

# Cascade Hall

## Hazardous Building Materials Abatement – Demolition Phase Work Package

Southern Oregon University  
Ashland, Oregon

Prepared for:  
Southern Oregon University  
1250 Siskiyou Boulevard  
Ashland, Oregon 97520

November 2024  
PBS Project No.: 52611.001



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# Southern Oregon University

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November 2024

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Date

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## **SECTION 01 11 00 - SUMMARY OF WORK**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. The work under this contract consists of hazardous building materials abatement, demolition of unregulated building materials, and related procedures identified by the Owner. Provide all material, labor and equipment necessary to accomplish the work.
- B. The Contract Sum shall not be affected by changes due to increases in equipment, transportation, labor or material costs, disposal costs and fees, or other similar events.

#### **1.02 RELATED WORK BY THE OWNER OR BY OTHERS**

- A. The Owner may undertake other work under a separate contract. Coordinate all abatement, demolition, and related work with the Owner's Representative, including schedule and phasing.
- B. The Owner may retain a third-party consultant to perform the following:
  - 1. Take and analyze air samples before, during and after the work.
  - 2. Observe the work of the Contractor.
  - 3. Monitor the Contractor's compliance with the Specification requirements.

#### **1.03 BASE BID**

- A. The scope of work included under the Base Bid shall include removal and disposal of asbestos-containing materials, selective demolition, and related work as indicated within this section and the attached abatement diagrams. The scope of work under the Base Bid is identified as follows. Refer to the attached abatement diagrams for additional information. All quantities are approximate.
  - 1. Demolition of Unregulated Building Materials – The scope of work includes demolition of unregulated interior and exterior building components to access asbestos-containing materials.
  - 2. Cement Asbestos Ducting Abatement – Remove and dispose of all sub-slab cement asbestos ducting material and all associated floor register boots throughout the building. Approximate locations of cement asbestos ducting below concrete floor slabs are shown on the attached abatement diagram HA1.6. Locational information presented on the abatement plan is based on a review of historical record drawings and limited PBS field verification; hence, actual locations and extents of this material may vary. Contractor shall perform exploratory selective demolition of concrete slabs to expose and abate up to 940 linear feet of cement asbestos ducting material and associated floor register boots.

3. Window Unit Abatement – Remove and dispose of all multi-pane window units with asbestos-containing glazing compound and window frame sealants throughout the building. Remove all residual sealant material from removed window openings. Approximately 500 window units are specified for removal.
4. Built-up Roofing Abatement – Remove and dispose of asbestos-containing built-up asphaltic roofing and all associated insulation down to the existing roof decking in all areas indicated on abatement drawing HA6.1. Asbestos-containing built-up roofing materials are concealed under overlaid membrane roofing systems. Note that a white, fibrous, asbestos-containing felt layer is anticipated to be present in a majority of the built-up roofing systems to be removed. The white felt layer was deemed to be friable in PBS core samples. Approximate roofing material quantities are as follows:
  - a. Built-up roofing with friable felt layer: 47,750 SF
  - b. Built-up roofing with asphaltic felt: 6,430 SF
  - c. Asphaltic roofing felt layer under membrane: 500 SF
  - d. Asphaltic roofing felt and tar at parapet curb (non-asbestos roof field): 250 SF
5. Roof Detail Mastic Abatement – Remove and dispose of all asphaltic roof detail mastic applied around roof penetrations and roof exhaust unit bases as indicated on abatement drawing HA6.1. Approximately 400 SF of mastic will require removal.
6. Roof Exhaust Unit Coating Abatement – Remove and dispose of all asbestos-containing coating material applied to roof-mounted exhaust units from the roof areas indicated on abatement drawing HA6.1. Approximately 12 exhaust units are present.
7. Louver Putty and Flashing Sealant Abatement – Remove and dispose of all asbestos-containing louver putty and flashing sealant at exterior roof level louvers located on the south side of the building as indicated on abatement drawing HA6.1. Up to 100 linear feet of putty material and 25 linear feet of flashing sealant is present.
8. Exterior Skimcoat Patching Abatement – Remove and dispose of up to 5 square feet of asbestos-containing patching material applied to a roof level exterior wall located on the south side of the building as indicated on abatement drawing HA6.1.
- B. Contractor shall remove and dispose of all building finishes, casework, mechanical equipment, loose furnishings, and other obstructions as necessary to access concealed materials included in the Base Bid scope of work.
- C. Contractor shall coordinate with the Owner to arrange for safely de-energizing all electrical fixtures prior to impact or removal.
- D. Contractor shall cover all door, window, and other openings resulting from completion of the Base Bid scope of work with minimum 1/2" plywood fastened from the building interior. Temporary barriers must be sufficient to maintain building security and prevent weather infiltration into the building.
- E. Weekly progress meetings may be conducted with the Owner throughout the

abatement period, at the Owner’s discretion. If such progress meetings are required, the Abatement Contractor’s project site supervisor is required to attend.

- F. Contractor is responsible for maintaining work areas in a safe condition throughout abatement.
- G. If suspect asbestos-containing materials are identified by the Contractor that are not identified in the abatement scope of work, all testing shall be conducted by the Owner. Contractor shall notify the Owner and the Owner shall provide sampling and analysis at the Owner’s expense. Contractor is not authorized to collect or analyze bulk samples from Owner property.
- H. Contractor is responsible for proper disposal of demolition debris generated under this contract off of Owner’s property.
- I. Unless otherwise indicated within this scope of work, abatement shall include complete removal of all indicated asbestos-containing materials.
- J. The Contractor and all sub-contractors under this contract performing abatement or demolition tasks on painted surfaces shall comply with all applicable lead paint regulations in OAR 437-Division 3, 1926.62 Lead in Construction Standard.

#### **1.04 PROJECT SCHEDULE**

- A. The Owner shall schedule a pre-abatement construction conference to be held prior to the start of work. Contractor’s superintendent and crew foreman must attend.
- B. Contractor shall begin work on submittals and DEQ notification no later than five (5) calendar days after written Notification to Proceed is received from the Owner.
- C. Refer to the Owner’s construction schedule for project benchmark and phasing requirements.

#### **1.05 PERMITS AND FEES**

- A. After execution of the contract, the Contractor shall obtain and pay for all permits, fees, and licenses necessary to execute and complete the scope of work. Obtain permits and notify the following agencies at least ten (10) days prior to beginning work. Other permits and notifications may also be necessary.

Oregon Department of Environmental Quality (DEQ)  
700 NE Multnomah Street, Suite 600  
Portland, Oregon 97232-4100  
Your DEQ Online

- B. Contractor shall maintain the notification to comply with the regulations set forth by DEQ throughout the construction period. Amended permits shall be submitted to DEQ to indicate the following changes to the initial permit.
  - 1. Project category and required fee. Contractor shall pay all fees associated with notifications amendments to comply with changes in scope, etc.

2. Daily hours onsite (clearance air monitoring is included).
  3. Start and stop dates.
  4. Work practices and removal procedures.
  5. Disposal procedures.
  6. Disposal site.
- C. Contractor shall immediately submit copies of amended DEQ notifications to the Owner. Failure to submit amended notifications may result in project stoppage until required amendments are submitted.

#### **1.06 PATENTS**

- A. Certain products or procedures may have a patent or require a licensing agreement. The Contractor should utilize all products and procedures under proper authority of the licensing agreements and patent rights. The Owner shall not be responsible for any licensing or patent infringements.

#### **1.07 SPECIFICATIONS ON SITE**

- A. Contractor shall maintain a minimum of two copies of the complete specifications on site at all times. Both copies shall be available to the Owner and authorized visitors.

#### **1.08 PROJECT STOPPAGE**

- A. At any time during the work, the Owner or Environmental Consultant may stop the work if violations of the Specifications are observed or if the functioning of the Owner is jeopardized by the activities of the Contractor or his subcontractors. Work shall stop immediately upon verbal direction of Owner or Environmental Consultant. Work may commence when violations are rectified, or activities are altered and determined to be acceptable by the Owner or Environmental Consultant.

#### **1.09 VARIATIONS IN QUANTITIES**

- A. The quantities and location of ACM indicated on the drawings and the extent of work included in this section are only best estimates that are limited by the physical constraints imposed by occupancy of the building. Accordingly, minor variations of plus or minus ten (10) percent of the estimated quantities of ACM within the limits of the base bid scope of work are considered as having no impact on contract price and time of this contract. Locations of ACM different than indicated on drawings but within the limits of a containment are considered as having no impact on contract price and time of this contract. Where additional asbestos abatement work is required beyond the above variations, the contract price and time will be adjusted under provisions of applicable clause in the contract. Additional or reduced abatement work beyond the variations stated will be a basis for adjustment of the contract price.

