



SECTION 028200

ASBESTOS ABATEMENT AND RELATED WORK

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS that are hereby made a part of this Section of the Specifications.
- B. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of the CONTRACT AND GENERAL CONDITIONS.

1.02 DESCRIPTION OF WORK

- A. Bulk samples of specific building materials at [PROPERTY NAME] have been collected and tested for asbestos content by [ASBESTOS CONSULTANT NAME], as described in their report [REPORT TITLE AND DATE]. This report provides information on the substrates that were tested, analytical results, and quantities of confirmed asbestos containing materials. A copy of the complete asbestos survey report is included herewith as part of this specification section. The quantities are provided for guidance and may not correspond exactly to the quantity to be removed. Contractor shall determine quantities of asbestos for bidding purposes.
- B. The intent of the Work is to [completely] remove [all] Asbestos Containing Materials (ACM) from the Site to accommodate [building demolition and/or redevelopment work].
- C. The Asbestos Abatement Contractor (pre-approved for work at the University by EH&S) shall furnish all labor, material, supervision, construction tools, transport vehicles and equipment necessary to perform the following work:
 - 1. [Pre-bid inspection. The potential Bidders are required to visit the Project Buildings prior to bidding in order to determine the amounts of asbestos containing and asbestos contaminated materials to be removed, as well as staging and protection requirements. All Contractors must comply with the Harvard University Construction Environmental Health and Safety Standard and OSHA's Control of Hazardous Energy (lockout/tagout) (29 CFR 1910.147) Requirements.]
 - 2. Provide access, support and protection to all authorized visitors and inspectors.
 - 3. Filing of and/or obtaining all required notifications (including, Harvard-required notifications), permits, work plans and payment of all required associated costs and fees. The Contractor is required to provide copies of all permits, notifications, and approvals prior to the start of any abatement work.
 - 4. Work area preparation and work practices, including installation of required warning signs and maintenance of work area/site security.



HARVARD

Campus Services

ENVIRONMENTAL HEALTH & SAFETY

5. Proper removal, packaging, transport and disposal of all asbestos containing materials as specified herein. Note that vehicles transporting bulk-loaded demolition debris containing a reportable quantity (greater than 1 pound) of asbestos shall be properly placarded in accordance with USDOT regulations. All drivers shall be appropriately trained and licensed to transport this material.
 6. Isolation of the work area for the duration of the work so as to prevent asbestos contaminated dust or debris from passing beyond the isolated area.
 7. Clean-up and final decontamination of all work areas.
 8. Implementation of a worker protection program in compliance with all applicable regulations.
 9. [As part of the work will be performed in the winter months, the Contractor shall be responsible for snow removal as necessary for the removal of asbestos-containing roofing materials, window caulking and glazing materials and other ACM and PACM.]
- D. It is the Contractor's responsibility to determine the most efficient method to legally perform this Work. Unless specifically noted, this Specification does not dictate specific methods to be implemented in the performance of the Work. [The entire application of all ACMs shall be removed inclusive of any substrate contamination, whether present on the substrate surface or embedded in the matrix of the substrate component. After abatement is complete, the building or equipment component must be rendered completely free of asbestos and rendered recyclable, reusable, and/or disposable in accordance with all applicable regulations].
- E. The Contractor shall perform all work in accordance with these specifications, the USEPA and OSHA regulations, NIOSH recommendations, Massachusetts Department of Environmental Protection and Massachusetts Department of Labor Standards regulations, local statutes, local ordinances, local codes and any other applicable federal, state and local government regulations and guidelines.
- F. The Contractor is advised that paints and debris existing within the buildings and tunnels may contain lead. The Contractor shall at all times be in compliance with OSHA regulation 29 CFR 1926.62 Lead in Construction; Interim Final Rule as well as other applicable regulatory requirements and other applicable portions of the contract documents.
- G. The Owner may have an independent asbestos consultant on-site to perform oversight and air monitoring. The abatement Contractor shall coordinate the asbestos abatement work schedule closely with Harvard and shall cooperate fully with the asbestos consultant.
- 1.03 RELATED WORK
- A. Section 013300 – SUBMITTAL PROCEDURES
 - B. Section 013543 – ENVIRONMENTAL PROTECTION
 - C. Section 013529 – HAZARDOUS MATERIALS HEALTH AND SAFETY
 - D. Section 015000 – TEMPORARY FACILITIES



- E. Section 017419 – CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT
- F. Section 024100 – BUILDING AND ANCILLARY STRUCTURES DEMOLITION
- G. Section 024119 – SELECTIVE DEMOLITION AND SALVAGED MATERIALS
- H. Section 026000 – MISCELLANEOUS HAZARDOUS MATERIAL REMOVAL

1.04 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referenced in text by basic designation only. The list provided below is not intended to be all inclusive of each regulation prevailing over the work. The latest version of the document listed shall govern the work performed.

- A. Environmental Protection Agency (EPA):
 - 1. Code of Federal Regulations, 40 CFR Part 763, Asbestos.
 - 2. National Emission Standard for Asbestos, 40 CFR, Chapter 61, Subpart M.
 - 3. Guidance for Controlling Friable Asbestos-Containing Materials in Buildings.
 - 4. A Guide to Respiratory Protection for the Asbestos Abatement Industry.
- B. Occupational Safety and Health Administration (OSHA):
 - 1. Asbestos Construction Standard, 29 CFR 1926.1101, 29 CFR 1910.245, and 29 CFR 1910.1200.
 - 2. Asbestos General Industry Standard, 29 CFR 1910.1001.
 - 3. Respiratory Protection, 29 CFR 1910.134.
 - 4. Specifications for Accident Prevention Sign and Tags, 29 CFR 1910.145.
- C. National Institute for Occupational Safety and Health (NIOSH):
 - 1. “Respiratory Protection A Guide for the Employee.”
 - 2. “Asbestos Fibers by Phase Contrast Microscopy (PCM),” NIOSH Method 7400.
- D. American National Standards Institute (ANSI):
 - 1. Z86.1-1973 - Commodity Specification for Air.
 - 2. Z9.2 - HEPA Filter Specifications.
 - 3. Z88.2-1980-Respiratory Protective Equipment



- E. Massachusetts Department of Labor Standards (DLS)
 - 1. The Removal, Containment or Encapsulation of Asbestos, 453 CMR 6.00.

- F. Massachusetts Department of Environmental Protection (MassDEP)
 - 1. Air Pollution Control Regulations, 310 CMR 7.00.
 - 2. Massachusetts Solid Waste Management Regulations, 310 CMR 19.000.
 - 3. Massachusetts Contingency Plan, 310 CMR 40.0000.
 - 4. Asbestos Cement Shingles Guidance Document, February 2006.
 - 5. Massachusetts Department of Environmental Protection, MassDEP Policy #BWP-96-012, Non-Friable Asbestos Containing Materials, April 1996.
 - 6. Asbestos Cement Pipe Guidance Document and Conditional Enforcement Discretion, June 2011, amended May, 2015.

- G. U.S. Department of Transportation (USDOT)
 - 1. Shippers - Hazardous Materials Regulations, 49 CFR 171 – 172.
 - 2. Shippers-General Requirements for Shipments and Packaging: Carriage by Rail; Carriage by Aircraft; Carriage by Vessel; and Carriage by Public Highway, 49 CFR 173; 174; 175; 176; and 177. 3. Hazardous Materials Regulations, Amendments and Reportable Quantities, 51 CFR 42176.

- H. City of Boston, Department of Health & Hospitals Asbestos Regulations

- I. City of Cambridge, Board of Health Ordinance

- J. Harvard University, Construction Environmental Health and Safety Standard

1.05 DEFINITIONS

All terms not defined herein shall have the meaning given in the applicable publications and regulations.

- A. Asbestos Abatement: Any activity which has as its principal purpose the removal, enclosure or encapsulation of asbestos containing material.

- B. Air Monitoring: The process of measuring the fiber content of a specific volume of air in a stated period of time.

- C. ANSI: American National Safety Institute

- D. Asbestos: The name given to a number of naturally occurring hydrated mineral silicates that possess a unique crystalline structure, are incombustible and are separated into fibers. Asbestos includes chrysotile, crocidolite, amosite, anthophyllite, actinolite and tremolite.



