this specification.) It is possible, if not likely, that additional damaged areas will be encountered during the remediation work. A qualified environmental professional trained and experienced in assessing microbial contamination shall evaluate additional contamination encountered during the remediation work. Based on the removal of the building materials as part of the asbestos abatement project the remaining building materials within the building should be properly cleaned and disinfected for microbial growth. The microbial contaminated materials will be removed two foot past visible contamination.

Scope of Work – Site Specific Work Locations and Requirements

Law Library

Reduce humidity levels below 50%. Remove all mold damaged building materials and contents that are not cleanable. Complete demolition of ceilings, walls, and floors. Clean all visible microbial growth from remaining items. Clean mold from all furniture and stationary objects. Encapsulate all remaining surfaces in accordance with manufacturer's recommendations. Maintain at least twelve (12) air changes per hour.

Library

Reduce humidity levels below 50%. Disinfect all surfaces. Removal of water damaged ceiling tiles. Clean all carpets. Clean all visible microbial growth from remaining items. Clean mold from all furniture and stationary objects. Encapsulate all surfaces in accordance with manufacturer's recommendations. Maintain at least twelve (12) air changes per hour.

Corridors

Reduce humidity levels below 50%. Disinfect all surfaces. Clean all visible microbial growth from remaining items. Clean mold from all furniture and stationary objects. Encapsulate all surfaces in accordance with manufacturer's recommendations. Maintain at least twelve (12) air changes per hour.

Conditions may change over time. The contractor is responsible for verifying conditions at the time of the project walk through and prior to performance. It is the contractor's responsibility to notify the owner of any changes or conditions that may warrant a change in project scope, additions or change orders.

2.0 GENERAL PROVISIONS

2.1 Definitions

The following definitions are utilized in this Specification:

Critical barrier: An engineered barrier that is impervious to penetration by bioaerosols, vapors, and particulates. The barrier may be constructed of wood, metal, or plastic, as long as aerosols cannot diffuse or migrate past the barrier. Generally part of a containment area.

Bioaerosol: Airborne particles that are living organisms or fragments originating from living organisms.

Abatement: The physical removal of contaminated building materials or the cleaning and disinfection of contaminated building materials that could not be physically removed and replaced.

Air Duct: A passageway of defined dimensions for the distribution of air within a structure.

Air Handling Unit: Any one of several varieties of mechanical air moving, filtering, and conditioning systems. Commonly used to draw or force air through a duct system.

Air scrubber: A free-standing, unducted, fan-driven apparatus used to filter ambient air within a defined area, usually a containment area.

Containment Area: An engineered space within a designated work area designed to control the migration of contaminants to adjacent, non-contaminated regions outside the work area during remediation

HVAC system: The entire air distribution system within a building, including, but not limited to the air handler, cooling unit, heating element, humidifier, filter device, ducts, vents, intakes, and exhausts.

Negative air pressure: Lower air pressure created in a defined area (containment space) by an exhaust fan or vacuum device. The pressure differential allows air movement from adjacent areas of higher pressure into the area of lower pressure. The function is to prevent contaminants from escaping the contained area.

Moisture Content: The percentage or weight of moisture (water) in materials, as compared to the weight of the material when “completely” dry.

Anti-microbial: Term applied to chemicals or processes that inhibit microbial proliferation, such as drying or an antibiotic. The suffix *-cide* is applied to those known to kill living organisms.

GFCI: Ground fault circuit interrupter. An electrical device designed to break an electrical circuit when the device senses a leak to ground.

Remediation: The overall process of correcting problems related to water damage of building materials and related microbial contamination.

Decontamination: The process of cleaning surfaces and objects includes thorough cleaning with HEPA vacuums and/or detergents.

HEPA Filter: A high efficiency particulate air (HEPA) filter capable of trapping and retaining 99.97 percent of all monodispersed particles equal to or greater than 0.3 microns in mass median aerodynamic equivalent diameter.

HEPA Vacuum Equipment: Vacuuming equipment with a HEPA filter system.

Isolation: The sealing of all openings into a work area with six-mil polyethylene sheeting and duct tape.

Work Area: Designated rooms, spaces, or areas of the subject site in which microbial remediation actions are to be undertaken. A contained work area is a work area, which has been isolated, equipped with controlled access portals and a decontamination unit, and is under a negative air pressure regime.