## 1.10 MISCELLANEOUS REQUIREMENTS AND OTHER INFORMATION

- A. All quantities given are estimates. Contractors are responsible for verifying site conditions during the bid period.
- B. The Contractor shall provide adequate lighting for the duration of the project.
- C. Non-friable asbestos abatement work is to be completed from within a regulated area, demarcated using asbestos caution tape according to all applicable regulations. Critical barriers shall be installed over penetrations within the work area, and local HEPA filtration shall be used. All workers completing non-friable asbestos abatement shall use PPE, including at least a ½ face respirator and Tyvek coveralls.
- D. Contractor shall install view windows of at least 24" X 24" to be placed in locations that allow asbestos abatement & demolition work to be observed at all times wherever feasible.
- E. All waste must be removed daily from the work area. Generated waste shall not be allowed to accumulate.
- F. Any drop boxes used at the site must be lockable and totally enclosed, with a hard cover.
- G. In the event that the Contractor is required to access electrical panels and de-energize components to be removed as a part of the contractual scope of work, the Owner shall be contacted to coordinate this work.
- H. Contractor shall use a digital manometer equipped with an automatic printout or downloadable use history for all work specified to be completed under negative pressure. Negative pressure must be -0.02 in/wc or greater throughout abatement work.
- I. Air filtration units must be exhausted outside the building for the duration of this project. Contractor shall maintain new HEPA filters and pre-filters for each air filtration unit employed on this project. Contractor shall immediately change air filtration unit filters upon the request of the Owner. Contractor shall secure doors or accessible windows using plywood of a minimum thickness of ½".
- J. Contractor shall clean all surfaces within the work area following the completion of asbestos abatement and demolition. The work areas and adjacent building areas must be free of all dirt dust and debris caused by work under this contract following the completion of this project and will be inspected by the Owner.
- K. Contractor shall provide temporary toilet facilities for their employees for the duration of this project.
- L. Contractor shall coordinate with Owner regarding placement of dumpsters, materials staging, temporary toilet facilities, and similar items.



**PART 2 - PRODUCTS**

Not applicable.

**PART 3 - EXECUTION**

Not applicable.

**END OF SECTION 01 11 00**

## **SECTION 01 15 00 - TEMPORARY FACILITIES**

### **PART 1 GENERAL**

#### **1.01 SCOPE**

- A. Contractor shall arrange for and provide temporary facilities and utilities such as water, electricity, gas, etc., as specified herein and as required for proper and expeditious prosecution of work. Contractor shall inspect the Owner's facilities to determine that the capacity and operation of services provided by the Owner are adequate for the execution of the work.
- B. Contractor shall arrange with utility company, rental company, etc. to provide any additional temporary service required, and pay all costs for such power, lighting, water, sanitation facility or any other service used, if temporary service from existing sources is insufficient to meet needs of temporary facilities.
- C. Contractor shall make temporary connections to utilities and services in locations acceptable to Owner and local authorities having jurisdiction thereof; furnish necessary labor and materials, and make installations in manner subject to acceptance of such authorities; maintain such connections; remove temporary installation and connections when no longer required; restore services and sources of supply to proper operating condition upon completion of the project.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIAL**

- A. Material may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

#### **2.02 TEMPORARY ELECTRICAL POWER AND LIGHTING**

- A. Temporary Electrical Service: The Owner will provide one power supply source in a single location within the building, without charge for use by the contractor. The Contractor shall provide connections and all means of conveying same to required locations and shall pay for any damage to existing systems resulting from misuse thereof. Electrical safety measures, including ground fault protection, waterproof temporary lighting, cords and spider boxes shall be included as part of the work under this contract.
- B. Contractor shall maintain temporary wiring in safe manner and utilize it so as not to constitute a hazard to persons or property.
- C. Temporary Lighting: Contractor shall provide temporary lighting in all work areas. Lighting shall be durable, grounded, and provide safe illumination levels throughout

the work area.

### **2.03 TEMPORARY WATER SERVICE**

- A. Contractor shall provide water for construction purposes and pay costs of water used. Contractor may make temporary connections to existing facilities; if available.
- B. Contractor shall provide hot water adequate to supply each crew with sufficient warm water to allow a thorough shower during worker decontamination.

### **2.04 TEMPORARY SANITARY FACILITIES**

- A. Contractor shall provide and pay for temporary sanitary services for this project. Contractor assumes full responsibility for damage and cleanliness. Temporary toilet facilities shall be in place prior to start of construction.

### **2.05 ACCESS TO SITE**

- A. Contractor shall instruct all vendors, Subcontractors, and employees to enter abatement site from location as indicated by Owner. Use of other entrances shall not be permitted.
- B. Contractor shall ensure only authorized personnel are allowed access into the building.

### **2.06 SECURITY**

- A. Contractor shall ensure gate is locked during all non-working hours.
- B. Contractor shall take adequate precautions against fire, keep flammable material at the absolute minimum and ensure that such material is properly handled and stored. Open flames, fires or gas-fired space heaters are not permitted.

### **2.07 NOISE AND VIBRATION CONTROL**

- A. It is essential that the work be performed in a manner to produce the least interference with adjacent buildings, businesses and properties. Contractor shall use methods and equipment that will keep noise and vibration to a minimum.
- B. At such times as the Owner determines that the work interferes with normal public functions, the Owner shall have the right to request the Contractor to stop the noisy or other work. The Contractor may resume this noisy work at a mutually agreed-upon time or switch to a less noisy method. If the work is stopped, it shall not be used as a claim for additional compensation or contract time.
- C. Contractor shall cooperate with the Owner by informing them in advance of particularly noisy operations, operations causing excessive building vibrations, or other potentially objectionable activities, so that the Owner may warn the staff and schedule work functions accordingly.

## **PART 3 - EXECUTION**

Not applicable.

**END OF SECTION 01 15 00**

**SECTION 01 41 00 - AIR MONITORING REQUIREMENTS**

**PART 1 - GENERAL**

**1.01 AIR MONITORING BY CONTRACTOR**

- A. The Contractor will be responsible for all OR-OSHA compliance monitoring and documentation.

**1.02 AIR MONITORING BY OWNER**

- A. The Owner may retain the services of a third-party consultant to collect and analyze asbestos air samples during the project. Documentation of sample results will be forwarded to the Contractor as appropriate to meet regulatory requirements.
- B. Samples analyzed by Phase Contrast Microscopy will use NIOSH Analytical Method No. 7400. Samples analyzed by Transmission Electron Microscopy will use the AHERA methodology, 40 CFR Part 763 or NIOSH Analytical Method No. 7402.
- C. Owner's Air Sampling During Abatement:
  - 1. Air Sampling Table is to be used as a guide. The Owner's third-party consultant may suggest modifications to the criteria. Modifications to the Maximum Allowable Fiber Count shall be made in writing by the Owner.

| Type of Sample       | Average Samples per 8-hour Work Shift | Sample Volume--L (Liters) | Approximate Flow Rate | Maximum Allowable Fiber Count (f/cc) |
|----------------------|---------------------------------------|---------------------------|-----------------------|--------------------------------------|
| HEPA Fan Exhaust     | 0 or selected units                   | 400-2000 L                | 2 to 10 LPM           | 0.01 f/cc                            |
| Outside of Work Area | 0-5                                   | 400-2000 L                | 2 to 10 LPM           | 0.01 s/cc or <pre-abatement          |
| Clearance PCM        | 1-5/work area                         | 800-3000 L                | 2 to 10 LPM           | 0.01 f/cc                            |
| Clearance TEM        | 1-5/work area                         | 1200-1800 L               | 2 to 10 LPM           | <70 s/mm2 average                    |

- 2. The Owner reserves the right to monitor Contractor's performance via air samples on abatement workers and in the work area in addition to the Contractor's air monitoring.
- 3. Visual inspection and clearance air monitoring services will be provided by

the Owner per work area during regular business hours (7:00 AM – 5:00 PM), or during the contractor work-shift hours. These services shall be conducted off-hours/shift if necessary to accommodate the Owner or in difficult to clear containments that are not the fault of the Contractor, at the Owner's discretion. Contractor may request clearances to be conducted off-hours/shift, and shall be responsible for payment of all overtime fees to the Owner in the form of a credit for all work associated with off-hours/shift work that is conducted at the Contractor's request.

4. Contractor shall provide the Owner with twenty-four (24)-hours notice prior to Visual Inspection and Clearance Air Monitoring.
5. Contractor shall provide a certified supervisor to remain onsite at all times while personnel are inside containment.
6. Contractor shall provide for clean make-up air where necessary to pass air clearances.

### **1.03 QUALITY ASSURANCE**

- A. If, at any time during the work, analysis of an air sample taken by the Owner's third-party consultant indicates a fiber count in excess of the allowable maximums specified, the Industrial Hygienist who analyzed the air sample shall immediately notify:
  1. The Contractor's Supervisor
  2. The Owner's Project Manager
  3. The Owner's Consultant
- B. Immediately upon being notified of fiber count exceeding the specified maximum allowable levels, the Contractor shall perform the following steps in the order presented, at no additional cost to Owner:
  1. Stop abatement work
  2. Discuss the fiber count, potential cause, and other concerns with the Owner. The Owner will determine the actions to be taken by the Contractor at no cost to the Owner.
  3. Modify work procedures, and make other changes determined to be the possible cause of high fiber counts.
  4. Carefully resume work under close air monitoring.
- C. Contractor has the right to run air samples in addition to the Owner's air monitoring at no additional cost to the Owner.

