Designation: E 1368 – 02

An American National Standard

Standard Practice for Visual Inspection of Asbestos Abatement Projects[1]

This standard is issued under the fixed designation E 1368; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers procedures for performing visual inspections of asbestos response actions to:

1.1.1 Establish the extent of the required work before it begins;

1.1.2 Determine the progress and quality of the work and evaluate the completeness of the response action; and

1.1.3 Evaluate the cleanliness of the work area prior to final air testing for clearance (if performed), and subsequent to dismantling of critical barriers.

1.2 This practice can be used on an abatement project, or for operations and maintenance (O&M) work, performed by the building owner's staff. It can also be used in conjunction with contract documents between the building owner and other parties involved in an abatement project.

NOTE 1—Standard contract documents (such as AIA and EJCDC documents) define contractual relationships and responsibilities for projects within the construction industry. Asbestos abatement projects differ from traditional construction projects in the manner of their design and execution, as well as in the type and level of oversight required to substantiate their successful completion. Non-traditional responsibilities are given to the building owner, project designer, and abatement contractor by this practice. Furthermore, responsibilities related to project oversight, inspections, and approvals are placed upon an additional non-traditional representative of the building owner; the project inspector, as defined by this practice. All parties are cautioned that the subject authorities and corresponding responsibilities be understood, mutually agreed upon, and correspondingly addressed with appropriate modifications, if necessary, to the contract documents for a specific project.

1.3 This practice provides the following information:

1.3.1 The objectives of the visual inspection process;

1.3.2 The responsibilities and qualifications of the individuals involved in the visual inspections;

1.3.3 The schedule of visual inspection activities during an abatement project and O&M work;

1.3.4 The inspection procedures for the various types of abatement work and O&M tasks; and

1.3.5 The criteria for certifying work as complete on the basis of the visual inspections.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* For specific safety statements, see 12.2.

2. Referenced Documents

2.1 *ASTM Standards:*

E 631 Terminology of Building Constructions[2]

E 736 Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members[2]

E 1494 Practice for Encapsulants for Spray-or-Trowel-Applied Friable Asbestos-Containing Building Materials[2]

2.2 *Other Documents:*

EPA 560/5-85-024 Guidance for Controlling Asbestos-Containing Materials in Buildings[3]

EPA 20T-2003 Managing Asbestos in Place: A Building Owner's Guide to Operations and Maintenance Programs for Asbestos-Containing Materials[3]

40 CFR Part 61 National Emission Standards for Hazardous Air Pollutants: Subpart M—Asbestos[3]

40 CFR Part 763 Asbestos-Containing Materials in Schools and Model Accreditation Plan (EPA AHERA Regulations)[3]

29 CFR 1910.1001 Occupational Exposure to Asbestos (OSHA General Industry Standard)[3]

29 CFR 1915.1001 Occupational Exposure to Asbestos (OSHA Shipyard Standard)[3]

29 CFR 1926.1101 Occupational Exposure to Asbestos (OSHA Construction Standard)[3]

Guidance Manual: Asbestos Operations and Maintenance Work Practices[4]

Asbestos Abatement and Management in Buildings: Model Guide Specification[4]

3. Terminology

3.1 *Definitions*—For definitions of building terms, see Terminology E 631.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *asbestos-containing materials*—material containing

[1] This practice is under the jurisdiction of ASTM Committee E06 on Performance of Building Constructionsand is the direct responsibility of Subcommittee E06.24 on Building Preservation and Rehabilitation Technology.

Current edition approved July 10, 2002. Published October 2002. Originally published as E 1368 – 90. Last previous edition E 1368 – 00.

[2] *Annual Book of ASTM Standards*, Vol 04.11.

[3] Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

[4] Available from National Institute of Building Sciences, Washington, DC.

more than one percent asbestos.

3.2.1.1 *surfacing material*, *n*—material that is sprayed, troweled-on or otherwise applied to interior and exterior structural and architectural sufaces. Surfacing material includes acoustical plaster on ceilings, fireproofing on structural members, textured paint and exterior stucco, and other materials applied to surfaces for acoustical, decorative, fireproofing and other purposes.

3.2.1.2 *thermal system insulation*, *n*—material which is applied to interior and exterior mechanical components to reduce heat gain or loss. Thermal system insulation includes insulation on pipes, fittings, boilers, breeching, tanks, ducts and other mechanical components.