Occupied Area: Any area adjacent to the work area that is occupied or potentially accessible by unprotected public.

OSHA: Occupational Safety and Health Administration.

2.2 Health and Safety

Work for this project shall be performed in compliance with applicable regulatory standards, including but not limited to, OSHA 29 CFR 1910 Standards for General Industry and OSHA 29 CFR 1926 Standards for the Construction Industry. Provisions of this RSOW relating to health and safety of workers, the public, and protection of the environment are considered to be minimum specifications. The remediation contractor is responsible for determining whether local, state, or federal regulations, ordinances, or guidelines require additional, and/or more stringent, protective measures. Failure on behalf of the remediation contractor to comply with applicable requirements does not relieve the contractor from liability and/or requirements for performance of the work.

The following standards, regulations, and reference documents are incorporated herein by reference and made a part of this specification.

Code of Federal Regulations (CFR) Publications:

- 1) 29 CFR 1926.28 - Personal Protective Equipment.
- 2) 29 CFR 1926.55 - Gases, Vapors, Fumes, Dusts and Mists.
- 3) 29 CFR 1926.57 - Ventilation.
- 4) 29 CFR 1926.59 - Hazard Communication.
- 5) 29 CFR 1926.95 - Criteria for personal protective equipment.
- 6) 29 CFR 1926.96 - Occupational foot protection.
- 7) 29 CFR 1926.100 - Head protection.
- 8) 29 CFR 1926.101 - Hearing protection.
- 9) 29 CFR 1926.102 - Eye and face protection.
- 10) 29 CFR 1926.103 - Respiratory protection.
- 11) 29 CFR 1926.104 - Safety belts, lifelines, and lanyards.
- 12) 29 CFR 1926.200 - Signs, Signals and Barricades.
- 13) 29 CFR 1926.301 - Hand tools.
- 14) 29 CFR 1926.302 - Power operated hand tools.
- 15) 29 CFR 1926.451 - Scaffolding.
- 16) 29 CFR 1926.500 - Fall Protection.
- 17) 29 CFR 1926.501 - Duty to have fall protection.
- 18) 29 CFR 1926.502 - Fall protection systems criteria & practices.
- 19) 29 CFR 1926.503 - Fall Protection training requirements.

The Contractor may also need asbestos and lead standards depending on age of structure.

American National Standard Institute (ANSI) Publications:

- Z9.2-1979 Fundamentals Governing the Design and Operation of Local Exhaust Systems
- Z88.2-1992 Practices for Respiratory Protection

National Fire Protection Association (NFPA):

Standard 90A Installation of Air Conditioning and Ventilation Systems.

Underwriters Laboratories, Inc. (UL) Publications:

- 586-77 Test Performance of High Efficiency Particulate, Air Filter Units

These regulations, in the most current version, are applicable throughout this project. Where there is a conflict between specifications in this RSOW and State, Federal, or local regulations, the more restrictive or stringent requirements shall prevail.

Reference Documents:

- 1) *Bioaerosols, Their Assessment and Control*. American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, Ohio, 1999.
- 2) *Mold Remediation in Schools and Commercial Buildings*. U.S. Environmental Protection Agency. April, 2001.
- 3) *Guidelines on Assessment and Remediation of Fungi in Indoor Environments*. New York City Department of Health. Updated April, 2000.
- 4) *Carpet Cleaning Standard S001*. Institute of Inspection, Cleaning, and Restoration Certification (IICRC).
- 5) *Standard and Reference Guide for Professional Water Damage Restoration S500 (2d Edition)*. Institute of Inspection, Cleaning, and Restoration Certification (IICRC).
- 6) *Assessment, Cleaning, and Restoration of HVAC Systems ACR 2002*. National Air Duct Cleaners Association. September 2001.
- 7) ASHRAE 62-2001

2.3 Utilities

The Owner shall provide water and power supply (i.e., electricity) from existing sources where the Contractor's use is not excessive and does not interfere with the building's normal usage. Where existing utilities or facilities are not adequate or cannot be used, the Contractor is responsible for providing alternative sources of potable water and power. The use of the utilities shall be coordinated through the Owner.