**END OF SECTION 01 41 00**

## **SECTION 02 82 13 – ASBESTOS ABATEMENT**

### **PART 1 GENERAL**

#### **1.1 SCOPE**

- A. This section covers the removal of materials that contain, or are presumed to contain, greater than one percent asbestos.
- B. The contractor shall provide all labor, materials, equipment, services, permits, and insurance required to complete asbestos abatement procedures as indicated in these Specifications and/or the drawings.
- C. Refer to Summary of Work Section 01 11 00 for a complete listing of asbestos-containing materials (ACM) to be abated. Abatement includes selective demolition, asbestos-containing materials, exploratory inspections, protect and save items, and disposal of asbestos and non-asbestos materials as shown and/or described in the general notes, abatement notes, or key notes on the hazardous materials abatement drawings.
- D. The quantities and locations of ACM indicated in the Summary of Work and on the hazardous materials abatement drawings are only best estimates. Accordingly, minor variations of plus or minus 10 percent of the estimated quantities of ACM within the limits of containment for each abatement stage are considered as having no impact on contract price and schedule of this contract. Locations of ACM different than indicated on drawings, but within the limits of the subject building, are considered as having no impact on contract price and schedule of this contract.

#### **1.2 DEFINITIONS**

- A. Abatement: Procedures to control fiber release from asbestos-containing building materials, which include encapsulation, enclosure, removal, repair, and related activities.
- B. Aggressive Sampling: Air sampling method that assures that asbestos fibers remain airborne during sampling. All surfaces inside the work area will be agitated by the liberal use of compressed air, leaf blowers, or similar. Fans will then be run throughout the sampling period to keep all suspended fibers airborne.
- C. AHERA: Asbestos Hazard Emergency Response Act, 40 CFR Part 763.
- D. Air Lock: A system for permitting ingress or egress without permitting air movement between a contaminated area and an uncontaminated area, typically consisting of two curtained doorways at least three feet apart.
- E. Air Monitoring: The process of measuring the asbestos fiber content of a specific volume of air in a stated period of time.
- F. Amended Water: Water containing a surfactant additive.
- G. Asbestos-containing Material (ACM): Any material containing more than one percent asbestos as defined under NESHAPS CFR 40, Part 61, OAR Chapter 340, Division 248, 926.1101, OSHA 29 CFR Part 1926.1101, and LRAPA Title 43.

- H. Authorized Visitor: The owner or designated representative, or a representative of any regulatory or other agency having jurisdiction over the project, and having required training, medical, fit test, etc.
- I. Certified Industrial Hygienist (CIH): An industrial hygienist certified in comprehensive practice by the American Board of Industrial Hygiene.
- J. Construction, Manager/General Contractor (CMGC): A construction delivery method in which the construction manager acts as the general contractor with schedule and cost risk. The CMGC provides design phase assistance in evaluating costs, schedule, and implications of systems and materials during design.
- K. Class I Asbestos Work: Activities involving the removal of TSI and surfacing ACM and PACM.
- L. Class II Asbestos Work: Activities involving the removal of ACM, which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and mastics.
- M. Clean Room: An uncontaminated area or room that is part of the worker decontamination enclosure system, with provisions for storing workers' street clothes and clean protective equipment.
- N. Critical Barrier: Solid barrier constructed from minimum of 2- by 4-inch studs, 16-inch o.c.; 0.5-inch plywood or drywall sealed airtight and covered on both sides (where applicable) with two layers of 6-mil plastic.
- O. Curtained Doorway: A device to allow ingress or egress from one room to another while permitting minimal air movement between the rooms, typically constructed by placing three overlapping sheets of plastic over an existing or temporarily-framed doorway, securing each along the top of the doorway in a pleated fashion and securing one vertical side of each sheet on alternating sides of consecutive sheets. Two curtained doorways spaced a minimum of three feet apart to form an air lock.
- P. Disposal: Procedures necessary to transport and deposit the asbestos-contaminated material in an approved waste disposal site in compliance with the Environmental Protection Agency (EPA) and other applicable regulations.
- Q. Enclosure: Procedures necessary to completely seal all asbestos-containing material behind airtight, impermeable, permanent barriers, including PVC jackets.
- R. Encapsulant (Sealant): A liquid material that can be applied to asbestos-containing material and that controls the possible release of asbestos fibers from the material either by creating a membrane over the surface (bridging encapsulant), or by penetrating the material and binding its components together (penetrating encapsulant).
- S. Environmental Consultant: Environmental consultant specializing in asbestos abatement—PBS Engineering and Environmental LLC, 3500 Chad Drive, Suite 100, Eugene, Oregon, 97408, 541.686.8684—or any subcontractor designated by PBS.



- T. Equipment Room: A contaminated area or room, which is part of the worker decontamination enclosure system, with provisions for storage of contaminated clothing and equipment.
- U. Fitting: With regard to pipe insulation, a fitting is any elbow, offset, reducer, tee, etc.
- V. Fixed Object: Fixtures that are attached to the building or too heavy or bulky to remove from the work area.
- W. Glovebag: A manufactured device consisting of a transparent plastic bag with inward projecting sleeves, an internal tool pouch, provisions for fastening and sealing at the top and sides, and a receptacle in the bottom to hold asbestos waste. The glovebag is installed to surround the material to be removed and contain all fibers released during the process. Glovebags are used to remove insulation from small sections of pipe and fittings.
- X. HEPA Filter: A high efficiency particulate air (absolute) filter capable of trapping and retaining 99.97 percent of asbestos fibers greater than 0.3 microns in length.
- Y. HEPA Vacuum Equipment: High efficiency particulate air (absolute) filtered vacuuming equipment with a filter system capable of collecting and retaining asbestos fibers. Filters of 99.97 percent efficiency for retaining fibers of 0.3 microns in length or larger shall be installed for filtering discharge air.
- Z. Independent Testing Laboratory: A laboratory financially independent from and hired by the owner, architect, or contractor that is either AIHA-accredited for asbestos with demonstrated proficiency via the AIHA PAT program, or has analysts proficient in the AIHA AAR program for air sample analysis.
- AA. Industrial Hygienist: An employee of the Independent Testing Laboratory who is experienced and trained in asbestos sampling and analysis as specified.
- BB. Insulating Cement: Cementitious material applied to pipe reducers, manifolds, etc.
- CC. Isolated Work Area: A totally contained area of the facility where abatement activities are performed.
- DD. Movable Object: Furnishings not attached to the building structure that can be removed from the work area.
- EE. Negative-air Glovebag: A manufactured device consisting of a transparent plastic bag with inward projecting sleeves, an internal tool pouch, provisions for fastening and sealing it at the top and sides, and a receptacle in the bottom to hold asbestos waste. The glovebag is installed to surround the material to be removed and contain all fibers released through the process, with provisions for allowing continuous airflow through the bag while maintaining negative pressure inside.
- FF. Owner Representative: Designated by the Owner, and/or designated employee(s) of the Owner Representative.
- GG. PACM: Presumed asbestos-containing materials.

- HH. Pressure Differential Fan System: An air-purifying fan system located inside or outside the isolated work area that draws air out of the work area through a HEPA filter, keeping static air pressure in the work area lower than in adjacent areas, and preventing escape of contaminated air from work area to adjacent areas.
- II. Public Area: Any area outside the isolated work area. When work area isolation measures are removed, the work area becomes a public area.
- JJ. Removal: All operations where ACM and/or PACM are taken out or stripped from structures or substrates, and include demolition activities.
- KK. Shower Room: A room between the clean room and the equipment room in the worker decontamination enclosure system that is equipped with soap, shampoo, and hot and cold running water controllable at the faucet, and suitably arranged for complete showering during decontamination. The shower room must be separated from the clean room and equipment room by air locks.
- LL. Special Fitting: With regard to pipe insulation, a special fitting is any valve, union, strainer, thermometer, flange, etc.
- MM. Surfactant: A chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.
- NN. Tack Coat: A coat of penetrating encapsulant applied to all surfaces from which asbestos-containing materials have been removed.
- OO. Thermal System Insulation (TSI): ACM applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain.
- PP. Vacuum Loader Removal: Wetting and pneumatic conveying of loose material through a vacuum hose to a sealed collection tank specially equipped to prevent escape of fibers.
- QQ. Wet Cleaning: The process of eliminating asbestos from building surfaces and objects by using cloths, mops, or other cleaning tools that have been dampened with water.
- RR. Worker Decontamination Enclosure System: A showering facility for workers, typically consisting of a clean room, a shower room, and an equipment room. Each of these rooms is separated from the others by air locks. The equipment room is separated from the work area by a curtained doorway. The clean room is separated from the public area by a curtained doorway.
- SS. Worksite Entry Logbook: A logbook kept in the clean room that must be signed by everyone entering or leaving the work area. All pages of the logbook must be the same as the sample page bound into these Specifications.

### **1.3 DOCUMENTS INCORPORATED BY REFERENCE**

- A. The current issue of each document shall govern. Where conflict among requirements or with these Specifications exists, the most stringent requirements shall apply.