HARVARD

Campus Services

ENVIRONMENTAL HEALTH & SAFETY

- E. Asbestos Abatement Contractor: Any person, firm, corporation or other entity who or which has a valid license issued by the Commonwealth for the purpose of entering into or engaging in asbestos work.
- F. Asbestos-Containing Materials (ACM): Any material containing any (~~one percent or more~~) by weight of asbestos of any type or mixture of types.
- G. Asbestos Containing Waste Materials (ACWM): Any ACM removed during a demolition or renovation project and anything contaminated with asbestos in the course of a demolition or renovation project including, but not limited to, asbestos waste from control devices, bags or containers that previously contained asbestos, contaminated clothing, materials used to enclose the work area during the demolition or renovation operation, and demolition or renovation debris. ASBESTOS-CONTAINING WASTE MATERIAL (ACWM) shall also include ACM on and/or in facility components that are inoperable or have been taken out of service and any ACM that is damaged or deteriorated to the point where it is no longer attached as originally applied or is no longer serving the intended purpose for which it was originally installed.
- H. Asbestos Consultants: Persons who perform design, oversight or assessment functions in asbestos abatement or asbestos hazard control, including asbestos inspectors, management planners, project designers and project monitors, as defined by 453 CMR 6.05. The Engineer or consulting firm that is pre-qualified to work at Harvard University and employs those licensed by Mass DLS in the aforementioned categories.
- I. Asbestos Project Designer: Certification as an Asbestos Project Designer authorizes the consultant to design Asbestos Response Actions through preparation of job specifications, bidding documents, architectural drawings and schematic representations of material locations. Except as mandated by AHERA for Asbestos Response Actions conducted in school facilities, the preparation of asbestos project designs is not required by 453 CMR 6.00. Where asbestos project design are prepared, such preparation shall only be performed by persons certified as Asbestos Project Designers pursuant to 453 CMR 6.07.
- J. Asbestos Project Monitor: A person who:
 - (a) Collects air and bulk samples and performs visual inspections for the purpose of determining asbestos project completion;
 - (b) Collects environmental asbestos air samples for the purpose of assessing the present or future potential for exposure to airborne asbestos; or
 - (c) Functions as the on-site representative of the facility owner or other persons by overseeing the activities of the asbestos contractor.
- K. Asbestos Waste Shipment Record (AWSR): The shipping document, required to be originated and signed by Harvard University, used to track and substantiate the disposition of ACWM. Contractors are required to use Harvard's online AWSR system described in section 3.11 of this document.
- L. Authorized Visitors: Any visitor authorized by Harvard, the Engineer or any representative of a regulatory agency or other agency having jurisdiction over the project.
- M. Contractor: Refers to the General Contractor and/or Subcontractor responsible for the Work under contract with Project Manager.



HARVARD

Campus Services

ENVIRONMENTAL HEALTH & SAFETY

- N. Critical Barrier: At least two or more layers of 6 mil. plastic sheeting sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a work area from migrating to an adjacent area, per 310 CMR 7.15.
- O. Decontamination Facility: A decontamination area that is adjacent and connected to the regulated area for the decontamination of such employees. The decontamination area shall consist of an equipment room, shower area, and clean room in series. The employer shall ensure that employees enter and exit the regulated area through the decontamination area.
- P. USDOT: United States Department of Transportation
- Q. Encapsulation: The application of a coating or liquid sealant to asbestos-containing material, per 453 CMR 6 and 310 CMR 07, to reduce the tendency of the material to release fibers.
- R. Enclosure: All herein specified procedures necessary to complete enclosure of all ACM behind airtight impermeable, permanent barriers.
- S. Engineer: Authorized representative of the Harvard Project Manager. Engineer shall be the Architect or Designer of Record for the construction project.
- T. Friable Asbestos Material: Material that contains more than one percent (1%) asbestos by weight and that can be crumbled, pulverized, or reduced to powder by hand pressure when dry.
- U. Glove bag: A manufactured plastic bag-type enclosure with built-in gloves, which is placed with an air-tight seal around a facility component which permits ACM in or on the facility component to be removed without releasing asbestos fibers into the atmosphere.
- V. Harvard Project Manager: A representative of the Property Owner, President and Fellows of Harvard College.
- W. Harvard EH&S: Harvard University, Environmental Health and Safety
- X. HEPA Filter: Equipment with a High Efficiency Particulate Air (HEPA) filter, greater than 99.97 percent efficiency by 0.3-micron DOP test, and complying with ANSI Z9.2 (1979).
- Y. MassDEP: Massachusetts Department of Environmental Protection.
- Z. DLS: Massachusetts Department of Labor Standards
- AA. SDS: Safety Data Sheet
- BB. MSHA: Mine Safety and Health Act
- CC. NESHAP: National Emission Standards for Hazardous Air Pollutants
- DD. NIOSH: National Institute of Occupational Safety and Health
- EE. OSHA: Occupational, Safety and Health Administration.



- FF. PACM: Presumed asbestos-containing materials.
- GG. PCM: Phase Contrast Microscopy
- HH. PLM: Polarized Light Microscopy
- II. Removal: All herein specified procedures necessary to strip all ACM from designated areas and to dispose of these materials at an acceptable site.
- JJ. Respirator: A device designed to protect the wearer from the inhalation of harmful atmospheres.
- KK. TEM: Transmission Electron Microscopy
- LL. TSI: Thermal system insulations which include all types of insulating materials on boilers, tanks, heat exchangers, pipes, ducts, breeching and other machinery, equipment and components which require insulation.
- MM. VAT: Vinyl asbestos (floor) tile.
- NN. Visible Emissions: Any emissions, per 310 CMR 7.15, that are visually detectable without the aid of instruments. This does not include condensed uncombined water vapor.

1.06 SCHEDULING

- A. The Contractor shall develop an abatement schedule for each phase of work prior to the Pre-Construction Conference. The Engineer or Harvard Project Manager may choose to alter the construction work sequence as they see fit.
- B. The Contractor shall update the schedule and submit any schedule changes for review by the Engineer and Harvard Project Manager at the weekly construction meetings.

1.07 NOTIFICATIONS, PERMITS, LICENSES AND CERTIFICATIONS

- A. Licenses and certifications: Maintain current licenses and certifications as required by applicable state or local jurisdictions for the removal, transporting, disposal or other regulated activity related to the work of this contract.
- B. State and Local Agencies: Send written notification as required by state and local regulations prior to beginning any work on asbestos-containing materials.
- C. The abatement CONTRACTOR, shall submit, as required, a Construction/Demolition Notification (AQ06) and an *Asbestos Removal Notification Form: BWP AQ 04 (ANF-001)* electronically to the MassDEP, and any other notification to other authorities and local municipalities as required, not less than 10 working days prior to beginning abatement activities. The Contractor shall forward a copy of the completed notification to the Project Manager and mail a copy to Harvard University Environmental Health & Safety (EH&S) Department, 46 Blackstone Street Cambridge, MA 02139 or e-mail it to the Environmental Project Manager.



HARVARD

Campus Services

ENVIRONMENTAL HEALTH & SAFETY

- C. Applications for Non-Traditional Asbestos Abatement Work Practices (NTWP) are made using the MassDEP form BWP AQ 36. A detailed proposal for specific NTWP, prepared by a DLS-certified asbestos project designer, must accompany the application form. Harvard EH&S Department shall be notified of any intent to submit an NTWP application and all applications are subject to pre-approval by Harvard EH&S .
- D. Emergency Waiver Requests: All waiver requests must go through the Project Manager and Harvard EH&S for authorization prior to any communication with MassDEP on the matter. Once the need for a waiver is agreed upon by the Project Manager and Harvard EH&S, Harvard EH&S will communicate directly with MassDEP to request the waiver. The EH&S notification shall consist of the details of the request, the building (street address), location within the building, quantity of material(s) that needs to be abated and the reason for the waiver.
- E. The Contractor shall submit certificates of required insurance to the University's Project Manager evidencing that the required coverage are in effect prior to the commencement of any asbestos abatement work. Copies of the certificates must be sent to the Harvard University Insurance Office. Each certificate shall name Harvard as an additional insured and provide for at least 10 days' notice to Harvard prior to any cancellation of the coverage. Information on required insurance can be obtained from the University Project Manager responsible for your project.
- F. The Abatement Contractor is responsible for immediately reporting any breach in containment to the Project Manager and to EH&S.
- G. The on-site presence of any regulatory inspector shall be immediately reported to the University Project Manager and EH&S. The Contractor's supervisor and a representative from EH&S shall accompany the inspector at all times while they are on-site. EH&S is to be contacted through the University's Operations Center at 617-495-5560.