2.4 Licenses, Fees, & Permits

The Contractor shall pay licensing fees, royalties, and other costs necessary for the use of any intellectual property including, but not limited to, copyrighted or patented product, design, invention, or process in the performance of the work specified in this RSOW. The Contractor shall be solely responsible for costs, damages, or losses resulting from infringement of these patent rights or copyrights. The Contractor shall hold the Owner and Consultant harmless from costs, damages, and losses resulting from infringement of these patent rights or copyrights, including reasonable attorney's fees. If the Contract Specification requests the use of any product, design, invention, or process that requires a licensing, patent, or royalty fee for use in the performance of the job, the Contractor shall be responsible for the fee or royalty fee and shall disclose the existence of such obligations.

2.5 Project Coordination

- A. **Notification and Communication:** Contractor shall notify all applicable regulatory agencies in accordance with established guidelines. All communication shall be with the Owner or Owner's Representative's designated personnel. The Contractor shall not discuss details of the project with building occupants or the media without written permission from the Owner or Owner's Representative.
- B. **Authority to Stop Work:** The Owner and Owner's Representative have the authority to stop the remediation work at such time as they determine that work conditions are not within the specifications and applicable regulations. Work will not resume until corrective action has been taken to the satisfaction of the Owner or Owner's representative.
- C. **Emergency Exits:** The Contractor shall establish visible emergency and fire exits from the work area in accordance with applicable regulations
- D. **Injuries:** If an injury occurs, the Contractor shall stop work until proper emergency response personnel have been contacted, the injured person has been removed from the work area, the cause of the injury has been determined and any problems corrected). The work area cannot be re-entered until deemed safe by a designated Project Supervisor.
- E. **Decontamination for workers:** Decontamination procedures for personnel and equipment shall be in accordance with applicable regulatory guidelines.

2.6 Pre-Job Submittals

Two copies of the following submittals shall be provided to the Owner or Owner's Representative prior to commencement of remediation operations. The Owner or Owner's Representative shall approve submittals, in writing, prior to starting work.

A. Respirators

1. The Contractor shall submit a written Respiratory Protection Program for, including make, model and National Institute of Occupational Safety & Health (NIOSH) approval number of the respirators to be used, as required by OSHA standards.
2. Contractors must provide a written certification for all employees, who will wear respirators in the work area, stating that they are properly trained for respirator use in accordance with 29 CFR 1926.103.
3. The Contractor must also provide current fit test certificates for each employee who will wear a respirator at any time during the course of the project.

B. Medical Examinations

The Contractor shall submit proof that individuals designated to wear air-purifying respirators have) medical examinations as per OSHA requirements. Proof shall consist of a physician's written opinion of said examinations stating that the worker is physically capable of wearing a negative pressure respirator while performing his or her duties.

C. Materials and Equipment Certification

1. Submit certification that vacuums, negative air pressure equipment filters, and other local exhaust ventilation equipment conform to ANSI Z9.2-1979.
2. Provide material safety data sheets (MSDS) and application instructions for all chemical products to be used at the subject site.

D. Worker Training

Submit proof that Contractor employees who are on-site for this project have been trained in microbial remediation activities. Copies of any training certificates shall also be included.

E. Licenses and Permits

Submit copies of licenses and permits required for this project.

In lieu of the above submittals and at the owner's discretion the Contractor may submit an affidavit to the Owner's representative stating that the above conditions have been met and are available upon request.

F. Waste Transportation and Disposal

If applicable, submit the method of transport of Waste, including the name, address, license number, EPA ID number, and telephone number of the Transporter(s) and the Disposal Facility(s) to be used.

G. Notifications

When required by regulations prior to work, contact appropriate government agencies in writing. If no notification is required, provide written notice to the Owner/Owner's representative of stating. All notifications shall contain, but are not limited to, the following information:

1. Name, address and telephone number of the Owner, including a contact person.
2. Name, address, EPA number, license number and telephone number of the Contractor, including the contact person.
3. Name, address and description of the building, including size, age and prior use of building.
4. The type and quantity of material involved and the description of the Work.
5. Scheduled start and completion dates for Abatement and Remediation Work.
6. Procedures that shall be employed to comply with the regulations.
7. The name, address, EPA number, and telephone number of the Waste Transporter.
8. The name and address of the Hazardous Waste Disposal Facility where the Waste shall be deposited.