1. US Environmental Protection Agency National Emissions Standards for Hazardous Air Pollutants (NESHAPS). (Code of Federal Regulations Title 40, Part 61, Subparts A and M.)
2. US Environmental Protection Agency Office of Toxic Substances Guidance Document, "Guidance for Controlling Friable Asbestos-Containing Materials in Buildings." EPA Report Number 560/5-85-024 ("Purple Book").
3. US Department of Labor Occupational Safety and Health Administration (OSHA):
  - a. Title 29 Code of Federal Regulations Section 1910.1001—General Industry Standard for Asbestos.
  - b. Title 29 Code of Federal Regulations Section 1910.134—General Industry Standard for Respiratory Protection.
  - c. Title 29 Code of Federal Regulations Section 1910 et al.—Occupational Exposure to Asbestos; Final Rule.
  - d. Title 29 Code of Federal Regulations 1926.1101—Construction Standard for Asbestos.
  - e. Title 29 Code of Federal Regulations Section 1910.1020—Access to Employee Exposure and Medical Records.
  - f. Title 29 Code of Federal Regulations Section 1910.1200—Hazard Communication.
4. National Institute for Occupational Safety and Health (NIOSH), 42 CFR, Part 84, Respiratory Protective Devices.
5. American National Standards Institute (ANSI) NY; ANSI Standard Z 88.2-1980 "American National Standards Practice for Respiratory Protection," latest edition.
6. Oregon Administrative Rules Chapter 340, Division 248, Department of Environmental Quality; Chapter 340, Division 33, Licensing and Certification Requirements.
7. Oregon Administrative Rules Chapter 437, Divisions 2 and 3.
8. Oregon Revised Statutes (ORS), Chapters 279C, Certified Asbestos Contractors and Prevailing Wage; 656, Workers Compensation; and 701, Construction Contractors and Contracts.
9. All related electrical work shall be performed in accordance with the National Electrical Code.
10. All local ordinances, regulations, or rules pertaining to asbestos, including its storage, transportation, and disposal.

## 1.4 SUBMITTALS AND NOTICES

- A. Contractors shall submit to the environmental consultant the following information prior to beginning work on the project:
1. **CONTRACTOR'S LICENSE.** Submit proof that the asbestos abatement contractor is currently and for the duration of the project licensed in the state of Oregon to perform asbestos abatement, per ORS Chapter 701, and OAR Chapter 340, Division 248.
  2. **ASBESTOS SUPERVISOR.** Submit the name and resume of the assigned on-site foreman. At minimum, the foreman shall have successfully completed the Department of Environmental Quality (DEQ) asbestos supervisor course as approved by the State of Oregon. Other criteria such as references and similar projects will also be reviewed. At the architect or environmental consultant's request, the contractor shall arrange an oral interview with the assigned on-site foreman. The owner, architect, and the environmental consultant reserve the right to reject the foreman from the work at any time during the project. The contractor shall then assign another on-site foreman for the owner, architect, and environmental consultant's approval as described above.
  3. **INSURANCE CERTIFICATE.** Submit a copy of the certificate of asbestos-specific liability insurance policy.
  4. **WORKER CERTIFICATION.** Submit written proof indicating that all employees impacting asbestos-containing materials are Oregon state certified asbestos workers. Proof shall include photocopies of certificates and a signature from the contractor's principal indicating that all employees assigned to this project have completed such a program.
  5. **RESPIRATOR PROGRAM.** Submit written proof indicating respirator program complies with all parts of OSHA Asbestos Regulations CFR Title 29, Part 1910.134 and 1926.1101, OR-OSHA Chapter 437, 1910.134 and 1926.1101.
  6. **MEDICAL PROGRAM.** Submit written proof medical exam program complies with OSHA Asbestos Regulations CFR Title 29, Section 1926.1101 and OR-OSHA Chapter 437, 1926.1101.
  7. **EMERGENCY PLANS.** Submit a written emergency control and cleanup plan to be followed by the contractor in the event of an accidental breach in containment, power failure, and accidental disturbance of ACMs in non-isolated areas.
  8. **NOTIFICATION.** Submit copy of written notification to DEQ of the proposed asbestos work not fewer than 10 days before work commences on this project. Submit upon receipt any approved amendments to notifications or re-notifications for multi-phase activities.
  9. **DISPOSAL PLAN.** Submit written proof that all required permits and arrangements regarding the transportation and disposal of asbestos-containing or contaminated

materials, supplies, etc. have been obtained. The disposal site must be approved by the EPA and/or DEQ and other responsible agencies.

10. WORK PLAN. Submit a written "work plan" satisfactory to the architect and environmental consultant describing the schedule for asbestos abatement, decontamination procedures, and plans for construction and location of decontamination enclosure systems, pressure differential exhaust fans, etc. in compliance with these Specifications and applicable regulations, including calculations for determining required number of negative-air filtration units. The plan shall schedule the systematic flow of work throughout the facility per Specifications on a day-by-day basis, outlining room-by-room, or area-by-area procedures and planned alternative control measures. The work plan shall include details on how the contractor intends to handle non-friable materials that may be removed outside of negative pressure containments. The contractor shall keep close coordination of his work with the architect and environmental consultant.
  11. AIR MONITORING. Submit information pertaining to the proposed Air Monitoring Program for this project, if appropriate. This information shall include the name(s) of the certified industrial hygienist appointed, the name of the on-site industrial hygiene technician working under his supervision, types of equipment, and sampling schedule, sampling procedures, calibration recordkeeping, and testing laboratory proposed.
  12. PRODUCT INFORMATION. Submit complete product information for any materials and products for which the contractor requests approval for use on this job (other than those specified).
  13. EMERGENCY PHONE NUMBER. Submit a local phone number at which the contractor or on-site foreman can be reached on a 24-hour basis during the course of the work.
- B. Contractor shall not begin work until submittals are reviewed and accepted by architect and the environmental consultant. Allow a ten-day review period.
  - C. During the work, the contractor shall submit the following to the architect and environmental consultant, on a periodic basis as agreed to by the architect, environmental consultant, and contractor:
    1. Waste shipment and disposal documentation.
    2. Air monitoring data.
    3. Notification updates.
  - D. Contractor shall submit to the architect and environmental consultant, in writing, all information required above regarding any new asbestos workers hired by, or subcontracted to, the contractor before these new asbestos abatement workers begin work.
  - E. Prior to removal of decontamination systems and isolation barriers, the contractor shall obtain specific written permission from the environmental consultant.

- F. Prior to making final application for payment the contractor shall:
  - 1. Complete all work under this contract.
  - 2. Submit to the environmental consultant all required submittals, including all waste shipment records completely filled out and signed.
  - 3. Submit to the owner all payroll reports for work on this contract and other information as described elsewhere in the Specifications, if appropriate, under the contract.
  - 4. Submit to the environmental consultant "as-abated" drawings along with a signed affidavit stating that all asbestos-containing materials have been removed as indicated on the drawings.
- G. See other sections of these Specifications, and EPA, OSHA, and other standards referenced therein, for further information and requirements not included above.

### **1.5 BUILDING PROTECTION**

- A. Building Security and Protection
  - 1. The contractor shall post adequate warning signs at all potential entrances to work areas as required by EPA and OSHA.
  - 2. The contractor shall protect all existing fixed equipment, building finishes that are to remain, and existing systems and functions from damage during the abatement process. Extra precautions are to be taken in protecting existing electrical panels, light fixtures, etc. Any damage to existing building, services, and/or equipment shall be remedied by the contractor at their expense.
  - 3. Contractor shall clean external surfaces of contaminated containers and equipment thoroughly by wet sponging and HEPA vacuum.
  - 4. Contractor shall maintain access and use of existing fire lanes.

### **1.6 PERSONAL PROTECTION**

- A. Training
  - 1. Prior to commencement of work, contractor shall ensure all workers have been trained as specified.
  - 2. The contractor shall provide and post, in the clean room(s) and the equipment room(s), the decontamination, respirator, and work procedures to be followed by the workers.
  - 3. For demolition of non-asbestos containing walls and ceilings in areas containing friable asbestos materials, the contractor has the option to train qualified demolition workers. Such training shall be the sole responsibility of the contractor and shall consist of a minimum of eight hours, unless applicable regulatory agencies accept a lesser amount of classroom time. Topics shall include the background of asbestos,

health effects, personnel protection, use of worker decontamination and other topics. Training shall be acceptable to OR-OSHA, DEQ, and other applicable agencies.

B. Personnel Personal Protective Equipment for Asbestos Removal

1. Work clothes shall consist of disposable full-body coveralls and head and foot covers ("Tyvek" or approved), boots, or sneakers. Eye, hearing, fall protection, and hard hats should be available as appropriate.
2. At minimum, respiratory protection shall be approved by National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA); US Department of Labor; US Department of Health, Education, and Welfare; Centers for Disease Control; and as listed below. Respiratory protection shall provide workers with a maximum calculated fiber level inside the mask of 0.01 f/cc.
  - a. Glovebag or modified glovebag: full-face mask, powered air-purifying respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 100.
  - b. Demolition of walls and ceilings that may impact friable asbestos-containing material: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.
  - c. Pre-abatement work in close proximity to friable asbestos-containing materials: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.
  - d. Abatement in isolated areas: full-face mask, powered air-purifying respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 100.
  - e. HEPA vacuuming and wet cleaning of surfaces: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.
  - f. Vinyl asbestos floor tile removal: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.
  - g. Handling of double-bagged asbestos-contaminated waste: half-face mask, negative-pressure respirator with disposable HEPA filter cartridges (magenta/purple color code). Protection factor: 10.
3. Additional respiratory protection shall be as required by CFR 29 1910.134 and 1926.1101, OR-OSHA Chapter 437, 1910.134 and 1926.1101.
4. As part of the Contractor's Respiratory Protection Program, all workers shall be provided with a selection of brands and sizes of respirators to choose from. At a minimum, all workers shall be qualitatively fit-tested at the time of respirator selection per OR-OSHA Worker's Compensation Department Rule 22-069 (4)(e)(5)(i), and semiannually thereafter.