3.2.1.3 *miscellaneous materials*, *n*—material, other than surfacing material and thermal system insulation, on interior and exterior structural, mechanical, electrical, or architectural components and surfaces. Miscellaneous material includes but is not limited to ceiling tiles, gaskets, floor coverings and mastics, wallboard joint compound, roofing materials and cementitious products.

3.2.2 *building asbestos survey*, *n*—an activity to determine the presence, location or condition of asbestos-containing materials in a building.

3.2.3 *clean room*, *n*—an uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.

3.2.4 *competent person*, *n*—one who is capable of identifying existing asbestos hazards in the workplace and who has the authority to take prompt corrective measures to eliminate them.

3.2.5 *contract documents*, *n*—the specifications, drawings, terms and conditions, general provisions, and other components of the agreement between the building owner and the contractor.

3.2.6 *crawl space*, *n*—an accessible area that may have a dirt floor, usually with low head room.

3.2.7 *critical barriers*, *n*—one or more layers of rigidly-supported plastic sheeting sealed over all openings into an asbestos work area (with the exception of make-up air provisions and means of entry and exit), designed to prevent airborne asbestos fibers or asbestos-contaiminated water from migrating to an adjacent area.

3.2.8 *decontamination area*, *n*—an enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the decontamination of workers, materials, and equipment contaminated with asbestos.

3.2.9 *dust and debris*, *n*—visible particles, fragments, or chunks of material, large enough to have settled in the work area by virtue of their weight, that are presumed to have originated from the material abated by the response action, or from a fiber release episode.

3.2.10 *encapsulant*, *n*—for friable asbestos-containing materials, a material that surrounds or embeds asbestos fibers in an adhesive matrix to prevent release of fibers.

3.2.10.1 *bridging encapsulant*, *n*—an encapsulant that forms a discrete layer on the surface of an in-situ asbestos matrix.

3.2.10.2 *penetrating encapsulant*, *n*—an encapsulant that is absorbed by an in-situ asbestos matrix without leaving a discrete surface layer.

3.2.11 *enclosure*, *n*—(*1*) a rigid, air-tight barrier constructed around an asbestos-covered component or structural element to protect the asbestos material from impact and to contain any release of asbestos fibers. (*2*) a space, within which asbestos abatement operations are performed, whose limits are defined by rigid or non-rigid barriers for the purpose of controlling access and limiting fiber escape.

3.2.12 *fiber release episode*, *n*—uncontrolled or unintentional disturbance of asbestos-containing materials which results in the generation of dust and debris.

3.2.13 *friable material*, *n*—material easily crumbled or powdered by moderate (hand) pressure.

3.2.14 *glovebag*, *n*—a nominally 6-mil minimum thickness transparent polyethylene or poly(vinyl chloride) plastic bag with inward projecting longsleeve gloves, designed to enclose an object from which an asbestos-containing material is to be removed.

3.2.15 *high efficiency particulate air (HEPA) filter*, *n*—the final stage filter on a negative pressure ventilation device (see 3.2.20) or on a vacuum cleaner.

3.2.16 *industrial hygienist*, *n*—a professional trained in the health and physical sciences who is qualified to recognize, evaluate, and monitor potential occupational and environmental exposures to hazardous materials, and to formulate measures for their control.

3.2.17 *inspector*, *n*—the building owner's representative who performs inspections, tests, and duties before, during, and at the conclusion of an abatement project or O&M task as prescribed by this practice.

3.2.18 *load-out area*, *n*—a structure attached to, but not within, the abatement area into which containers of removed material are passed and stored for subsequent transfer to a truck for disposal.

3.2.19 *mini-enclosure*, *n*—an enclosure as defined in 3.2.11 (*2*), consisting of a change room and work room (no shower), that is large enough for one or two workers, is under negative pressure by a HEPA-filtered exhaust device, and is used for a relatively short period of time.

3.2.20 *negative pressure*, *n*—slightly reduced pressure within the work area, relative to the space outside the work area, to prevent leakage of contaminated air from the work area.

3.2.21 *pre-bid conference*, *n*—a meeting held at the job site to discuss and clarify contract requirements and allow prospective bidders to view the work.

3.2.22 *regulated area*, *n*—an area established by the employer to demarcate areas where airborne concentrations of asbestos exceed or can reasonably be expected to exceed the permissible exposure limit.