H. Pre-Work Submittal Checklist

1. Work schedule
2. Copies of notifications
3. Copies of licenses (contractor/subcontractors)
4. Equipment and product data and MSDS
5. Registry of approved contractor and sub-contractor personnel
6. Worker training documentation/certificates
7. Worker medical records/certificates
8. Worker respirator fit test documentation
9. Certificates of Insurance (contractor/subcontractors)
10. List of subcontractors
11. Contractor's written OSHA respiratory protection plan
12. Contractor's written security/emergency plan

2.7 Post-Job Submittals

Upon completion of work and prior to approval of final payment, Contractor must submit the following documentation as part of a post-job submittal package:

A. Daily Logs

Copies of daily logs describing the work performed each day, names of all workers and visitors on-site, any unusual activities, etc. The daily logs shall be notarized and signed by the Contractor's project supervisor as well as the Owner or Owner's representative.

B. Disposal Records

Copies of waste manifests and receipts acknowledging disposal of waste material from the project, showing delivery date, quantity, and appropriate signature of landfill's authorized representative.

C. Manometer Records

Strip charts from the recording manometer or data log entries of periodic manometer readings within the containment area indicating the measured pressure differential, date, and time.

D. Pre-Final Completion Submittals/Close-out Documentation:

1. If required, copies of waste manifests and waste shipment records
2. HEPA equipment service/maintenance records
3. Water filtration equipment service/maintenance records
4. If required, pressure differential (manometer) records
5. Visitor's register/sign-in logs
6. Daily site and containment entry/exit logs
7. Environmental monitoring data
8. Copies of citations/violations
9. Copies of safety meeting attendance records
10. Copies of reports of accidents/first aid administration
11. Efficacy assessment of an independent environmental professional

2.8 Residence Occupancy and Access Restrictions

- A.** Portions of the facility where work will take place should not be occupied during remediation operations.

2.9 Scheduling

- A.** All work shall be performed during normal working hours of 7:00 am – 5:00 pm Monday through Friday or as directed by Owner. Working hours that may be completed outside the regular working hours shall be coordinated with the Owner, Owner’s representative and shall take into account any local ordinances regarding construction activities and noise.
- B.** Coordinate with the Owner and Owner’s appointed environmental consultant on work hours and availability of workspaces and storage areas.

2.10 Observations

A qualified environmental consultant will observe the status and progress of the Work for completeness and general compliance with the requirements of the Contract Documents.

2.11 Sign-In / Out Log

All Contractor personnel and Project Site visitors shall Sign-In/Out with the On-site Project Supervisor, on a daily basis for the duration of the project

2.12 HVAC and Electrical System

Contractor will shut down and lockout HVAC and electrical systems for the Work Area. Main power distribution services to other areas can remain energized during remediation activities.

2.13 Owner-Directed Specifications

The Contractor shall abide by applicable security rules and regulations established by the Owner and provided to the Contractor.

3.0 PRODUCTS

3.1 Materials

Materials and equipment proposed for use on this project shall be subject to review and acceptance by the Owner, or Owner's Representative, and shall be in compliance with Local, State, and Federal regulations and requirements.

The list of required materials shall include, but not necessarily be limited to, the following:

1. **Critical barriers:** For this project, it is most feasible for the barriers to be composed of six (6) mil polyethylene sheets in sizes to minimize the frequency of joints. All seams and interfaces of the barrier shall be sealed with tape or another appropriate material. Polyethylene shall be flame retardant.
2. **Duct Tape:** Duct Tape 2" or wider, or an equivalent, capable of sealing interfaces of adjacent sheets of plastic and for attachment of plastic sheet to finished or unfinished surfaces of dissimilar materials, and capable of adhering under both dry and wet conditions.
3. **Protective Packaging/Disposal of debris:** Clear or opaque, six (6) mil sealable polyethylene bags. Bags should be doubled to prevent puncture and spillage of contaminated materials. Each bag should be twisted closed and sealed with tape to prevent escape of contaminants.
4. **Warning Signs and Barrier Tape:** Warning signs shall state that the work area is a "Restricted Area" and that "Personal Protective Equipment is required in the area." Barrier tape shall be marked with the word "Caution" or "Danger." "Danger" is typically reserved for higher hazards, life threatening situations.
5. **Personal Protective Equipment:** PPE should be provided and maintained in accordance with the NYCDOH or USEPA guidelines, including NIOSH approved respirators, goggles, and protective clothing, i.e., safety shoes, gloves, and head protectors. The contractor shall maintain a sufficient supply of protective clothing, respirators and cartridges to allow all supervisors and workers to change when needed.
6. **Cleaning Agents:** Only approved cleaners and detergents shall be used. These should be appropriate for the specific job and not be corrosive or leave toxic residue.