5. Contractor shall supply replacement filter cartridges, as required. Cartridges that have become wet or clogged shall be replaced immediately.

C. Worker Decontamination Enclosure System

1. The contractor shall construct a personnel decontamination facility immediately outside of the isolated work area consisting of three chambers and two air locks as follows:
  - a. The equipment room shall consist of an air lock to the shower room, and a curtained doorway to the work area.
  - b. The shower room shall have two air locks, one to the equipment room and one to the clean room. All showers shall have hot and cold water controllable at the taps and installed in this room. The contractor shall supply and maintain soap, shampoo, and towels at all times in the shower area. Shower wastewater shall be filtered to remove all fibers larger than five microns, or as required by local regulations, before disposal in the municipal sewer system, or shall be collected and disposed of as asbestos-contaminated material. Permits shall be obtained and all water discharge regulations complied with, as required by local municipalities. Water filters shall be disposed of as asbestos-contaminated material.
  - c. The clean room shall consist of an air lock to the shower room and a curtained doorway to the adjacent building area. The clean room shall contain a first aid kit, a place to sit down, the Worksite Entry Logbook, and storage for workers' and visitors' clothing and shoes. Work, respirator, and decontamination procedures; regulations; and prevailing wage rates shall be conspicuously posted. There shall be a supply of clean, protective clothing, and respirators and cartridges in the clean room at all times.
  - d. A monometer measuring pressure differential within and outside the containment shall be installed and remain operable on any containment from the start of abatement work until work is complete, and satisfactory clearance results are obtained. Air pressure within the containment shall remain at or below -0.02 inches of water (compared to ambient air pressure) throughout.
2. Contractor shall not begin asbestos abatement work unless this system is functional, in good repair, and has been found acceptable for specification compliance by the environmental consultant.

D. Personnel Protection Procedures in Isolated Work Areas

1. Each worker shall, upon entering the jobsite, remove street clothes in the clean change room, put on and fit-test their respirator, put on clean protective clothing, and sign in on the Worksite Entry Logbook before entering the equipment room or the work area.
2. Workers shall, each time they leave the work area, remove gross contamination from clothing before leaving the work area; proceed to the equipment room and remove



and dispose of disposable work clothes; remove and store shoes, boots, and other equipment except respirators; still wearing the respirator, proceed to the showers and clean the outside of the respirator with soap and water while showering; remove the respirator; thoroughly shampoo and wash themselves; remove filters, dispose of filters in the container provided for that purpose, and wash and rinse the inside of the respirator.

3. Following showering and drying off, each worker shall proceed directly to the clean change room and dress in clean clothes at the end of each day's work or before eating, smoking, or drinking. Before reentering the work area from the clean change room, each worker shall put on his respirator with clean filters, dress in clean protective clothing, and sign in on the Worksite Entry Logbook.
4. Contaminated work footwear and other equipment shall be stored in the equipment room when not in use in the work area. Upon completion of asbestos abatement, footwear shall be disposed of as contaminated waste or cleaned thoroughly inside and out, using soap and water, before removing from work area.
5. Workers shall not eat, drink, or chew gum at the worksite except in the established clean room. Smoking or using other tobacco products is prohibited.
6. Workers shall be fully protected with respirators and protective clothing immediately prior to the first disturbance of asbestos-containing or contaminated material and until final cleanup is completed.

E. Access to Isolated Work Area by Others

1. Except for emergency personnel, the contractor shall limit access to the work area to authorized visitors.
2. The contractor shall provide protective clothing, respirators, and equipment for all authorized visitors, as specified above.
3. All authorized visitors shall be subject to the personnel protection provisions specified above, and shall sign in and out on the Worksite Entry Logbook.

F. Personal Protection during Work in Non-Isolated Work Areas:

1. Work clothes per Section 1.06 B.
2. Respiratory protection per Section 1.06 B.
3. Worker protection procedures will differ from Section 1.06 D, in that two layers of coveralls shall be worn after removal of street clothes. Worker decontamination through a Worker decontamination enclosure is required. The first layer of coveralls must be removed when exiting the glovebag work area. The worker shall immediately proceed to the worker decontamination unit. The remaining requirements of Section 1.06 D still apply.
4. Contractor shall submit to the architect and environmental consultant for approval an emergency control and cleanup plan to be followed in the event of asbestos

contamination during glovebag use. Contractor shall ensure all workers are thoroughly familiar with approved plan.

5. Contractor shall promptly remove all bags as they are used to the bag-holding and decontamination enclosure system.

G. Emergency Precautions

1. The contractor shall establish emergency and fire exits from the work area. Contractor shall ensure these exits are well marked and remain unobstructed.
2. The contractor shall be prepared to administer first aid to injured personnel after decontamination. Seriously injured personnel shall be treated immediately or evacuated without delay for decontamination.
3. Contractor shall notify the local fire department of the asbestos abatement project prior to beginning work area preparation.

### **1.7 SAFETY**

With regard to the work of this contract, the safety of the contractor's employees, the owner's employees, and the public is the sole responsibility of the contractor.

### **1.8 LIABILITY**

The contractor is an independent contractor and not an employee of the owner, architect, or the environmental consultant. The owner, architect, and environmental consultant shall have no liability to the contractor, or any third persons, for contractor's failure to faithfully perform and follow the provisions of these Specifications and the requirements of the governing agencies. Notwithstanding the failure of the owner, architect, or the environmental consultant to discover a violation by the contractor of any of the provisions of these Specifications, or to require the contractor to fully perform and follow any of them, shall not constitute a waiver of any of the requirements of these Specifications, which shall remain fully binding upon the contractor.

### **1.9 DELIVERY**

Contractor shall deliver all materials to the worksite in the original packages, containers or bundles bearing the name of the manufacturer and the brand name.

### **1.10 STORAGE**

Contractor shall store all materials subject to damage off the ground, away from wet or damp surfaces, away from heat sources, and under cover sufficient to prevent damage, contamination, or fire.

### **1.11 PROTECTION**

Damaged or deteriorating materials shall not be used and shall be removed from the premises by the contractor. Materials that become contaminated with asbestos shall be disposed of in accordance with the applicable regulations by the contractor.

### **1.12 SUBCONTRACTORS**

Any subcontractors employed by the contractor shall be bound to all the work and safety standards specified elsewhere in this Specification. Subcontractor's personnel shall be fully trained and supervised by the contractor during performance of this work.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- A. Plastic Sheet: Plastic sheet shall be flame-retardant polyethylene material sized in lengths and widths to minimize the frequency of joints. The minimum thickness shall be 6-mil.
- B. Plastic Bags: Plastic bags shall be 6-mil polyethylene printed with warning labels per OSHA and EPA regulations.
- C. Tape: Tape shall be capable of sealing joints of adjacent sheets of plastic; attaching plastic sheet to finished or unfinished surfaces of dissimilar materials; and adhering under dry and wet conditions, including use of amended water. Minimum of 2-inch-wide tape must be used.
- D. Disposal Containers: Disposal containers shall be suitable to receive and retain any asbestos-containing or contaminated materials until disposal at an approved site. The containers shall be labeled in accordance with OSHA and EPA regulations. Containers must be both airtight and watertight, and have hard top, bottom, and sides.
- E. Warning Labels and Signs: Warning labels and signs shall be posted as required by State and Federal regulations.
- F. Amended Water: Clean potable water containing a surfactant additive. The surfactant additive shall be 50 percent polyoxyethylene ether and 50 percent polyethylene ester, or equivalent, and shall be mixed with water at a concentration of one ounce surfactant to five gallons of water, or as recommended by the manufacturer in the case of an equivalent.
- G. Encapsulants (Sealants): Encapsulants shall be of the bridging or penetrating variety and shall be listed as "satisfactory" by the EPA. Encapsulants shall provide a suitable substrate bonding agent for application of new material where appropriate. Penetrating Encapsulant: No. 207 Special Sealer #33775-27A as manufactured by Makus-Cincinnati, Inc.; "Asbestop 30B-2" as manufactured by Asbesco Corp.; "Cable Coating 22-P" as manufactured by American Coatings Corp., or approved. Bridging Encapsulant: Decadex Firecheck, manufacturer's standard color "Magnolia," as manufactured by Pentagon Plastics, Inc.; "Cable Coating 2-B," manufacturer's standard color gray, as manufactured by American Coatings Corp.; or approved.
- H. Rewettable Lagging Cloth: Twelve ounce glass fabric lagging cloth saturated with dried lagging adhesive. "Dip-Lag" as manufactured by Claremont Co. or approved.
- I. Enclosure: Protective plastic jacketing systems, framed gypsum board enclosures, suspended ceilings or other materials as specified elsewhere.
- J. Other Materials: Provide all other materials such as lumber, nails, and hardware, which may be required to construct and dismantle the decontamination area, and the barriers that isolate the work area, and as required to complete the work, as specified.