3.2.23 *residue*, *n*—visible material which remains on the abated surface due to incomplete removal and cleaning.

3.2.24 *response action*, *n*—a method of abatement (such as removal, encapsulation, or enclosure) or operations and maintenance (such as repair, clean-up, or preventive measures) of asbestos-containing material in any form, for any purpose whatsoever.

3.2.25 *sealer*, *n*—material applied to a pipe or substrate after completion of the final cleaning operation to bond unremoved fiber residue to the pipe or substrate, that is compatible with intended retrofit requirements and operating temperature conditions.

3.2.26 *testing laboratory*, *n*—a laboratory that determines (*1*) airborne fiber concentrations from air sample filters, and (*2*) the amount and type of asbestos in bulk samples.

3.2.27 *unremoved material*, *n*—any material which was required to be removed by a response action but remains substantially undisturbed.

3.2.28 *visual inspection process*, *n*—the activities before, during, and at the conclusion of a response action that are associated with detecting the presence of visible residue, dust and debris, or unremoved material and verifying the absence thereof at the completion of a response action.

4. Summary of Practice

4.1 Visual inspection of asbestos abatement projects is an important process in determining whether the work has been acceptably performed. The inspector must be involved throughout the entire process, the success of which depends on the cooperation of all participants.

4.1.1 The visual inspection process begins at the earliest stages of planning and continues through completion of the work.

4.1.2 The fundamental criterion for completeness of removal and clean-up is the absence of visible residue, dust and debris, and unremoved material. General refinements of this criterion are set forth in this practice, and the visual inspection procedures and criteria applicable to a specific project must be clearly stated in the contract documents.

4.1.3 Protective measures, including critical barriers and enclosures, decontamination chambers, protective clothing, and respirators, must remain in effect until visual inspection is completed and final air testing for clearance meets the provisions in the specification.

4.2 Visual inspection of O&M work is an important process in determining whether the work has been acceptably performed. Visual inspection of O&M work is critical in the absence of other controls for fiber release, such as negative pressure, particularly if air testing for clearance will not be performed.

4.3 Visual inspection is only one component of a complex set of procedures involved in asbestos abatement or O&M work. Consultation of reference materials and publications, including the *ASTM Manual on Asbestos Control*,[5] is suggested for orientation to the broader aspects of asbestos control.

5. Significance and Use

5.1 This practice applies to response actions for all types of asbestos-containing materials, including surfacing materials, thermal systems insulation, and miscellaneous materials, whether friable or not, regardless of the quantities involved and the reason for conducting the response action.

5.1.1 Abatement for the purpose of removing asbestos-containing materials or encapsulating or enclosing them, regardless of the engineering controls and work practices used, requires performance of visual inspections as described in this practice.

5.1.2 Operations and maintenance activities, such as removal, encapsulation or enclosure of asbestos-containing materials incidental to repair or replacement of a component, clean-up of debris from a fiber release episode, or other preventive measures, require the performance of visual inspections as described in this practice. See EPA 20T-2003 and *Guidance Manual: Asbestos Operations and Maintenance Work Practices.*

5.1.3 This practice applies to response actions performed under a contract from the building owner, as well as to work performed by the building owner's staff.

5.2 The specific objectives of the visual inspection process before, during, and at the conclusion of an asbestos abatement project are: to review the extent of asbestos-containing material (ACM) within the scope of work, to monitor performance of the work, and to verify if visible residue, dust or debris, or unremoved material are absent at the completion of removal and clean-up activities.

5.2.1 The visual inspection process is used to evaluate all four aspects of an asbestos abatement project as follows:

5.2.1.1 *Extent of ACM within Scope of Work*— The building survey which is intended to locate and quantify asbestos-containing materials is not properly called a "visual inspection" within the context of this practice. To define the extent of ACM involved, a building survey is a necessary prelude to the first step of the visual inspection process. The building survey, which may use other building records, is intended to locate and assess the condition of ACM with confirmation by laboratory analysis of bulk samples. Additional surveys may be required during project design to find ACM in locations not entered or accessible during the initial building survey. The extent of the ACM to be abated must be known in order to properly design the abatement project. See 40 CFR Part 61.

5.2.1.2 *Project Work Performance*—Observation of work activities throughout the abatement project confirms acceptable work performance and aids the visual inspection for completeness of removal of ACM from the surfaces and components and for completeness of cleanup of the work area. Careful examination of the work area may be required at the start of the project for debris that may have been generated after the building surveys and project design.