3.2 Tools and Equipment

1. **Transportation Equipment:** Transportation equipment, as required, shall be suitable for loading, temporary storage, transporting, and unloading waste. All over-the-road transportation equipment must carry any required appropriate transport licenses, signage, placards, and insurance as necessary. (tailor the specification to the job site)
2. **Vacuum Equipment:** All vacuum equipment utilized in the work area shall utilize HEPA filtration as per ANSI Z9.2-1979.
3. **Other Tools and Equipment:** The Contractor shall provide other suitable tools including, but not limited to: saws, lighting, hammers, drills, brooms, and carts.
4. **GFCI:** The Contractor shall provide ground fault circuit interrupters (GFCI) to protect all electrical cords and connections.
5. **Lighting:** Use approved lighting equipment in the work area.
6. **Scaffolding:** Scaffolding, as required to accomplish specified work, shall meet all applicable Federal, State and Local safety regulations and be used in accordance with manufacturer's specifications.
7. **Manometer:** Contractor shall provide manometers to measure the pressure differential in each contained work area relative to the non-contained occupied areas. The manometer(s) that provide a permanent record of the pressure differential that indicates the time, date, and measured pressure differential in inches of water (" H₂O) are preferred.
8. **Sanitation:** Specify use of building facilities or portable sanitation facilities for workers. Personal hygiene is important to prevent contamination release. Provide water sources for personal hygiene, decontamination, and emergency uses.
9. **Disposal:** In accordance with current regulatory standards.

4.0 ABATEMENT / REMEDIATION

4.1 General Requirements

1. Trained and Competent Personnel

Personnel trained and experienced in the remediation of microbial contaminated materials shall perform work. The training shall include the following criteria at minimum:

1. Instruction on the potential hazards associated with microbial remediation.
2. Recognition of signs and symptoms of microbial exposure.
3. Personal protective equipment options and usage instructions.
4. Proper work practices to minimize microbial exposure.
5. Installation, maintenance, and removal of critical barriers and containment equipment.
6. Techniques for the removal of contaminated building materials and treatment of contaminated building materials.
7. Techniques for decontamination.
8. Procedures for medical emergencies within the containment area.

A qualified instructor(s) with experience and prior training in microbial remediation work will provide the training.

2. Work Area Isolation

During the setup and removal stages, all microbial remediation work areas shall remain isolated from other non-contaminated portions of the building, utilizing critical barriers. The remediation contractor shall monitor access to the microbial remediation work area.

3. Personal Protective Equipment

The following are minimum worker protection items for workers performing microbial remediation:

1. **Respirators:** Air purifying respirators equipped *as applicable* with NIOSH approved filters and where required organic vapor cartridges in tandem shall be the minimum respiratory protection permitted during all stages of work. No modifications or interchanging of respirator parts from different brands will be permitted. The Contractor must provide sufficient cleaning materials and replacement filters, cartridges, and spare parts in order to properly maintain the respiratory equipment. Disposable respirators or filtering face pieces shall not be permitted under any all respiratory protection shall be provided to workers in

accordance with the submitted respiratory protection program, which at minimum includes all items in OSHA 29 CFR 1926.103. A copy of this program shall be kept on site.

2. **Gloves:** Gloves shall be worn while working in the work area. Glove material shall be appropriate for protection against the specific chemical agent(s) that is/are being handled.
3. **Eye Protection:** Fog proof goggles for personnel engaged in microbial remediation work shall be used, when a half-face respirator is worn. Additional eye protection is not required if the Contractor uses full-face respirator masks.
4. **Protective Clothing:** Mold impervious disposable head and foot coverings, and a body suit made of Tyvek™, or equivalent material, shall be worn during all microbial remediation work. All gaps and seams shall be reinforced with duct tape or similar material. Coverall suits shall include attached foot covering and hood.
5. **Foot protection:** Workers shall wear puncture resistant work boots while working at the subject site.
6. **Head protection:** Workers shall wear hard hats when performing demolition work or if there is any possibility of objects falling on workers heads.