1.08 LOCATION OF WORK AND SITE CONSTRAINTS

- A. Location of work areas, descriptions, estimated types and quantities of ACM are described in the Asbestos Survey Report referred to in Paragraph 1.02A and included herewith as part of this specification section. If the abatement Contractor encounters any previously unidentified and/or untested material that is suspected to be asbestos containing, the Contractor shall stop all work in the affected area and notify Harvard EH&S Department who will arrange for sampling and testing of the suspect material. If the material in question is in fact asbestos containing, the abatement Contractor shall remove and dispose of the material in accordance with this specification, with all referenced documents included as part of this specification, and with all Federal, state and local regulations. [Removal and disposal of this previously unidentified asbestos containing material shall be performed by the Contractor at the unit prices bid for in this Contract.
- B. Any areas where abatement activities are occurring shall be restricted to authorized personnel. Authorized personnel shall include only Massachusetts certified asbestos workers, supervisors, project monitors, and emergency response personnel.
- C. Temporary Utilities: Currently there are electricity sources available at the *PROPERTY NAME*. The Contractor will be required to provide temporary power as well as bathroom facilities during the abatement period. [Water is available at the Site, but not inside buildings.] Refer to Section 015000 – TEMPORARY FACILITIES AND CONTROLS for procedures and costs relating to sanitary facilities, temporary power and temporary water.



1.09 AUTHORITY TO STOP WORK

- A. Harvard has the authority to stop the work at any time the determination is made, either directly or through the services of Harvard's Asbestos Project Monitor or the Engineer that conditions are not within the specifications and applicable regulations. The stoppage of work shall continue until conditions have been corrected and corrective steps have been taken to the satisfaction of Harvard's Asbestos Project Monitor. Standby time required to resolve violations shall be at the Contractor's expense, and any fines, etc., for hazardous conditions or non-compliance will be at the Contractor's expense, and will not be grounds for change orders or time extension.
- B. Harvard's Asbestos Project Monitor shall notify the Contractor when airborne fiber levels measured outside the work area enclosures or at the boundary of regulated areas exceed 0.010 f/cc or established background levels, at which time Harvard's Asbestos Project Monitor will direct the Contractor to stop work, determine the cause of the elevated fiber levels and implement corrective actions.
- C. Stop work orders may be issued for, but not limited to the following:
 - 1. Breaks in barriers.
 - 2. Loss of negative air (-0.02 inches of water column - minimum negative pressure to be maintained).
 - 3. Leakage to other areas.
 - 4. Fiber concentrations outside the work area, which exceed 0.010 f/cc for any one PCM sample.
 - 5. If the Contractor disregards laws or regulations of any regulatory or governing body having jurisdiction.
 - 6. If the Contractor's work presents a risk to the building, to building occupants to the general public or to the environment as determined by the Harvard Project Manager, the Engineer, or Harvard EH&S.
 - 7. A condition is determined to be immediately dangerous to life or health (IDLH)
- D. The absence of a stop work order by Harvard or Harvard's Asbestos Project Monitor shall not in any way be construed as an approval or acceptance of the Contractor's work.

1.10 CONTRACTOR QUALIFICATIONS

- A. The Asbestos Abatement Contractor shall be pre-approved prior to the start of abatement work. A list of pre-approved contractors is provided on the EHS Website.
- B. All personnel of the approved Contractor involved with this work shall meet the following minimum qualifications:
 - 1. Asbestos worker medical examination within the past year in accordance with OSHA 1926.1001 with a Medical Practitioner written opinion that the worker has



- no condition that would preclude him/her from working with asbestos or wearing a respirator.
2. Record of successful respirator fit testing performed by a qualified individual within the previous year, for each employee. Fit testing documentation should match the type of respirator being worn.
 3. Current certification by the DLS as an Asbestos Supervisor or Asbestos Worker. The Contractor is required to provide proof of training and licensing of any and all employees completing the Work prior to the start of any abatement work.
- C. There shall be a sufficient number of trained and qualified workers, supervisors and superintendents to accomplish the work within the required schedule.

1.11 EMERGENCY PRECAUTIONS

- A. The Contractor shall refer to and comply with the Fire Prevention and Protection Exhibit of Harvard University's *Construction Environmental Health and Safety Standard*, which specifically addresses fire protection during construction activities.
- B. The Contractor shall establish and maintain emergency and fire exits from the work areas.
- C. Local emergency medical personnel, both ambulance crews and hospital emergency room staff, shall be notified prior to commencement of abatement operations as to the possibility of having to handle contaminated, injured workers, and shall be advised on safe decontamination. The Contractor shall submit copies of such notifications to the Engineer.
- D. The Contractor shall have a written Site Health and Safety Plan. When an injury occurs the Contractor shall stop work and implement fiber reduction techniques (e.g., water spraying) until the injured person has been removed from the work area.

1.12 SUBMITTALS

- A. The Contractor shall submit each item in this Article according to the Conditions of the Contract and Section 013300 SUBMITTALS, for information only, unless otherwise indicated.
- B. All submittals shall be submitted to the Engineer prior to the start of work. Submittals that vary from building to building must be submitted prior to the start of work in the applicable building. Duplication of submittals that are constant from building to building is not required.
- C. An Abatement Work Plan using conventional containment and negative pressure shall be submitted by the Asbestos Contractor on a building-by-building basis prior to work in each building. The Abatement Work Plan shall include, at a minimum, the following:
 1. Layout of project execution components showing the configuration of the containment area.
 2. A description of Security System, warning signs and labels for bags and drums.



3. Access routes to asbestos controlled areas.
 4. A description of wetting agents and low pressure wetting system.
 5. Description of enclosures to be used.
 6. Description of wall, floor and opening coverings and sealing tapes.
 7. Fire Protection Plan, safety plan, and emergency evacuation plan. This includes the submittal of flame cortication's for plastic sheeting/barriers from the local fire departments as required.
 8. Detailed plans for decontamination facilities, toilets and systems allowing intra-room communication and communication between the work area and other areas.
 9. Engineering systems for exposure control showing the number, location and capacity of exhaust systems, the expected direction of flow and the negative pressure in each work area.
 10. Submit manufacturer's certification that vacuums, ventilation equipment, and other equipment required to contain airborne asbestos fibers conform to ANSI Z9.2 and to requirements as listed in this Specification.
 11. SDSs for all products used on the Project.
 12. Standard Operating Procedure showing how workers, visitors, and employees will be protected from exposure and how spaces outside the work areas will be protected from contamination until completion of the work.
- D. A separate Non-Traditional Work Plan shall be prepared by the Asbestos Project Designer and provided to the Engineer and Harvard Project Manager addressing the bulk demolition and segregation of material. EH&S shall submit this Non-Traditional Work Plan to MassDEP for review and approval. This Non-Traditional Work Plan shall include the following:
1. A description of the wetting procedures to be used for all phases of the work including, but not limited to demolition, load-out, etc. This item shall address the amount of water to be used, size and number of hoses, water source and means for determining whether adequate water is being used (lack of visible emissions, compliance with air sampling action level, etc.). At minimum, several 1.5 inch diameter or larger fire hoses shall be required with adequate pressure to apply water to all areas of demolition.
 2. A description of the procedures to be used to contain water run-off.
 3. Proposed methodology of bulk loading including minimizing cross-contamination of surrounding areas.
 4. A description of air monitoring locations, equipment, and procedures.



HARVARD

Campus Services

ENVIRONMENTAL HEALTH & SAFETY

5. A description of the proposed transport vehicles including transporter's name, size of vehicles, type of container, etc.
 6. A description of the proposed packaging procedures (minimum of two, 10-mil pre-fabricated liners per load, sized to fit the transport vehicle).
 7. Identification and a copy of the license of the proposed Harvard-approved landfill in which the asbestos materials will be disposed.
 8. Proposed methodology to final clean basement floors and/or foundation walls after bulk materials have been removed.
 9. Proposed locations of remote decontamination facilities including written waiver from DLS and MassDEP for use of remote decontamination facility.
 10. Proposed methodology for decontamination of transport vehicles and demolition equipment including wash down procedures, provisions for capturing wash water, etc.
 11. Application for, and obtaining of waivers and exemptions which may be required by various regulatory agencies since this demolition work and clean-up will be performed instead of conventional asbestos abatement.
 12. Standard Operating Procedure showing how workers, visitors, and employees will be protected from exposure and how spaces outside the work areas will be protected from contamination until completion of the work.
- E. Handling and off-site management of disposable protective clothing to be used on this Project. Disposable protective clothing shall be disposed as ACWM in accordance with 310 CMR 7.15(15) through (18).
- F. Respiratory Protection System(s), including literature describing sample respirators, hoses and certificate with system literature for the air supply system from manufacturer stating that air supply system meets specifications on quality, quantity and escape time. These submittals are required only if supplied air respiratory protection is used.
- G. Certification of compliance with OSHA requirements including but not limited to medical surveillance, record keeping and personal monitoring. Documentation of worker training, respiratory protection, and medical examination.
- H. Documentation of certification shall be in accordance with DLS, 453 CMR 6.00, for each employee.
- I. Copies of transporter and landfill destination permits and Waste Shipment Records.
- J. Copies of all Notifications made to Massachusetts Asbestos Program, Local Board of Health, Local Fire Department, and any other agencies, as required.
- K. Application for and obtaining of waivers and exemptions, which may be required by various regulatory agencies.