5.2.1.3 *Completeness of Abatement*—The presence of residue, visible without the use of magnifying devices, on surfaces and components from which asbestos has been removed indicates that additional cleaning of these surfaces is required. All ACM required to be removed by the contract documents must be gone in order to pass the inspection for completeness of removal. Similarly, the presence of improperly encapsulated or insufficiently enclosed material indicates that these measures, if used for abatement or as an adjunct thereto, were inadequately performed and corrective action shall be taken.

5.2.1.4 *Completeness of Clean-up*—The presence of dust or debris on surfaces in areas where abatement has taken place

[5] *ASTM Manual on Asbestos Control: Removal, Management, and the Visual Inspection Process*, Manual No. 23, ASTM, West Conshohocken, PA, November 1995.

indicates that these areas were not properly cleaned following the abatement. Final air samples for clearance and re-occupancy shall not be taken until the visual inspection for completeness of clean-up is passed.

5.2.2 Visual inspection is not a substitute for air monitoring at any stage of the work and is particularly not a substitute for final air testing for building re-occupancy following an asbestos abatement project. The basic premise of this practice is that a surface, component, or work area where residue, dust or debris, or unremoved material, visible without the use of magnifying devices, is still present is not sufficiently clean for subsequent stages of work. Any residue, dust, or debris found during the inspections is assumed to contain asbestos, and the surfaces, components, and area must be re-cleaned before proceeding further.

5.2.3 Passing the visual inspections for completeness of abatement and clean-up improves the chances, but does not guarantee, that the area will pass final air testing for clearance.

5.3 Visual inspection is an important means of determining acceptable completion of operations and maintenance work. The objectives of the visual inspection process as it applies to O&M work are similar to those for abatement projects with specific procedures and acceptance criteria that recognize the following aspects of O&M activities:

5.3.1 Operations and maintenance work is generally briefer than abatement projects, involves less ACM, and is consequently referred to as “small-scale, short-duration” in Appendix B to 40 CFR Part 763 (EPA AHERA regulations). Permissible quantities and operations may vary according to applicable regulations and are not specified in this practice.

5.3.2 Operations and maintenance work often lacks such protective measures as negative pressure and decontamination facilities that provide protection to workers and building occupants during abatement projects.

6. Qualifications

6.1 The following credentials are evidence of the ability to perform the visual inspections as described in this practice:

6.1.1 Credentials that indicate knowledge of building design include the following:

6.1.1.1 Experience in building design, construction, or operations,

6.1.1.2 Classroom training as an AHERA-accredited inspector or project designer, and

6.1.1.3 Academic degree(s), licensure or registration as an architect or engineer, or both.

6.1.2 Credentials that indicate knowledge of building construction and operations include the following:

6.1.2.1 Field experience in building construction, renovation, demolition, or maintenance, or combination thereof,

6.1.2.2 Classroom training as an AHERA-accredited project designer or supervisor, and

6.1.2.3 Formal or on-the-job training in construction technology or management, with particular emphasis on communications with construction supervisors and workers.

6.1.3 Credentials that indicate familiarity or expertise in asbestos abatement and O&M techniques include the following:

6.1.3.1 Training as an AHERA-accredited supervisor or project designer, or completing an O&M training course,

6.1.3.2 Field experience in asbestos abatement project surveillance, provided that such experience includes inspections as described in this practice and is not limited to air monitoring, and

6.1.3.3 Academic degree(s) or certification in industrial hygiene, or both, with experience that includes inspections as described in this practice and is not limited to air monitoring.

6.1.4 Credentials that indicate familiarity or expertise with suspected ACM and its substrates include training as an AHERA-accredited inspector and field experience in performing asbestos building surveys.

6.2 Accreditation as an AHERA asbestos inspector is a desirable credential. However, neither this practice nor the EPA Model Accreditation Plan requires accreditation to perform visual inspections for completion of response actions.

6.3 Completion of the ASTM Technical and Professional Training course *Standards for Asbestos Control* may be accepted as evidence of appropriate training to perform visual inspections, but does not substitute for asbestos abatement project field experience.

6.4 Completion of a project monitor course as described in the EPA Model Accreditation Plan may be accepted as evidence of appropriate training to perform visual inspections, but does not substitute for asbestos abatement project field experience.