4. Work Area Restrictions

1. Cleaning and disinfection agents shall be utilized only as required and only as prescribed by the manufacturer. The use of biocides of any kind shall not be permitted during this project.
2. The use of water shall be minimized during the remediation work at the subject site.
3. At no time shall others enter the work area, or go further than the demarcated work area isolation barrier, without proper respiratory protection and protective clothing.
4. No equipment, supplies or materials (except properly containerized waste materials) shall be removed from the work area unless such equipment, supplies and/or materials have been cleaned, as appropriate (decontaminated).

4.2 Remediation / Abatement Protocols

1. General

The remediation methods/techniques enumerated as follows, are not meant to exclude other similarly effective methods. The Contractor shall submit, in writing, changes or variances to the methods listed. The Owner or Owner's representative shall respond in writing and in a timely manner to any such requests.

1. The HVAC system serving the residential area shall be shut down prior to beginning any remediation work.
2. Electrical lines located inside the work area shall be de-energized prior to beginning work. The Contractor shall retain the services of a licensed electrician to provide a temporary power panel and equipment in compliance with all electrical code requirements for temporary electrical systems. All electrical cords and equipment used by the Contractor shall be connected to a ground fault circuit interrupter (GFCI) in-line with the supplied current.
3. The Contractor shall supply fire extinguishers appropriate for the anticipated conditions at the subject site. A minimum of one (1) fire extinguisher shall be provided inside each containment area plus one (1) outside each containment. All workers shall be instructed in the general principles of fire extinguisher use and the hazards associated with incipient stage fire fighting.
4. The Contractor shall provide temporary lighting, if necessary, for each work area. The lighting shall be sufficient to illuminate all parts of the work area.
5. The high volume air filtration devices (AFDs or negative air pressure machines) in each work area shall provide a minimum of five air changes per hour and a negative pressure differential of at least 0.02" H₂O. The AFDs shall be located as far away from the decontamination chamber as possible and ducted to the outdoors with flexible tubing. Manometer readings will be required as a submittal following the project completion.
6. The Contractor shall provide dehumidifiers within the work area to reduce the relative humidity levels within the work areas to reduce the chance of developing a conducive atmosphere for microbial growth within the work area.

2. Specific

1. Isolate each work area using barrier materials, tape, and warning signs. Install critical barriers consisting of one layer of 6 mil, fire retardant polyethylene sheeting at entrances and openings to each designated work area including HVAC ducts.
2. The pre-cleaning of rough/porous surfaces shall be performed using vacuums equipped with high efficiency particulate air (HEPA) filters. Hard/non-porous surfaces shall be pre-cleaned by wet wiping with a damp cloth. High volume air filtration devices equipped with HEPA filters shall be used to filter the room air during this initial cleaning and during the construction of negative pressure enclosures. Non-porous or semi-porous items like wood should be wiped down and/or HEPA vacuumed.

3. The Contractor shall make an inventory of moveable items which includes a description of each item and any damage or other observations. The Contractor is responsible for protecting the items being moved and is responsible for damage caused or missing items. The Contractor shall also be responsible for an inventory of items disposed of as waste.
4. Any non-moveable objects that will remain in the work area (e.g. light fixtures, pool table) shall be pre-cleaned and protected using 6 mil. polyethylene sheeting.
5. HVAC equipment serving each work area shall be shut down prior to installation of critical barriers. If shut down is not feasible, all vents shall be sealed with barrier material.
6. Construct a negative pressure enclosure in each designated work area using two layers of 6-mil polyethylene sheeting secured with duct tape and wood supports as necessary. The enclosures shall cover all surfaces with the exception of the surfaces that will be remediated (e.g. certain walls, floors). The inner layer of poly sheeting shall be installed in such a way that it can be removed separately from the outer layer of poly sheeting at the end of the removal work without affecting the integrity of the containment system. The work area shall be kept orderly, clean, and clear of work material, polyethylene sheeting, tape, cleaning materials, clothing, and all other disposable material or items used.
7. A decontamination chamber (clean room) shall be constructed at the entrance to the work area. This clean room shall be large enough to allow workers to change in and out of their PPE and store one waste bag. Triple flaps shall be installed at both ends of the clean room to serve as airlocks. No personnel shall be permitted to pass beyond the clean room without appropriate PPE. Coveralls shall be removed in the clean room in an "inside out" manner to minimize the dispersal of fungi spores. Ventilation shall be maintained in the work area at all times through the use of a HEPA filtered negative pressure machine(s).
8. Contaminated material removal shall be performed carefully and intact if possible, so that material that will remain has a smooth and even edge.
9. Upon completion of inspections and microbial post remediation testing, all substrates within the negative air containment shall be thoroughly cleaned using HEPA vacuums and damp wiping with a mild detergent.
10. Upon successful completion of the microbial post-remediation, moveable objects (e.g., furniture, area rugs, window dressings, etc.) moved from the subject site shall be returned to their original location.