### **2.2 TOOLS AND EQUIPMENT**

- A. Water Sprayer: The water sprayer shall be an airless or other low-pressure sprayer for amended water application.
- B. Air-Purifying Equipment: Air-purifying equipment shall consist of high-efficiency particulate air (HEPA) filtration systems. No air movement system or air equipment shall discharge asbestos fibers outside the work area. Each unit shall be capable of variable volume from a minimum of 500 cubic feet per minute (CFM) to at least 1700 CFM under load and shall have at least two stages of pre-filtration ahead of the HEPA final filter. Each unit shall be overload protected, and equipped with an elapsed time indicator (hour meter), static pressure gauge with low flow alarm, and heat and smoke sensors that visually and audibly warn workers and shut unit fan down within 30 seconds. The units shall be: Micro-Trap Portable Air Filtration System manufactured by Asbestos Control Technology, Inc., "HOG 2000" Negative-air Protection System manufactured by Control Resource Systems, or approved.
- C. Pressure Differential Monitoring Equipment: A combination sensing, alarm, and recording device shall be in operation at all times during use of the HEPA air-purifying equipment. The unit shall be a "Neg-A-Master," manufactured by Control Resource Systems, Inc., or approved.
- D. Water-purifying Equipment: Water-purifying equipment shall be capable of removing all fibers longer than five microns, or as required by local regulations, from water used in abatement work and decontamination showers. Control Resource Systems, Inc. "AQUA-HOG" or approved.
- E. Airless Sprayer: An airless sprayer, suitable for application of penetrating encapsulant material, shall be used.
- F. Vacuum Equipment: All vacuum equipment used in the work area shall be High-efficiency Particulate Air (HEPA) equipment, and suitable for wet/dry usage.
- G. Scaffolding: Scaffolding, as required to accomplish the specified work, shall meet all applicable safety regulations. All special scaffolding shall have drawings and calculations stamped and signed by a civil or structural engineer registered in the state of Oregon.
- H. Transportation Equipment: Transportation equipment, as required, shall be suitable for loading, temporary storage, transit, and unloading of contaminated waste without exposure to persons or property. Equipment shall have a hard top, bottom, and sides. If equipment is rented, notify rental agency in advance, in writing, of intended use of equipment.
- I. Electrical: Electrical tools, equipment, and lighting shall meet all applicable codes and regulations. Ground fault protection as required by OSHA, shall be in effect at all times. Contractor shall take all additional precautions and measures necessary to ensure a safe working environment during wet removal.
- J. Glovebags: Bags shall be clean poly bags seamless at the bottom, with pre-printed asbestos warning labels, 6-mil PVC with attached TYVEK arms, and latex gloves. Bags shall

be Profo' Bag manufactured by Asbestos Control Technology, Inc., or Asbest'O'Saf/SAC by Control Resource Systems, Inc., or approved.

- K. Remote Filter Housing: Stainless steel housing shall have pre-filters and HEPA filter sealed to cabinet flanges by Century Equipment "Advance Guard II" or approved equal.
- L. Other Tools and Equipment: Other suitable tools shall be provided for the removal, enclosure, encapsulation, patching, and disposal activities including, but not limited to, hand-held scrapers, wire brushes, sponges, and rounded-edge shovels.

## EXECUTION

### 3.1 FULL ISOLATION WORK AREA PREPARATION

- A. Contractor shall perform the following isolation procedures in the order in which they are presented. Any alternative control measures considered for Class I/II work shall be performed in accordance with 29 CFR 1926.1101.
1. Shut down, remove filters, and isolate HVAC systems to prevent contamination and fiber dispersal. Coordinate with building users and Owner prior to shutdown.
  2. Coordinate all electrical, safety, and other service connections, requirements and equipment with the Owner. Use a journeyman electrician at a minimum. It is the contractor's responsibility to verify operation of systems that will be shut off during abatement. If any system is found to be defective or not operating satisfactorily, the contractor shall notify the Owner or environmental consultant in writing prior to shutoff.
  3. Install critical barriers as follows: seal off all openings including, but not limited to, doorways, windows, and other penetrations of the work area with solid critical barriers except openings left for HEPA air-purification system, which shall be properly HEPA-filtered. Where doors exist, sealing may be done by closing door, sealing with tape on both sides, and then covering both sides with two layers of plastic sheeting.
  4. Pre-clean movable objects, such as furniture and equipment to be removed (and carpeting), within the proposed work areas using HEPA-filtered vacuum equipment and/or wet cleaning methods as appropriate, and remove such objects from work areas to a temporary location, or consolidate such objects away from removal work and enclose with critical barriers.
  5. Pre-clean fixed objects within the proposed work areas using HEPA-filtered vacuum equipment and/or wet cleaning methods as appropriate, and enclose with critical barriers. Equipment that must continue operating shall be enclosed and ventilated to avoid damage.
  6. Set up the worker decontamination enclosure system (decon). Once this system is installed and abatement commences, it shall be used in the specified manner for the ingress and egress of all personnel and equipment, except in emergency situations. All personnel shall sign the Worksite Entry Logbook each time they pass in or out of the decontamination enclosure.
  7. Install HEPA air-purifying equipment pressure differential fan system so as to ensure lower static pressure in the isolated work area than in surrounding areas, a flow of air through all parts of the isolated work area towards the air-purifying equipment, and minimum air contamination levels at abatement worker breathing zones. Discharge from air-purifying equipment shall be ducted outside the building. Use one or more units of capacity as recommended by the manufacturer for the volume of the isolated work area, but in no case shall airflow be less than six air changes every 60

minutes with a minimum pressure differential of 0.02 inches wg between the work area and the decon clean room.

8. Cover floor and wall surfaces with plastic sheeting sealed with tape. Cover floors first so that plastic extends at least 12 inches up on walls, then cover walls with plastic sheeting to overlap floor plastic by a minimum of 24 inches, thus overlapping the horizontal floor material by a minimum of 12 inches. Install additional layer of plastic sheeting on floor and walls in similar manner. Contractor may use mechanical fastening techniques, such as tack strips, as necessary to secure wall plastic sheeting. Contractor shall repair any damage resulting from mechanical fasteners.
  9. Maintain emergency and fire exits from the work areas, or establish alternative exits satisfactory to the local building or fire department officials. Ensure that all exits remain unobstructed and well marked.
  10. Adequate portable fire extinguishing equipment shall be maintained within work area as defined by OSHA and/or local fire department officials.
- B. No asbestos abatement work shall occur unless the work area isolation has been found acceptable for Specification compliance by the environmental consultant.
- C. Isolated work area enclosure system maintenance. The contractor shall be responsible for daily documentation of the following:
1. Prior to the first use, and at the beginning of each shift during abatement work, containments shall be given a complete visual inspection by the contractor's shift foreman and industrial hygienist. Inspection shall include the HEPA air-purification system and associated filters. A smoke tube test by the shift foreman shall then be made of the worker decontamination enclosure system and other critical areas to verify that the isolated area is under negative air pressure. Work shall not begin until all defects have been repaired.
  2. Periodic inspections shall be made, as required, during each shift to assure continued proper functioning of the containment and HEPA system.

### **3.2 NON-ISOLATED WORK AREA PREPARATION**

- A. Contractor shall perform the following procedures in the order in which they are presented and describe procedures for glovebag work and other work in non-isolated work areas. Any alternative control measures considered for Class II work shall be performed in accordance with 29 CFR 1926.1101.
1. Shut down heating, ventilation, and air conditioning (HVAC) systems. Coordinate with building users and the Owner prior to shutdown.
  2. Restrict access to work area and post warning signs. Do not perform glovebag work or any abatement work in an occupied area.
  3. Completely pre-clean entire work area using HEPA vacuum equipment or wet cleaning methods.



4. Set up the worker decontamination enclosure system. Once this system is installed and abatement commences, it shall be used in the specified manner for the ingress and egress of all personnel, except in emergency situations. All personnel shall sign the Worksite Entry Logbook each time they pass in or out of the decontamination enclosure.
  5. At the direction of the environmental consultant, install HEPA exhaust fan in work area. Duct fan intake to immediate area of work in such a manner that any fibers released will be drawn away from the worker and into intake duct.
  6. Cover floor and other surfaces below work area with 6-mil plastic sheeting. Seal openings and install curtained doorways and air locks as directed by the environmental consultant.
  7. Have emergency cleanup equipment and supplies, including HEPA vacuum, amended water, disposal bags, mop, buckets, towels, and sponges on hand prior to start of abatement work.
- B. No asbestos abatement work shall occur unless the work area has been found acceptable for Specification compliance by the environmental consultant or industrial hygiene technician.

### **3.3 REMOVAL OF ASBESTOS-CONTAINING MATERIALS IN FULL ISOLATION WORK AREAS**

- A. Contractor shall isolate work area as specified.
- B. Contractor shall remove all asbestos-containing pipe insulation, surfacing material, and other asbestos-containing materials as defined in the project-specific scope of work.
  1. Contractor shall spray the asbestos material with amended water. A fine spray of this solution shall be applied to prevent fiber disturbance preceding the removal of the asbestos material. The asbestos shall be sufficiently saturated to prevent emission of airborne fibers in excess of specified fiber levels.
  2. Contractor shall remove asbestos material while damp and pack it in sealable plastic bags (6-mil minimum thickness). Bags shall be moved to bag load out facility or equipment room in the worker decontamination system. Outside surface shall be washed and placed inside a second plastic bag (6-mil minimum thickness) bearing appropriate warning label, name of waste generator, and location from which waste was generated.
  3. After completion of stripping work, contractor shall clean all surfaces from which asbestos has been removed by brushing and/or wet sponging or cleaning by an equivalent method to remove all visible material. During this work the surfaces being cleaned shall be kept wet. Avoid using wire brushes if possible.
  4. Contractor shall collect all water used in the removal and cleaning process and dispose of as contaminated waste or filter to remove all fibers more than five microns in length before disposal in the municipal sewer system, or as required by local regulations. Water filters shall be disposed of as asbestos-contaminated material.