HARVARD

Campus Services

ENVIRONMENTAL HEALTH & SAFETY

- L. The Contractor shall maintain on-site all SDSs for all chemicals used including mastic removers and provide copies of the SDSs to the Engineer and Harvard Project Manager.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials or equipment delivered to the site shall be unloaded, temporarily stored, and transferred to the work area in a manner which shall not interfere with operation of others at the site, or employee's access and safety.
- B. Damaged or deteriorated materials shall not be used and shall be promptly removed from the premises. Materials that become contaminated with asbestos-containing material shall be thoroughly cleaned, or sealed in plastic bags or sheeting, labeled, and legally disposed of in an approved, secure landfill.
- C. All materials and equipment shall comply, at a minimum, with all sections of this specification, applicable federal, state, and local codes, and industry standards.

2.02 ABATEMENT EQUIPMENT & SUPPLIES

- A. HEPA-Filtered Exhausts - Air inside each work area shall be exhausted through a HEPA filter. Commercially manufactured HEPA-filtered exhaust units, with specification plates intact, must be provided for each work area to attain, at a minimum, four air volume changes per hour and an inward flow velocity of clean air into each work area at the Decontamination Facility of at least 100 feet per minute. The HEPA filter shall be preceded by replaceable pre-filters and the unit must be designed so that it cannot be operated unless all filters are in place. The units must also be designed with a gauge to indicate the pressure drop across filters, and lights and audible alarms to indicate that the filters are properly installed, functional, and when they must be changed. Flexible ducting shall be required to allow exhausting to the exterior of the building. No exhaust with any other type of particulate cleaning system (such as electrostatic precipitators) shall be allowed without prior written approval.
- B. Plastic Sheeting ("Poly") and Bags - shall be polyethylene or equivalent with a thickness of at least 6 mil for all applications. Two layers of fire retardant sheeting shall be used.
- C. Wetting Agent or Surfactant - shall be 50 percent polyoxyethylene ester and 50 percent polyoxyethylene ether, or equivalent, mixed in the proportion of one ounce of surfactant per five gallons of water. The material shall be odorless, nontoxic, nonirritating, and noncarcinogenic. It shall be applied as a mist using a low pressure sprayer recommended by the surfactant manufacturer. To protect the building components and its occupants from exposure to potentially harmful volatile organic compounds (VOC), only low-VOC and low-odor products shall be utilized for floor tile and mastic abatement.
- D. Tape and Glue - shall be capable of sealing plastic joints and attaching plastic to finished surfaces. The bonding strength and resulting seal integrity shall not be affected by mist or water, wetting or encapsulating agent, or any other materials to be used in the work area.
- E. Warning Signs and Labels - shall comply with all federal, state, and local codes and regulations. The Contractor shall post the appropriate signs at all approaches to the work area. The signs shall contain the following text:



**DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY
WEAR RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING IN THIS AREA**

- E. Waste Containers and Transportation - shall be suitable for loading, temporary storage, transport, and unloading of contaminated waste without risk of ripping, rupture, or exposure to persons, or emissions to the atmosphere. - Transportation methods -shall comply with the provisions of 40 CFR 61, Subpart M, and with any and all state and local hazardous or special waste regulations for temporary storage, transport, and disposal if such codes are enforced in states in which the waste will be stored, transported, or disposed.
- F. Truck Liners - shall be polyethylene or equivalent with a thickness of at least 10 mil for all applications.

2.03 SAFETY SUPPLIES AND EQUIPMENT

- A. Respirator Types - Provide all workers with a full or half face piece respirator which is approved by NIOSH/MSHA for protection against airborne asbestos, and meets the requirements of the OSHA Asbestos Standard. Provide respirators for each worker and at least two extra respirators for use by approved visitors. Minimum respiratory protection required shall be compliant with current OSHA and DLS regulations 453 CMR 6.00 and OSHA regulations 29 CFR 1926.1101. An adequate supply of HEPA filter cartridges shall be maintain at all times.
- B. Protective Clothing – Provide all authorized visitors and employees involved in asbestos projects with full body disposable clothing, including head, body, and foot coverings consisting of material impenetrable by asbestos fibers, and equipment as required by OSHA Asbestos Regulations at 29 CFR Part 763, Subpart G, as applicable.
- C. Additional Personal Protective Equipment (PPE) – The Contractor shall ensure that all workers are supplied with PPE (i.e., safety glasses, earplugs, hardhats) needed to comply with the Personal Protective Equipment Exhibit of Harvard University’s *Construction Environmental Health and Safety Standard*.

2.04 DECONTAMINATION FACILITIES

- A. Decontamination facilities shall be constructed in compliance with 453 CMR 6.14 and 29 CFR 1926.1101(j).

2.05 TOOLS AND EQUIPMENT

- A. Airless Sprayer: Airless sprayers, in sufficient quantity and suitable for application of encapsulating material, shall be used.



HARVARD

Campus Services

ENVIRONMENTAL HEALTH & SAFETY

- B. Negative Air Filtration Unit: Asbestos filtration devices shall utilize HEPA filtration systems, 99.97% efficient to 0.3 microns particulate size.
- C. Scaffolding: Scaffolding, lifts, ladders, and aerial equipment as required to accomplish the specified work, shall meet all applicable safety regulations.
- D. Transportation Equipment: Transportation equipment, as required, shall be suitable for loading, temporary storage, transport, and unloading of contaminated waste without exposure to persons or property. The equipment shall be secured at all times and access restricted to unauthorized personnel.
- E. Vacuum Equipment: All vacuum equipment utilized in the work area shall utilize HEPA filtration systems, 99.97% efficient to 0.3 microns particulate size. Deliver all vacuums to the site with clean waste containers and intact, undamaged HEPA filters installed.

PART 3 – EXECUTION

3.01 COORDINATION AND SCHEDULING

- A. The Asbestos Abatement Contractor shall coordinate all work with the Engineer and the Contractor.
- B. The Contractor shall submit to the Engineer prior to contract performance, a schedule of work including sequencing of asbestos removal areas and demolition.
- C. The Contractor shall give not less than a two-week advance notice of proposed time for shutting down or interrupting any utility, service or facility, which may affect normal facility operations.
- D. The Contractor shall make all required notifications and obtain all permits including, but not limited to MassDEP, DLS, All associated costs and fees shall be paid for by the Asbestos Abatement Contractor and included in the base bid price.

3.02 RESPIRATORY PROTECTION SYSTEMS

- A. Provide all workers and authorized visitors with NIOSH approved respirators compliant with OSHA regulations and a sufficient quantity of disposable filters, so that workers can change filters during the workday. Store the respirator filters at the job site in the change room, and protect them from exposure to asbestos or other hazardous materials prior to their use.
- B. Workers shall always wear a respirator properly fitted on the face while within the work area enclosure and decontamination and bag/drum wash areas. Any worker failing to wear his/her respirator or in any way performing his/her work in an unsafe manner shall be restricted from working at this site.
- C. Instruct and train workers in proper respirator use.



HARVARD

Campus Services

ENVIRONMENTAL HEALTH & SAFETY

- D. The Contractor shall maintain a record of successful respirator fit testing performed by a qualified individual within the previous year, for each employee to be used on this Project.

3.03 PROTECTIVE CLOTHING

- A. Provide to all workers, foremen, superintendents and authorized visitors and inspectors protective disposable clothing consisting of full body coveralls, head covers, gloves and 18-inch high boot type covers or reusable footwear.
- B. Provide eye protection and hard hats as required by job conditions and safety regulations.
- C. Reusable footwear, hard hats and eye protection devices shall be left in the "Contaminated Equipment Room" until the end of the asbestos abatement work.
- D. All disposable protective clothing shall be discarded and disposed of as asbestos waste every time the wearer exits from the workspace to the outside through the decontamination facilities
- E. Provide all personnel throughout the abatement process with the specified protective clothing and gear. Ensure that all personnel entering and leaving the workspace use the following procedures:
 - 1. Entering from the outside: Change from street clothes into protective clothing and wear clean protective gear. Go through shower room into Dirty Equipment Room, pick up equipment and tools and enter the work area.
 - 2. Exiting from the work area: Dispose of all protective clothing into labeled plastic bags for asbestos waste. Do not take off the respirator, but still wearing the respirator enter the shower and shower thoroughly. Remove respirator and wash and wipe thoroughly to decontaminate the respirator. After drying, enter the Clean Room, store the decontaminated respirator in the assigned space and dress into street clothes.
 - 3. Post written procedures in the workplace and train all personnel on the procedures for the evacuation of the injured and the handling of potential fires. Provide aid to a seriously injured worker without delay for decontamination. Make provisions to minimize exposure of rescue workers and to minimize spreading of contamination during evacuations and fire procedures. Exceptions to normal, routine-exiting procedures shall be made for emergencies such as, but not limited to, serious personal injury and fires.
 - 4. The Contractor shall instruct all employees and workers in the proper care of their personally issued respiratory equipment, including daily maintenance, sanitizing procedures, etc.
- F. All respiratory equipment shall be inspected by Contractor's personnel at the beginning of each work period, including breaks and lunch periods.