3. Clean-up Procedures

1. Disposable cleaning materials, such as sponges, mop heads, filters, disposable clothing shall be placed in double six-mil polyethylene bags and sealed.
2. Polyethylene sheeting and tape from covered surfaces shall be removed and placed in double six-mil polyethylene bags and sealed for disposal.
3. Vacuum bags and filters shall be placed in double six-mil thick polyethylene bags and sealed for disposal.
4. Contaminated clothing or work area clothing used during remediation shall be placed in polyethylene bags for disposal or cleaned prior to leaving the work area.
5. At the completion of the work, the remediation contractor shall perform cleaning and decontamination of entire work area by a thorough HEPA vacuuming of all surfaces.
6. The work area shall be subject to a final visual inspection by the Contractor and the Owner's Representative prior to final air and tape sampling.

4.3 Waste Disposal

Waste from the subject site shall be disposed of as normal construction debris in an appropriate landfill.

5.0 FINAL INSPECTION AND POST-REMEDIATION TESTING

5.1 Final Inspection

1. Upon completion of abatement procedures and fine cleaning, each work area shall be visually reviewed by a qualified environmental professional, representing the Owner, to ensure that the work area has met the following criteria:
2. Contractor materials, equipment, waste bags, etc. shall be removed from the work area except for the negative air machine(s) and temporary lighting.
3. The work area shall be visually free of microbial contaminated materials and associated dust or debris. Re-cleaning of the work area shall be required if the above criteria is not met.
4. Upon satisfaction of the above criteria, a minimum of 48 air changes shall be allowed to occur within the containment prior to beginning environmental bioaerosol sampling.

5.2 Post-Remediation Testing

Upon satisfactory completion of the final review in each work area and after a 12 hour waiting period with the negative pressure ventilation system operational, the Owner's Representative shall conduct post-remediation testing as described in this section. A qualified environmental microbiology laboratory that participates in the American Industrial Hygiene Association's (AIHA) Environmental Microbiology Proficiency Test or Laboratory Accreditation Program (EMLAP) shall analyze environmental samples.

Initial, In-Progress, and Post-Remediation Fungal Spore Screening: Fungal spore sampling shall be performed as a screening tool to measure the total (non-viable) spore concentration. The testing shall be performed using Air-O-Cell™ cassettes manufactured by Zefon International or equivalent device. The cassettes shall be used in accordance with the methods recommended by the manufacturer. A high volume pump shall be used to draw air through the cassette calibrated at 15 liters of air per minute (lpm) using a primary standard. A minimum of (1) one sample shall be collected per containment. Additional samples may be collected depending on the design of the containment area or the square footage involved. This will be at the discretion of the Owner's Representative. A minimum of one (1) control sample shall be collected from the outdoor ambient air. One (1) quality control blank sample shall also be collected and analyzed per lot of samples.

Samples shall be placed on a 24-48 hour turn-around time. Spore trap results must meet the following criteria prior to continuing to analyze the viable air samples:

1. Work area samples shall have a total spore concentration that is equal to or lower than the average of the control samples.
2. The concentration of each individual fungal genus (e.g. *Penicillium*) shall be quantitatively and qualitatively equal to or less than the control samples.
3. The presence of target species (those identified as the genus or species being removed) or toxigenic species may preclude satisfaction of the post-remediation criteria based on the discretion of the Owner's Representative.

5.3 Containment Demobilization

After the environmental professional has declared the environmental assessment for each particular work area to be acceptable, the negative pressure enclosures shall be dismantled and removed. All waste materials shall be double bagged and disposed of. The Contractor shall be responsible for repairing any damage caused to finished surfaces. Adhesive or duct tape residue shall be removed.

5.4 Construction Phase of Remediation

The Contractor is responsible for replacing removed building components and finishes.