- C. If noted on the abatement drawings, some areas of asbestos-containing flooring mastic shall be removed using grinding methods such that all residual mastic including staining shall be removed. Care shall be taken to minimize damage, chips, cracks, etc. to the subfloor.
- D. Grinding of mastic containing <1% asbestos shall be performed using full isolation methods.
- E. Removal of non-friable materials, such as floor tiles, shall be accomplished by such manner as to minimize breakage and maintain non-friability. Do not drop, throw, saw, or scrape non-friable materials during removal, handling, or disposal. The use of spud bars to remove floor tiles is an acceptable practice.
- F. All wooden subfloor associated with asbestos-containing mastic shall be wholly removed and disposed of as asbestos waste in accordance with section 3.9, Disposal.
- G. Contractor shall maintain a safe and uncluttered work area, worker decontamination system, and bag load out facility on a daily basis.

### **3.4 REMOVAL OF ASBESTOS-CONTAINING MATERIALS IN NON-ISOLATED AREAS**

- A. Contractor shall apply spray coat of amended water to material to be removed; material shall be kept damp during entire removal process.
- B. Glovebag work shall be as follows. All removal using the glovebag method shall be performed strictly according to regulations, manufacturer's printed instructions, and as demonstrated by the manufacturer's representative or as further specified in this section. Workers are not to smoke or wear hand or wrist jewelry while using glovebags.
  - 1. Contractor shall coordinate the shutoff of all sources of heat to objects to be worked on. Do no work on objects above 150 degrees Fahrenheit (°F).
  - 2. Contractor shall install port for hose of HEPA vacuum to create reduced pressure inside glovebag. Installing of fresh air intake and/or bridging to prevent collapse of bag are acceptable. Reduced pressure shall be maintained throughout entire abatement procedure.
  - 3. During the removal phase, contractor shall use amended water to reduce potential for airborne fibers.
  - 4. After completion of insulation removal and cleaning, but prior to removal of glovebag, contractor shall apply a single "tack" coat of penetrating encapsulant to surface of pipe and any remaining non-asbestos insulation, within the glovebag.
  - 5. After the pipe has been sealed, but prior to removal of glovebag, contractor shall thoroughly wash the upper chamber of the glovebag and seal the contents of the bag in the lower chamber.
  - 6. Contractor shall seal flap if used and, using a HEPA vacuum, remove all contaminated air in the upper chamber.

7. Contractor shall follow procedures set forth in these specifications in case of a spill or if air analysis indicates a fiber count in excess of limits.
  8. Contractor shall promptly double-bag the glovebag after removal is complete, place it into a sealed container, and remove to the bag holding enclosure.
  9. Contractor shall cover ends of remaining existing insulation with rewettable lagging cloth. Lagging cloth shall be extended a minimum of 6 inches back along existing insulation.
- C. Wrap and cut method shall be as follows: at intervals determined by the Contractor, glovebag-remove 2 to 3 feet of asbestos-containing pipe insulation as specified. Seal remaining pipe, with asbestos-containing pipe insulation intact, in two separate layers of 6-mil plastic sheeting. Cut pipe wrap sections at ends taking care to not damage adjacent wrapped or unwrapped insulated sections. Label double-wrapped pipe as specified for disposal. Obtain approval of landfill prior to utilizing this method. Dispose as contaminated waste in accordance with Specifications and approved landfill requirements.
- D. Sinks with asbestos-containing undercoatings shall be removed whole with the undercoating to remain intact and in non-friable condition. Sinks shall be wrapped or bagged in two layers of 6mm, labeled, transported, and disposed of as specified in the Disposal section.
- E. Door, window, and vent caulking shall be removed using the following methods:
1. Caulking shall be removed in a non-friable state. Caulking that is determined to be friable or which is rendered friable during the abatement process shall be removed using either containment or glovebag methods.
  2. The contractor is to utilize wet methods during removal and packaging for disposal.
  3. The contractor is to utilize a heat gun if at any time the caulking has the potential to become friable during removal.
  4. The contractor is to have HEPA vacuums available and shall use them during removal.
  5. The use of abrasive or mechanical methods to remove the caulking is prohibited.
  6. Burning or blistering of the caulk with excessive heat by the heat gun is prohibited.
  7. All asbestos-containing caulk and building components with residual asbestos caulk shall be disposed of as asbestos-containing waste as specified in the Disposal section.
- F. Window glazing compound shall be removed whole and intact with the attached window units. If intact removal is not possible, or if glazing compound is already in friable condition, this compound shall be removed within containment. Glazing and any attached building materials shall be double wrapped in 6-mil plastic sheeting and labeled, transported, and disposed of as specified in the Disposal section.

- G. Removal of cement asbestos board and similar material such as laboratory countertops shall be as follows: material shall be removed one sheet or piece at a time. If any breakage, abrasion, or other disturbance of the material is to occur, the material shall be kept continuously wet. Cut or remove fasteners one at a time while running a HEPA vacuum at the point where work is being done to collect all dislodged particles and fibers.
  - 1. When all fasteners have been removed, carefully remove entire sheet or piece and wrap in 6-mil plastic sheeting while still wet. Do not drop, throw, break, saw, or scrape cement asbestos board during removal, handling, or disposal.
  - 2. Label, transport, and dispose of wrapped sheets as specified in the section 3.9.
  - 3. Clean entire substrate with HEPA vacuum or wet cleaning methods and leave ready for application of replacement material.

### 3.5 CLEANUP IN FULL ISOLATION WORK AREAS

- A. At the conclusion of removal in the isolated work area, conduct cleanup in the sequence described below. Windows, doors, HVAC vents, etc. shall remain sealed and HEPA-filtered pressure differential fan systems shall remain in service.
  - 1. REMOVE MATERIAL AND EQUIPMENT. Contractor shall remove visible accumulations of material and debris (including filters removed from HVAC equipment and HEPA air-purification equipment). Contractor shall include all sealed containers and equipment used in the work area in the cleanup, and remove them from work area after decontamination of outer surfaces.
  - 2. FIRST CLEAN. Contractor shall clean all surfaces in the work area and any other contaminated areas with water and/or with HEPA-filtered vacuum equipment.
  - 3. WAIT 24 HOURS. After the first cleaning of the work area, wait 24 hours to allow for settlement of dust. During this settling period, no entry to the work area shall be allowed.
  - 4. SECOND CLEAN. Wet-clean or clean with HEPA-filtered vacuum equipment all surfaces in the work area. After completion of the second cleaning operation, perform a complete visual inspection of the work area to ensure that the work area is free of visible debris.
  - 5. VISUAL INSPECTION. Prior to application of post-removal encapsulant, contact the environmental consultant for a visual observation of the work area. The work area shall be free of visible debris. Observation by the consultant does not alleviate the contractor of responsibility to provide work in compliance with Specifications. Contractor shall contact environmental consultant at least 24 hours prior to desired inspection time.
  - 6. REMOVE PLASTIC SHEETING. After visual observation by the consultant, contractor shall apply a coat of approved encapsulant to all surfaces in the work area where asbestos has been removed and to disposable plastic sheeting as a post-removal encapsulant. Encapsulant application shall follow all applicable manufacturer's

recommendations and shall provide a compatible bonding agent for application of new material.

7. FINAL CLEAN. After the encapsulation is complete, the contractor shall remove all noncritical plastic and clean all floors, walls, fixtures, and other surfaces within the work area with only critical barriers in place using wet methods or HEPA-filtered vacuum equipment. Plastic sheeting over carpets may remain in place.
8. CONTACT ENVIRONMENTAL CONSULTANT. Contact the environmental consultant for a visual observation of the work area. The work area shall be free of visible debris. Observation by the consultant does not alleviate the contractor of responsibility to provide work in compliance with Specifications. Contractor shall contact environmental consultant at least 24 hours prior to desired inspection time. Consultant shall conduct final air monitoring as specified after work area has been allowed sufficient time to dry.
9. TEARDOWN. When the final observation by the environmental consultant and air sampling test results are satisfactory, the contractor shall then remove the decontamination systems and remaining barriers.
10. DISPOSAL. Contractor shall properly dispose of all waste materials. All polyethylene material, tape, cleaning material, and contaminated clothing shall be double-bagged, sealed, and labeled as described above for asbestos waste material.

### 3.6 CLEANUP IN NON-ISOLATED WORK AREAS

- A. Cleanup shall be performed following completion of non-isolated work including but not limited to glovebag and wrap-and-cut methods. All dust and debris shall be cleaned regardless of whether or not these materials have been shown to contain asbestos.
- B. FIRST CLEAN. Contractor shall remove visible accumulations of asbestos material and debris. All surfaces shall be cleaned within the affected work area. Cleaning shall be with amended water and/or HEPA-filtered vacuum equipment. In a large open area, the affected work area shall include the immediate work area and an area that encompasses at least 6 feet in all directions or as defined by the environmental consultant. In small work areas, the affected work area shall include the entire room.
- C. AFFECTED AREA. The affected work area may be further defined in the scope of work by the environmental consultant. During the work, high fiber levels, as indicated by air monitoring results, may increase the area to be cleaned. The increase in the affected area due to high fiber levels or other indications of fiber dispersal will be defined by the environmental consultant, and the contractor shall bear all costs of additional cleaning.
- D. VISUAL INSPECTION. After completion of the cleaning operation, the environmental consultant shall perform a visual observation of the affected work area to ensure that the affected work area is free of visible dust and debris. Observation by the consultant does not alleviate the contractor of responsibility to provide work in compliance with Specifications. Contractor shall contact environmental consultant at least 24 hours prior to desired inspection time.