3.04 GENERAL PREPARATION PROCEDURES

- A. Upon receipt of a Notice to Proceed, the Contractor shall meet at the Site with the Engineer to reach agreement on:
1. Scope and manner of Work performance and all schedules.
 2. Contractor and supporting vendor vehicle access and parking.
 3. Contractor access to the work areas, including approved doors, stairways, and corridors.
 4. Location of water supply and wastewater drain connection points, if available.
 5. Determination of all equipment and other items to be removed from the work areas, and the location of temporary storage space, if applicable.
 6. Any other logistical factors to minimize interference with public safety and health, and other Contractor activities.
- B. Prepare each work area according to the following general sequence of procedures to ensure that proper fiber containment and protection systems are installed before any work, which could generate airborne asbestos fibers.
1. Erect barricades, post access restriction signs, seal all openings into the work area airtight (including doors, chases, shafts, and other vertical penetrations), and erect or install Decontamination Facilities and HEPA exhaust systems.
 2. Install poly sheeting in the work zone. Perform pre-cleaning/surface decontamination where appropriate prior to installing protective poly sheeting.
 3. Isolate and seal airtight with plastic and tape all HVAC system openings in the work area. All HVAC or exhaust systems within, or ductwork passing through, a fully contained removal area shall be inactivated (this does not refer to glove bag removal areas).
 4. Obtain formal approval from Asbestos Project Monitor of all preparation work and containment areas before commencing asbestos removal. The Asbestos Project Monitor shall be given at least 48 hours notification of the intent to start removal work in any work area.
 5. If saw cutting or any other method or device that renders roofing friable is utilized during asphalt-based, asbestos-containing roofing removal, then a negative air containment area must be erected.
- C. Isolation of Electrical Systems
1. The scope of the electrical isolation work covers the protection of electrical equipment that is in areas where asbestos removal work is performed and where the water used for wetting the material before or during removal could possibly contact the equipment and create a hazard.
 2. Provide portable electrical panels with ground fault protection for all non-battery power requirements. These panels shall have sufficient capacity for all HEPA exhausts and vacuums, power tools, portable lighting, and all other electrical



needs.

3. Provide a licensed electrician to perform all electrical work including, but not limited to connecting, energizing, and de-energizing the electrical panels and to be on call to handle any electrical problem, which may arise during the course of the work.
4. All materials and workmanship shall comply with the latest editions of applicable codes, standards, and specifications.
5. Once a work area becomes isolated by containment, only weatherproof lighting and washable tools and equipment will be allowed in the area.

3.05 DECONTAMINATION FACILITIES

- A. Description - Any person or thing exiting from the work areas must pass through a Decontamination Facility consisting of three separate, adjacent rooms separated by curtained entrances, constructed in accordance with applicable regulations. Bulk non-friable asbestos waste, which was packaged in a clean environment, does not require decontamination in a shower. All containers passing through the Decontamination Facility must be cleaned thoroughly before exiting the facility.
- B. Construction - Decontamination Facilities shall be constructed and maintained as specified in applicable regulations and shall be located in areas approved by Engineer.
- C. Manner of Operation - All personnel shall enter the Clean Room, remove and store street clothes, and put on clean protective clothing and respirators; then enter the Equipment Room, put on any additional equipment, and enter the work area. All personnel exiting the work area shall enter the Equipment Room, remove and store or dispose of all contaminated clothing and shoes, shower, and then put on street clothing in the Clean Room. Respirators shall be worn into and cleaned in the shower, and dried and stored in the Clean Room.
- D. Wastewater Disposal - All water from the shower and cleaning hose shall be collected, pumped through a 5.0-micron filter, and then legally drained to points approved by the Engineer. The Contractor shall legally handle, transport, and dispose of all filtrant and solids.
- E. Cleaning - Decontamination Facility shall be cleaned using a HEPA-filtered vacuum at least once every shift, or more frequently, if needed, to prevent dust accumulation.
- F. Prohibitions - Smoking, drinking, or eating shall not be permitted in any work area or Decontamination Facility.

3.06 WORK AREA ISOLATION

- A. Pre-clean any fixed objects or equipment within the work areas by using HEPA-filtered vacuum equipment and wet washing except where air samples indicate concentrations of airborne fibers less than 0.010 f/cc and where there is no contamination of any surfaces; then enclose with minimum 6-mil plastic sheeting sealed airtight.
- B. At minimum, large areas, such as open elevator shafts, doorways, and stairwells, shall be sealed with two layers of 6-mil poly over plywood on 2" x 4" framing or approved



alternative.

- C. Protect and isolate the work area for the duration of work by completely sealing off all openings and fixtures (including, but not limited to, floors, walls, ceilings, heating and ventilation ducts, doorways, corridors, windows, and lighting) using plastic sheeting sealed securely in place. The work area shall be sealed airtight to 3
- D. Seal airtight all holes, including but not limited to windows, doors, vents, drains, grilles, grates and any other penetrations of the work area.

3.07 AIR FILTRATION SYSTEM - FULLY ENCLOSED WORK AREAS

- A. Provide negative air filtration system in the work area to maintain a minimum negative pressure of -0.02 inch of water. If negative air pressure of -0.02 inches is lost, work shall be halted until the required negative air pressure is restored. A negative air pressure of -**0.02** inches of water shall be maintained in the work area throughout the duration of the project unless a more stringent standard is recommended by either an Industrial Hygiene Consultant or the Harvard Department of Environmental Health and Safety. The negative pressure shall be continuously monitored using a printer. Any breach in containment or loss of negative air pressure shall be immediately reported to the Project Manager and the Harvard's EH&S.
- B. The Contractor shall provide local exhaust ventilation in the work area to maintain a negative pressure in the work area relative to the adjacent non-work areas. The exhaust units must be equipped with a HEPA filter capable of retaining 99.97% of particulate matter greater than or equal to 0.3 microns in diameter. This filter must comply with ANSI Z9.2 standards. The fan for each unit should be sized to draw a desired airflow through the filters in the unit at a specified pressure drop. The unit should have an air-handling capacity of 1,000 CFM to 2,000 CFM. (Under "clean" filter conditions).
- C. HEPA air filtration equipment shall be equipped with visible and audible alarms that indicate the equipment is operating properly and when the air filtration media requires replacement and/or equipment requires servicing.
- D. The system created to maintain the specified negative air pressure differential shall be capable of providing a minimum of one air change every 15 minutes. Fifteen-minute air changes are mandatory during removal of asbestos-containing materials. All HEPA exhaust units shall be vented outside the building.
- E. All air filtration units utilized on this project shall be delivered to the site in good condition with no visible debris and shall have intact HEPA filters installed with no holes, voids or gouges in the filters. Pressure differential within the work area shall be maintained at less than -0.02 inches water pressure differential on a manometer.
- F. The air filtration system shall be operated on a continuous 24-hour basis throughout the abatement process through successful final air clearance testing and containment dismantling. The ventilation system shall be in accordance with EPA recommendations included in the "Guidance for Controlling Friable Asbestos-Containing Materials in Buildings".



HARVARD

Campus Services

ENVIRONMENTAL HEALTH & SAFETY

- G. No work will be allowed when the negative pressure differential in the work area is not at least -0.02 inches relative to adjacent building areas.
- H. Employees should start removing the asbestos material at a location farthest from the exhaust units and work towards them. If an electric power failure occurs, removal must stop immediately and should not resume until power is restored and exhaust units are operating again.

3.08 WORK AREA EXHAUST

- A. Install one or more portable HEPA-filtered exhausts to maintain each work area, including the Decontamination Facility, under negative pressure, and to reduce airborne asbestos fiber concentrations.
- B. The exhaust(s) must be capable of providing at least an inward velocity through any unsealed openings, including the Decontamination Facility, of at least 100 fpm, and four full air changes per hour throughout the work area.
- C. All exhaust air shall pass through a HEPA filter before being discharged to the exterior of the building.
- D. Deficient air flows shall be immediately reported and work ceased until the situation is corrected.
- E. Exhaust system shall be operated constantly from the time that preparation is completed, until "clean air" certification is obtained.