6.5 Performing visual inspections involves physical activity and requires visual acuity. The absence of physical and vision limitations that might compromise the inspection may be considered a prerequisite for performing the duties of the inspector.

7. Responsibilities of Abatement Project Participants

7.1 During an abatement project the participants include the building owner, the owner’s representative(s) and the abatement contractor. Their responsibilities vary and are detailed below.

7.2 *Building Owner*:

7.2.1 The building owner who is responsible for an asbestos abatement project large enough to involve a contract for the service will often hire an experienced and competent consultant, such as an architect, construction engineer, or industrial hygienist, to act as the owner’s representative.

7.2.2 The responsibilities of the consultant retained by the building owner shall be mutually agreed upon and shall include the items in 7.3.

7.2.3 If the building owner is directly monitoring the work of the abatement contractor, the building owner is responsible for performing the visual inspection or ensuring that the visual inspection is performed by others in accordance with the contract documents. If a consultant is retained to prepare the contract documents and enforce their implementation, the consultant is responsible, even though he may have delegated the visual inspection functions to others.

7.2.4 If anyone other than the building owner has the authority to stop the contractor from removing asbestos-containing material and require the contractor to correct violations of the specification or regulations, this must be clearly stated in the contract documents. The building owner

retains the final responsibility for accepting the performance of the work done by the contractor and all others employed on the project.

7.3 *Owner's Representative(s)*—The owner may have various people helping him complete an abatement project, and this section discusses three of them: the consultant, project designer, and inspector.

7.3.1 At the beginning of the project, the project designer will prepare contract documents, based on a thorough survey of the building (usually assisted by an industrial hygienist or testing laboratory) to establish the presence and condition of asbestos-containing materials. The documents should include the procedures for the visual inspections and the degree of cleanliness required as each stage of work is completed and at the conclusion of the project.

7.3.2 During the project, an experienced individual will perform the visual inspections, identify corrective actions needed, and certify when abatement is complete and acceptable visual cleanliness has been achieved. The building owner, or the consultant he has retained for assistance in managing an abatement project, may hire this individual.

7.3.3 The inspector, as this person is called herein, may be an industrial hygienist, testing laboratory employee, or other individual experienced in asbestos abatement. For small-scale operations, the visual inspections may be performed by a foreman or supervisor.

7.3.4 The inspector assists the project designer in defining inspection methods and criteria in the contract documents, preferably through the involvement in the building survey. The inspector should also, if necessary, collect and analyze representative debris or contaminated soil samples from a crawl space that is part of an abatement project.

7.3.4.1 The inspector should know the testing methods for the encapsulant used, if the project is to involve encapsulation of asbestos-containing materials.

7.3.4.2 The inspector may have other duties on the project related to air monitoring and project surveillance. For example, as part of prework visual inspections, the industrial hygienist may take air samples to establish background levels of airborne fiber counts in all areas slated for asbestos abatement.

7.3.5 The inspector must be familiar with the parts of the contract documents for which he is responsible, including:

7.3.5.1 The locations and types of asbestos to the abated and the correct methods to properly carry out the type of abatement involved,

7.3.5.2 The work area isolation methods to control debris accumulation and air sampling procedures to verify their effectiveness,

7.3.5.3 The visual inspection procedures, the techniques for performing them properly, and the schedule of their performance, and

7.3.5.4 The definition of *clean* in the contract specifications or procedure.

7.3.6 The inspector must be timely with the inspection and analyses (if the inspector is taking air samples) to expedite the abatement work. The inspector must be available to report to the job within a reasonable time after notification and must perform the inspection quickly and efficiently without sacrificing thoroughness. To do this, the inspector must have all of his equipment available and in proper working order at the job site when it is needed.

7.3.7 The inspector must report work practices not in accordance with the contract documents, citing the applicable page and paragraph number of the document, and also any potential violations of federal and state regulations.

7.3.8 The inspector is also responsible for regularly advising the building owner or his representative of work progress and of any schedule changes, work problems, or other information obtained from visual inspections.

7.4 *Abatement Contractor*:

7.4.1 Unless the building owner is performing the abatement project with his own personnel, an abatement contractor will have been selected for the work.

7.4.2 The abatement contractor has a responsibility contractually to the building owner, and also a responsibility to protect his contractual rights by the following:

7.4.2.1 Performing an inspection immediately prior to beginning work to identify and document any existing contamination or other changes in site conditions. During this inspection, the contractor should be accompanied by the building owner and consultant, or by the inspector.