- E. ENCAPSULANT. After visual observation by the environmental consultant, contractor shall spray-apply encapsulant to the material substrate, all temporary plastic sheeting, and other temporary protective materials.
- F. CLEARANCE SAMPLING. Post-abatement air sampling shall be at the discretion of the Environmental Consultant and will be determined by the ongoing sample results.
- G. TEARDOWN. When the final observation by the environmental consultant and air sampling test results (if required) are satisfactory, the temporary plastic sheeting and other temporary protective materials shall be removed by the contractor.
- H. DISPOSAL. Contractor shall properly dispose of all waste materials, all polyethylene material, tape, and cleaning material, and contaminated clothing shall be double-bagged, sealed, and labeled as described for asbestos waste material.

### 3.7 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS

- A. When cleanup is complete, contractor shall:
  - 1. Relocate objects moved to temporary locations in the course of the work to their former positions. Coordinate with the Owner.
  - 2. Clean, repair and/or repaint all surfaces soiled, discolored, or damaged by removal of tape, adhesive, or other work of this contract to match existing surfaces. The contractor shall bear all costs associated with damage incurred during the abatement, which includes, but is not limited to, perimeter plaster walls, wall murals, windows, and mullions
  - 3. If the contractor uses caulking to seal cracks in concrete floor, the caulking must be removed to architect's satisfaction at completion of project.
  - 4. Return mechanical, electrical, and other systems shut down by the contractor to complete and functional operation.
  - 5. Re-secure objects removed in the course of work in their former positions, including air dampers in plenums, and adjust for proper operation.
  - 6. Clean, repair and/or repaint all surfaces soiled, discolored, or damaged by removal of tape, adhesive, or other work of this contract to match adjacent surfaces.

### 3.8 DISPOSAL

- A. Contractor shall affix warning labels having waterproof print and permanent adhesive to the lid and sides of all containers. Warning labels shall be conspicuous and legible, and contain the following words:

**DANGER**  
**CONTAINS ASBESTOS FIBERS**  
**AVOID CREATING DUST**  
**CANCER AND LUNG DISEASE HAZARD**  
**AVOID BREATHING AIRBORNE ASBESTOS FIBERS**

- B. The contractor shall determine current waste handling, transportation, and disposal regulations for the work site and for each waste disposal landfill. The contractor must comply with these regulations and all US Department of Transportation, DEQ, and EPA requirements. Double-bagged material in containers shall be delivered to the pre-designated disposal site for burial. Labels and all necessary signs shall be in accordance with DEQ and OSHA standards.
- C. Contractor shall remove decontaminated containers from the site as soon as possible. Notify disposal site in advance of delivery of material to assure immediate burial of containers.
- D. If the bags are broken or damaged, or the container is contaminated, the contractor shall clean and decontaminate the entire container for reuse.
- E. Contractor shall submit three copies of written proof of disposal at approved disposal site to the environmental consultant prior to completion of the abatement work specified in this section. Use copies of the DEQ Waste Shipment Record ASN-4, completely filled out and signed, and accompanied by tickets and/or receipts from disposal site if disposed in an approved Oregon landfill.

**END OF SECTION 02 82 13**

## **SECTION 02 82 13.23 – Non-Friable Asbestos-Containing Roofing**

### **PART 1 GENERAL**

#### **1.1 SCOPE OF WORK**

- A. This section covers removal of non-friable asbestos roofing materials as determined by the owner's consultant, such as built-up roofing, cement asbestos board (transite), or asphalt shingles.
- B. The removal of asbestos-containing roofing materials may be performed by a non-asbestos-abatement contractor if the materials are and remain in non-friable condition and remain largely intact throughout removal process and the following work practices are followed. If materials are or become friable, the work shall immediately be stopped and the environmental consultant shall determine next steps.
- C. The contractor shall verify that planned removal methods are within State of Oregon Occupational Safety and Health Administration (OSHA), Department of Environmental Quality (DEQ) guidelines for maintaining exempt status of this material.
- D. Testing performed by the owner shall not alleviate the contractor from any responsibility for complying with OSHA, and DEQ rules. The owner or its environmental consultant cannot be held liable for any citations of non-compliance or injury as a result of the work.
- E. Roofing materials contained within the building structure shall not be addressed by this section. Such materials shall be handled by the asbestos abatement contractor in accordance with asbestos abatement specifications.
- F. All penetrations into the built-up roof membrane that contain asbestos are to be performed using properly trained personnel.

#### **1.2 RELATED WORK**

- A. Not Used
- B. Not Used

#### **1.3 REFERENCED STANDARDS TO BE INCORPORATED INTO THIS SECTION**

- A. Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1926.1101 Occupational Exposure to Asbestos, Construction Industry Standard.
- B. Johnson Roofing Company, Inc. March 15, 1995. OSHA Agreement #94-41039.
- C. Environmental Protection Agency National Emissions Standards for Hazardous Air Pollutants. CFR Title 40, Part 61, Subparts A and M.
- D. State of Oregon DEQ. How to Remove Nonfriable Asbestos-Containing Petroleum-Based Roofing Materials (updated March 2014).
- E. Department of Transportation Regulations 49 CFR 171 and 172.



- F. State of Oregon DEQ. Oregon Administrative Rule 340, Division 248. Asbestos Requirements.
- G. State of Oregon DEQ. How to Remove Nonfriable Cement Asbestos Materials (updated March 31, 2014).
- H. State of Oregon DEQ. How to Remove Nonfriable Asbestos Containing Petroleum-Based Roofing Materials (updated March 31, 2014).

#### **1.4 ASBESTOS RELATED PROCEDURES**

- A. At minimum, removal of intact, non-friable asbestos-containing built-up roofing is to be performed in compliance with OSHA 1926.1101, the Johnson Roofing Company, Inc./OSHA Agreement #94-41039 March 15, 1995.
- B. The following procedure shall be followed at a minimum:
  - 1. Provide a competent person on the job site at all times during roof removal. The competent person is defined in the Johnson Roofing Co., Inc. Assoc./OSHA Agreement #94-41039 March 15, 1995.
  - 2. The competent person shall determine the following:
    - a. Whether the material is intact or non-intact
    - b. That appropriate work practices for removal of roofing are utilized
    - c. That all workers engaged in the removal are properly trained
    - d. That air monitoring is performed
  - 3. The contractor is to follow all procedures according to OSHA 1926.1101 and the OSHA Agreement #94-41039 March 15, 1995.
  - 4. The contractor is responsible for DEQ notifications and associated fees.

#### **1.5 REMOVAL PROCEDURES FOR ASBESTOS-CONTAINING NON-FRIABLE PETROLEUM-BASED ROOFING MATERIALS**

- A. Porous materials, such as plywood sheathing, which are impacted with asbestos-containing tars, mastics, or other similar materials shall be wholly removed and disposed of as asbestos-containing waste.
- B. Roofing shall be removed in an intact state to the extent feasible.
- C. Wet methods shall be used to remove roofing materials that are not intact, or that will be rendered not intact during removal, unless such wet methods are not feasible or will create safety hazards.
- D. Cutting machines shall be continuously misted during use, unless a competent person determines that misting substantially decreases worker safety.
- E. All dust that results from using a power roof cutter to remove built-up roofs shall be collected by a HEPA dust collector, or HEPA-vacuumed along the cut line, or gently swept

and the remaining still-wet dust and debris carefully and completely wiped up along the cut line. The dust and debris shall be immediately bagged or placed in covered containers.

- F. Roof material that has been removed from a roof shall not be dropped or thrown to the ground. Unless the material is carried or passed to the ground by hand, it shall be lowered to the ground via a covered, dust-tight chute, crane, or hoist.
- G. Any areas of asbestos-containing roofing material that is not intact shall be lowered to the ground as soon as practicable, but in any event, no later than the end of the work shift. While the material remains on the roof, it shall be kept wet, placed in an impermeable water bag, or wrapped in plastic sheeting.
- H. Upon being lowered, unwrapped material shall be transferred to a closed receptacle in such a manner so as to preclude the dispersion of dust.
- I. Roof level heating and ventilation air intake sources shall be isolated and the ventilation system shut down during demolition and roof-system installation.

#### **1.6 DISPOSAL OF ASBESTOS-CONTAINING ROOFING MATERIAL**

- A. The contractor is required to notify the landfill operator of proposed disposal materials, confirming that the asbestos-containing roofing materials are acceptable at that landfill.
- B. The contractor shall confirm which method of disposal is required and perform transportation, packaging, and disposal accordingly.
- C. The contractor shall provide to the owner a signed, written confirmation from the landfill operator.
- D. The contractor shall provide the appropriate manifest, signed by the contractor and the landfill operator, to the owner within 10 days of the time the material left the site.

**END OF SECTION 02 82 13.23**