3.09 APPROVAL OF CONTAINMENT AREAS

- A. After the work area has been prepared as specified, the Contractor shall request an inspection by Harvard's Asbestos Project Monitor. No removal or disturbance of asbestos-contaminated materials or systems is to occur until the Engineer has inspected and approved each separate prepared work area.
- B. Any deficiencies in the preparation work shall be promptly corrected in a manner satisfactory to the Engineer.

3.10 ASBESTOS REMOVAL PROCEDURES

- A. [Demolition of block, concrete, plaster, gypsum board walls and ceilings, and other building materials, equipment and components to properly access and remove ACM is part of the Asbestos Abatement Contractor's work. Selective demolition shall be performed in a controlled manner as to not affect ACMs or PACMs in ceilings, wall cavities and/or pipe chases. Debris generated during the selective exploratory demolition work shall be properly separated and removed prior to performing any asbestos abatement/removal. Selective demolition and exploratory demolition shall be required for all buildings. Additional ACMs discovered in wall and ceiling cavities during this limited exploratory demolition shall be brought to the attention of the Engineer.]
- B. *For areas where there has been cross-contamination* - [The Asbestos Abatement Contractor shall remove all movable objects/items stored in the buildings unless otherwise



specified. Non-porous items can be decontaminated and disposed of as conventional waste unless otherwise specified or regulated. Porous materials are to be disposed of as ACWM unless regulated or specified otherwise.]

- C. Friable Asbestos-Containing Materials (Excluding Glovebag Removal) [& Exterior Underground TSI/Pipe Insulation Removal in Tunnels and Conduits]:
1. All asbestos-containing materials to be removed shall be contained within a negative pressure enclosure system, wetted with amended water and carefully removed to prevent damage and creation of airborne dust.
 2. Once the removal of all asbestos-containing material is complete, all surfaces and walls within the area shall be thoroughly cleaned by wet wiping/cleaning, followed by thorough drying, and then HEPA vacuumed. A satisfactory encapsulant (lockdown material) shall be applied to all surfaces from which friable asbestos has been removed.
 3. The exterior of disposal bags, drums, and other containers shall be vacuumed and washed free of all visible asbestos fibers before their removal from the work area.
 4. During underground TSI/pipe tunnel work, the Contractor must excavate, locate TSI piping and remove TSI encased in concrete trench while under full containment. Removal work involving the use of remote decontamination facilities and procedures must be approved by the Engineer, MassDEP, and DLS. Remove and dispose of any soils that come in contact with friable TSI. Refer to Drawings and abatement schedule for additional details.
- D. Friable Asbestos-Containing Materials (Using Glovebag Removal Methods):
1. All glovebag removal operations shall be conducted in accordance with OSHA regulation 29 CFR 1926.1101 and applicable state regulations. Glovebags cannot be slid on pipes or reused.
- E. Nonfriable Asbestos-Containing Materials:
1. If the Contractor and the Engineer determine, that the non-friable ACM can be removed without creating any airborne dust or loose friable asbestos, the specific practices listed herein shall be followed as approved in the Contractor's written work plan. Otherwise, the nonfriable asbestos must be removed under the conditions of a full negative-pressure enclosure.
 2. All non-friable asbestos removal areas shall be properly segregated by posting caution signs meeting the specifications of OSHA regulation 29 CFR 1926.1101 at all locations and approaches to any location where airborne concentrations of asbestos have potential to exceed ambient background levels. Workers shall don all protective equipment prior to entering the regulated work area. The material shall be removed very carefully to minimize any breakage that may release airborne fibers.
- F. Slate Shingle with Glue Daubs and Vapor Barrier Papers, Asphalt-Based Roofing and Flashing Material Asbestos Removal
1. Operations involving the cutting or abrading of asphalt-based asbestos roofing material is considered to release sufficient friable material or fibers to constitute an asbestos abatement activity. All work using such equipment must be performed



by DLS certified asbestos workers in a negative pressure enclosure. These restrictions may be modified if the Contractor uses slicing or shearing equipment or manual means to remove the asbestos materials and if the USEPA and state regulations and guidance documents on abatement of roofing materials are followed.

2. Removal of roofing material prior to general building demolition shall be performed in accordance with OSHA regulation 29 CFR 1926.1101. Additionally, removal shall meet all requirements specified in the MassDEP Policy, Non-Friable Asbestos Containing Materials, and Policy #BWP-96-012 as approved in the Contractor's site specific Work Plan required in Paragraph 1.12.
3. Work Procedures
 - a. Perform whatever procedures are necessary including the application of wet methods and covering materials to ensure that release of asbestos is reduced to no visible emissions. Work using any cutting or abrading equipment must be performed in a negative pressure enclosure.
 - b. Remove asbestos roofing materials using tools and equipment specified in regulatory guidance documents.
 - c. Continuously mist the work area as asbestos roofing materials are being removed from the structure.
 - d. The Contractor shall make every attempt to remove all asbestos roofing materials intact. If removal of roofing systems will render the material friable, then the material shall be removed using the full containment methodology unless a waiver for work practice variance is obtained from MassDEP.
 - e. All loose debris shall be immediately collected using HEPA-filter vacuums and/or wet cleaning methods. The vacuum debris and wipe materials shall be segregated, packaged, and disposed of as asbestos contaminated waste.
 - f. Wet methods shall be used whenever operations call for the scraping of resilient roofing materials or mastic.
 - g. Where cutting and abrading is prohibited, a negative pressure enclosure is not required provided the asphaltic roofing material is not in a friable state. Waste must be lowered by a crane, hoist, or dust-tight chute, in accordance with applicable regulations.

G. Floor Coverings, Mastics and Floor Leveling Compounds

1. The Contractor shall remove all asbestos-containing floor coverings, including but not limited, to 9"x 9" floor tile, 12"x 12" floor tile, floor sheeting, mastics on wood, mastic on concrete, multilayered floor coverings, floor levelers and stair treads.
2. Asbestos-containing floor coverings and mastics requiring abatement exist in many buildings. Current building conditions vary from clean floors with accessible floor coverings to floor finishes covered with furnishings and equipment. [If asbestos-containing floor tile adhesive is applied directly onto wood flooring, the Asbestos Abatement Contractor shall remove the wood contaminated by adhesive and dispose of contaminated wood as asbestos waste.]
3. The Contractor shall remove and dispose of all asbestos-containing floor coverings, associated mastics, tar papers and floor levelers. The Contractor will encounter and shall remove floor coverings, etc. under the following conditions: ACM is under varying quantities of a) deteriorating non-asbestos wall & ceiling plaster, b) ceiling tile and paint debris, some of which is lead containing; c) under floor boards; d)



under plywood; e) under building equipment (desks, chairs, shelving, cabinets, radiators, toilets, baseboard heating, etc.); f) under damaged thermal system insulation, g) on concrete, and h) on various wood underlayments. The Contractor is also responsible for the removal of cabinets and partition walls to access asbestos floor covering and adhesive mastic.

4. [The Contractor shall eliminate all mastic remnants when positive. The Contractor shall remove all materials or substrates (i.e.: wood underlayments, floor levelers, etc.) if visible or microscopically detectable asbestos-containing mastic remains on these surfaces after abatement. The Contractor shall also remove as asbestos any non-asbestos mastics which are asbestos contaminated or become asbestos contaminated during asbestos abatement operations in that location.]

H. Accessible TSI, Pipe, Fittings, Valves, and Debris

1. The Contractor shall remove and dispose of all accessible TSI pipe, fitting and valve insulation as identified in the Abatement Schedule.
2. The Contractor will encounter and shall remove TSI under varying building conditions. Virtually all buildings contain TSI in various areas. [The TSI is in varying states of disrepair as a result of maturation and/or delamination. TSI debris is co-mingled with plaster, ceiling tiles, trash and general building debris. The TSI contamination exists on carpets and in hallways resulting from maturation, delamination, and/or tracking during vandalism. Some TSI is submerged in water and some is located in tight spaces, concealed in wall and floor cavities and chases.] Some TSI is embedded in walls, floors, ceilings, etc.
3. The Abatement Schedule identifies quantities of accessible TSI piping, general locations and general work environment description on a building-by-building basis. [Furthermore, approximate quantities are provided for damaged TSI, surface area cleaning, etc.] [The Asbestos Abatement Contractor shall abate all accessible TSI from all areas of the building prior to demolition operations as part of their lump sum bid.]
4. In areas of building conduit spaces where limited headroom or the condition of the conduit prevents safe access by workers, as determined by the Engineer, the asbestos abatement Contractor will be allowed to “wrap and cut” segments of intact TSI pipe insulation while insulation remains on the pipe. The Contractor shall then transport the cut pipe section to a full containment area and remove insulation from the pipe. The Contractor shall fine clean pipe and remove from full containment as non-ACM. The Contractor must ensure the “cutting points” of the pipe are free of ACM prior to cutting. This action is specified for limited areas within crawlspaces or conduits only. In areas with sufficient access and headroom, the abatement of ACM pipe insulation shall follow standard removal practices. The Contractor will be required to remove asbestos insulation by the glove bag removal methodology to create a clean space to cut the pipe surface.

I. Concealed TSI Pipe, Fittings, Valves and Debris

1. The asbestos abatement Contractor may encounter and shall investigate all areas of all buildings to locate concealed TSI pipe insulation, perform selective demolition to access all concealed TSI, remove and dispose of all TSI and contaminated porous building materials (or properly decontaminated thereof) and provide certification that all concealed TSI has been removed prior to demolition. If, during the course of demolition, TSI is found, the asbestos abatement



Contractor shall access and abate TSI. Demolition activities will be suspended until the Engineer determines that identified TSI is successfully abated, however, demolition may be permitted to proceed in other buildings or locations where these ACMs will not be impacted.

2. The following are some examples of concealed areas that require abatement (Note: these are example locations only and other locations may exist on the project): (1) Behind and above non-ACM plaster reinforced with wire lathe walls and ceilings; (2) behind sheetrock walls and above ceilings; under wood floors; (3) within floor trenches or floor grates covered with steel plating or concrete covers; (4) under deteriorated building debris; (5) under non-ACM blown-in insulation; (6) inside heating/HVAC units; (7) behind ceramic tiled walls and ceilings; (8) above suspended ceilings; (9) above spline tiled ceilings; (10) behind wood wall paneling; and (11) partially buried in soil, submerged in water; or between floor spaces. Concealed TSI covers virtually all piping systems. Concealed TSI is commonly found in vertical and horizontal pipe chases behind walls and ceilings of rooms, bathrooms, wet walls, janitor closets, etc. The Contractor is also responsible for removing as ACM all commingled concrete slurry or building materials where TSI is embedded or has come in contact with such material.
3. [The abatement schedule provides approximate quantities of concealed TSI on a floor-by-floor or per building basis. The Contractor shall locate and remove these materials as part of the lump sum bid.]

J. Encapsulation:

1. After all asbestos-containing material is removed, seal the surface with an approved encapsulation material. Encapsulation materials shall be applied after clearance visual inspection has been performed by Harvard's Asbestos Project Monitor. The Contractor shall inform the Engineer whenever any asbestos-containing materials cannot be removed, whether in total or in part prior to encapsulating.
2. The encapsulant shall be prepared and applied according to the manufacturer's specifications. A SDS must be submitted to Harvard and the Engineer for acceptance for the encapsulant prior to its use at the Project Site. A copy of the SDS must be available to the workers and the workers shall wear appropriate personal protective equipment as designated on the SDS during the preparation and application of the encapsulant.]

K. Bulk Waste Management

1. Due to adverse structural integrity of portions and entire buildings, conventional asbestos abatement may not be safely performed in designated buildings and areas without extensive shoring. These areas of buildings and entire buildings are identified as an Appendix to this specification. As such, localized demolition of these areas and buildings will occur and the resulting porous debris shall be considered asbestos-containing or asbestos-contaminated materials.
2. The Contractor shall prepare and submit to the Engineer for approval a work plan that describes the methodology to be used to protect human health and the environment during all phases of demolition, load-out, transport and disposal of all debris generated by the demolition and removal of the asbestos containing materials and contaminated building debris. Certain buildings designated in



within the Appendix at the end of this specification as being structurally unsound contain friable and non-friable ACM that will not be removed prior to demolition of the building due to unsafe conditions. Bulk-loading ACWM is not permitted without the Department's prior approval of a Non-Traditional Asbestos Abatement Work Practice application. A detailed proposal for specific Non-Traditional Asbestos Abatement Work Practices, prepared by a DLS-certified asbestos project designer, must accompany the application form.

3. Harvard's Asbestos Project Monitor will be performing continuous air monitoring around the perimeter of designated buildings and areas during all phases of demolition, load out and cleaning. All samples will be analyzed at the Site by PCM Analysis (NIOSH Method 7400 or equivalent). PCM sample analysis will be performed within 2 hours of sample collection time. If, at any time, air sample results indicate airborne fiber concentrations in excess of 0.010 fibers per cubic centimeter (f/cc) of air, the Contractor shall stop work and the MassDEP will be notified. Contractor shall take direction from Harvard's Asbestos Project Monitor and/or the MassDEP regarding steps that must be taken to reduce the airborne fiber concentrations. Such steps may include working slower or more cautiously, additional wetting or other methods. The Contractor shall at all times use methods that maintain airborne fiber concentrations below 0.010 (f/cc). All costs incurred for maintaining airborne fiber concentrations below 0.010 (f/cc) centimeter or for maintaining approval of MassDEP during the demolition process shall be considered part of the work and the responsibility of the Contractor. If any PCM air samples indicate fiber concentrations above 0.01(f/cc), the work practices and engineering controls described in the Contractor's work plan and being employed at the Site shall be reviewed and modified until acceptable airborne fiber levels are achieved.

3.11 WORK AREA CLEANUP, DECONTAMINATION AND WASTE DISPOSAL

A. General Requirements

1. After all asbestos-containing or asbestos-contaminated materials have been removed, remove all wastes and perform a final cleanup and decontamination of each work area. Final cleaning shall be performed only after all waste is packaged and removed, but before reinstalling or demolishing any equipment, or dismantling any barrier, Decontamination Facilities, or protective coverings. Cleaning shall be subject to the approval of Harvard's Asbestos Project Monitor based on a visual inspection, surface dust wipe tests (if necessary), and air testing.
2. The Abatement Contractor will clean all work areas at the end of each workday and will collect and store all waste generated from the asbestos abatement process (e.g., removed asbestos containing material, dust from HEPA filters, etc.) in secure, closed containers that are properly labeled.
3. The Abatement Contractor is not allowed to stockpile any asbestos containing materials on-site. All materials must be removed from the project site at the end of each work day unless the materials are properly containerized, secured and labelled, as approved by the Owner.



B. Cleaning Methods and Approvals

1. All waste containers and removal equipment shall be thoroughly cleaned with a HEPA-filtered vacuum, decontaminated with the use of amended water, and then promptly removed from the work area.
2. All surfaces in the work area shall be thoroughly wiped/washed clean and, after drying, thoroughly decontaminated with a HEPA-filtered vacuuming device then encapsulated.
3. After cleaning, Harvard's Asbestos Project Monitor shall inspect the work area. To facilitate scheduling of inspections and air tests, the Contractor shall notify Harvard's Asbestos Project Monitor of the anticipated completion of the final work area cleaning at least 48 hours in advance.
4. If any visible waste or fibers are observed within the work area during the inspection, the Contractor shall perform additional cleanup and decontamination.
5. If the air sample results are above the Air Quality Standard of 0.010 f/cc as measured by PCM analysis, the Contractor shall perform additional cleaning and decontamination, and the inspection and air tests shall be repeated at the Contractor's expense
6. If the air sample results are below the Air Quality Standard of 0.010 f/cc, the Engineer shall give approval for the Contractor to remove all protective coverings, which do not comprise part of the work area seal, containment barrier, or Decontamination Facility.
7. Once these items have been properly packaged and removed from the work area as contaminated waste, package and properly dispose of all remaining plastic sheeting, disassemble and remove the Decontamination Facility and HEPA exhausts, and perform a final HEPA vacuuming and/or wet cleaning of all surfaces.
8. Upon completion of the cleaning, all temporary access openings shall be repaired and all unsafe conditions corrected.

C. Waste Disposal

1. General Requirements - All asbestos wastes (e.g., pipe lagging, floor tile, transite, etc.) must be handled, packaged, stored, transported, and disposed of as specified in this subsection, and in compliance with all federal, state and local regulations and codes. The Contractor, or the Asbestos Abatement Contractor, is responsible for the ultimate disposal of all removed asbestos containing materials and other asbestos containing waste generated from the work of this section.
2. Waste Labeling - If waste containers are not already so preprinted, warning labels having waterproof print and permanent adhesive shall be affixed to the lid and/or sides of the containers, whether or not these containers are further packaged. Warning labels shall be conspicuous and legible, and conform to the latest OSHA, EPA and DOT labeling requirements. The Contractor shall properly wrap/bag all waste from the asbestos abatement process (e.g., removed asbestos containing material, dust from HEPA filters, etc.) within the asbestos work area. Wrapped/bagged waste shall be stored in secure, closed containers (e.g., drums, roll-off containers) and labeled with the following text:



DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

3. Waste Packaging - All waste shall be thoroughly wetted when packaged and Contractor shall inspect each bag, drum or container to observe that water condensation is visible. Insufficiently wetted bags shall be opened, rewetted, and resealed inside a negative pressure enclosure. When a waste bag is full, it shall be securely sealed with tape, and then placed in the designated temporary storage area inside of the work area.

D. Waste Container Removal and Disposal Documentation

1. It is the responsibility of the Contractor to determine current waste handling, transportation, and disposal regulations for the work site and for each waste disposal landfill. ACM waste shall not be stored on-site for more than 30 days. The Contractor must comply fully with these documents and all DOT and EPA requirements.
2. The Contractor shall only make arrangements with and dispose ACM at a Harvard utilized facility as identified on the EH&S Website.
3. The Contractor, transporter and landfill shall document generation, transport and disposal of the waste at the designated landfill by using a Harvard University Asbestos Waste Shipment Record (AWSR) to accompany the shipment of all waste generated as part of the work of this section. This record is a legally required document, which identifies the generator, transporter(s), temporary storage location(s) and disposal site for any asbestos waste material. The issuance of an Asbestos Waste Shipment Record initiates a documented tracking system to ensure that asbestos waste is transported and disposed of properly and within specified regulatory time limits.
4. The Contractor is responsible for obtaining and completing the AWSR by utilizing the University's online system for issuing project-specific AWSR(s) for use on Harvard projects. This web-based system allows the University to track regulatory compliance dates and ensure that all asbestos waste is being disposed of at Harvard approved disposal facility in an appropriate manner and timeframe. Contractors must be pre-qualified to perform any asbestos abatement work and must attend a Harvard AWSR training session in order to get familiar with the web-based system and obtain a user identification and password to access the system.
5. Measure the volume of each container or load of waste removed from the Site. The Contractor shall provide Harvard's Asbestos Project Monitor with an estimated total volume of each load/container of waste and provide an accurate count of each type of container for each load BEFORE the waste is removed from the Site. The Contractor shall obtain final authorization for the shipment of asbestos materials from either the Harvard Project Manager, the Asbestos Consultant or Harvard EH&S. The AWSRs are only to be signed by EH&S personnel, the Harvard Project Manager or the Asbestos Consultant/Industrial Hygienist.



6. The Contractor, or Asbestos Abatement Contractor, shall dispose all asbestos waste at a Harvard University approved Asbestos Landfill. A listing of current approved landfills is provided on the EH&S website. Provide legal transportation of the waste to the disposal landfill, and complete or obtain all required licenses, manifests, weight slips, or other forms. Proper truck placarding must be performed in accordance with USDOT regulations. Legible copies of all forms or licenses, and the signed original of the Waste Disposal Form (e.g., Asbestos Waste Shipment Record) for each waste load, shall be given to Engineer.
7. The Contractor shall not transfer asbestos materials to any off-site or off-premises facility unless the facility has a valid site assignment, and is approved by MassDEP as a Solid Waste Facility in accordance with 310 CMR 16.00 and 19.000, respectively. All asbestos waste generated from Harvard University must be received by the approved Asbestos Landfill and the final Harvard AWSR must be signed by the approved Asbestos Landfill and returned Harvard University within 35 days of leaving University property. Copies of the final documentation must be provided to the project manager and Harvard EH&S.

3.12 MONITORING, TESTING AND INSPECTIONS

- A. All monitoring, with the exception of Asbestos Abatement Contractor personnel monitoring, will be performed by Harvard's Asbestos Project Monitor. The Contractor is responsible for personnel monitoring in compliance with OSHA regulations. Harvard's Asbestos Project Monitor may, at his/her discretion, also conduct personnel monitoring on Contractor personnel. Monitoring by Harvard's Asbestos Project Monitor shall not relieve the Contractor of obligation to perform personal exposure assessments.
- B. The performance and execution of the work will be closely monitored throughout the abatement process and throughout the demolition process by Harvard's Asbestos Project Monitor. The monitoring will be inside the work areas, demolition sites and the surroundings to ensure full compliance with these specifications and all applicable regulations. The Contractors shall provide cooperation and support to Harvard's Asbestos Project Monitor throughout the abatement and demolition process. The continuous monitoring and checking may include air samples in the workspace, personnel samples at breathing levels for a number of workers to be determined solely by the Harvard's Asbestos Project Monitor, air samples in the areas surrounding the work area and the outside, checking of the Standard Operating Procedures, Engineering Control System, Respiratory Protection System, labeling, packaging, transporting and disposal of asbestos, Decontamination Facilities and procedures and any other aspects of the abatement process that may impact the health and safety of the public or the pollution of the environment. The continuous monitoring and checking is further intended to document type and quantities of ACM removed and to document the Contractor's compliance with regulations and the Contract Documents.
- C. The Contractor is responsible for meeting OSHA requirements for their personnel, including but not limited to, monitoring requirements, safety compliance and record keeping. Personal monitoring results from the previous day shall be posted each day, and legible copies of the results forwarded to Harvard's Asbestos Project Monitor.
- D. Final Clearance air sampling will be performed by PCM in accordance with DLS protocols in work areas where clearance sampling is required.



- E. If the concentration of all the air samples taken inside the work area, as analyzed by the PCM method described in DLS regulation 453 CMR 6.00, does not exceed 0.010 (f/cc) centimeter of sampled air (f/cc), the removal shall be considered complete and the containment area dismantled.
- F. If the concentration of any of the air samples taken inside the work area exceeds 0.010 f/cc, then the Asbestos Abatement Contractor shall re-clean the work area and final air clearance testing shall be repeated. All costs associated with the collection and analysis of repeat air clearance samples due to elevated clearance fiber levels shall be paid for by the Contractor.
- G. The Asbestos Abatement Contractor shall not start containment dismantling operations until the Asbestos Abatement Contractor has received written approval from Harvard's Asbestos Project Monitor.

3.13 FINAL INSPECTION AND TESTING

- A. After thorough cleaning and removal of all asbestos waste and Contractor's materials, tools and equipment, the Asbestos Abatement Contractor's Asbestos Supervisor shall perform an initial inspection of the work area to determine if it is ready for a final visual inspection by Harvard's Asbestos Project Monitor. Once the Asbestos Abatement Contractor has determined that the containment or regulated work area is ready for the final visual inspection, Harvard's Asbestos Project Monitor shall be notified no less than 24 hours in advance to schedule and perform the required final inspection and final clearance air testing. Harvard's Asbestos Project Monitor will visually inspect the workspace for the detection of any visible debris, dust, residue or contamination. The visual inspection shall be performed prior to applying lockdown encapsulation to surfaces. All surfaces shall be dry to beginning the visual inspection.
- B. Following a successful visual inspection of the work area the Asbestos Abatement Contractor shall encapsulate all surfaces within the work area. Following encapsulation of the work area and after a sufficient period of time has elapsed to allow complete drying of the work area; the final clearance air sampling will be performed by Harvard's Asbestos Project Monitor.
- C. The final testing shall take place under active agitation of the air in the workspace with fans running, leaf blowers operating and any other means found suitable by Harvard's Asbestos Project Monitor during the final testing. Fans, leaf blowers and extension cords necessary for final clearance air testing shall be provided by the Contractor and the Contractor shall cooperate with and assist Harvard's Asbestos Project Monitor. The analysis of all samples collected shall demonstrate that fiber levels do not exceed 0.010 f/cc by PCM.
- D. After the specified post-abatement levels have been confirmed through the final testing specified herein, the plastic enclosure shall be removed, the exposed surfaces thoroughly wet cleaned and/or HEPA vacuumed, and the plastic, tape, material from equipment room and shower room bagged and disposed of as asbestos waste. A final check will be carried out by Harvard's Asbestos Project Monitor to ensure that no dust or debris remain on surfaces as the result of asbestos removal and related activities and containment dismantling operations. Critical barriers, HEPA exhaust units and decontamination facilities shall remain in place until all final cleaning and clean-up operations have been completed and all other containment dismantling has been completed.



HARVARD

Campus Services

ENVIRONMENTAL HEALTH & SAFETY

- E. After achieving the level of cleanliness and decontamination as specified herein and as confirmed by the final testing and checking, the Harvard's Asbestos Project Monitor will thoroughly inspect the work areas jointly with the Asbestos Abatement Contractor to determine whether any damage has been done to any building component, finish, equipment or any other part of the work space or property that will not be subsequently demolished or have been specifically designated for salvage. A final inspection report shall be prepared jointly between Harvard's Asbestos Project Monitor and the Abatement Contractor detailing the list of items to be fixed by the Abatement Contractor.

END OF SECTION