7.4.2.2 Performing his own visual inspections of each phase of work, to ensure that the work area is, in fact, ready for inspection by the owner's representative.

7.4.2.3 Assisting the inspector during the inspection and subsequently correcting problems found.

7.4.3 The contractor's competent person (3.2.4), usually a foreman or supervisor, must work closely with the inspector and notify the inspector in a timely manner when an area is ready for inspection. Sufficient time must be provided for cleanup of areas that do not pass the final visual inspection, for resolution of unexpected or difficult situations, and for subsequent reinspection, if required.

7.4.4 The contractor must provide the inspector with all resources required by the contract documents that are not normally considered the inspector's "tools of the trade." These resources may include ladders or scaffolds, mechanical scissor lifts, adequate lighting, electrical power, and personnel protection and decontamination provisions. If contractor personnel are to assist with the inspection or to perform concurrent cleaning during the inspection, these personnel and the necessary supplies must be available at the time of inspection.

7.4.5 Ultimately, the caliber of the work performance and the quality of the completed project are the sole responsibility of the contractor, who warrants and guarantees that the finished project fulfills the requirements of the contract documents.

8. Visual Inspection Schedule, Procedures and Acceptance Criteria for Abatement Projects

8.1 This section provides a generalized schedule for conducting visual inspections and discusses the various tasks associated with each phase. The inspector should use the acceptance criteria in this section to determine if abatement work has been satisfactorily completed. The standards of performance to which an abatement contractor will be held must be explicitly stated in the contract documents.

8.2 *Inspection Prior to the Project*:

8.2.1 *Preliminary Work Area Survey*—The project designer should determine the location and condition of asbestos-containing materials in a building, in order that a complete and accurate abatement plan, including contract documents, can be written.

8.2.2 *During Preparation of the Contract Document*—The inspector should accompany the building owner on a preliminary inspection of the work site to define the limits of the area in which the asbestos hazard is to be abated. Identify areas difficult to access, places with loose debris, and unique or problematic situations. Identify existing contamination from previous activities at this time and agree on appropriate action. If encapsulants are to be used, test several on small areas according to Practice E 1494 to choose the most effective and to determine post-abatement test methods. This process establishes the depth to which a penetrating encapsulant will be absorbed, and the thickness of the film formed by a bridging encapsulant. If a crawl space is present, inspect the area and take samples of debris and contaminated soil. The procedures for determining the extent to which the crawl space must be free of asbestos at the completion of abatement must be fully and explicitly described.

8.2.2.1 The contract documents should stipulate all procedures and performance measures to which the contractor will be expected to conform, the criteria for visual cleanliness that will be used to judge the quality of work, and a clear description of the methods to be used for inspection. At this time, decide which items are to be removed from the work area by the owner's personnel before the project begins, and which items are to be cleaned and removed by the contractor.

8.2.2.2 Clearly state the sequence of cleanup activities and visual inspections in the contract documents. It is particularly important to specify the inspections that will be performed before the removal of plastic sheets, decontamination areas, or any isolation barriers that separate work areas from occupied parts of the building.

8.2.3 *During the Pre-Bid Conference*—The inspector should attend the pre-bid conference and project walk-through to address questions from bidders on the inspection criteria in the contract documents.

8.2.4 *During the Pre-Construction Activities*—The building owner and inspector should walk through the work area with the contractor immediately before abatement activities begin, in order to verify the current building conditions and changes since the pre-bid conference.

8.3 *Inspection During the Project*:

8.3.1 The inspector must carry out inspections during the project to confirm that the means and methods of abatement conform to specified procedures. On a large asbestos abatement project, it is likely that work will proceed in phases through several areas. Consider each location isolated from another as an independent area, and inspect it as work is completed. Visual inspection activities must keep pace with the work progress and sequence so that the work in one area does not risk contaminating areas still undergoing preparation, or areas that have already been cleaned, inspected, and released.

8.3.2 *Inspections During Abatement*:

8.3.2.1 Barriers of plastic sheeting plywood or equivalent materials should isolate the regulated areas, and should be left in place and intact throughout the work period. Closely inspect tears in the plastic floor covering prior to their being mended to see if any debris or water has leaked through to the surface below, particularly if carpeting is underneath. The integrity of the decontamination areas for personnel and equipment must be maintained throughout the work.

8.3.2.2 If the abatement project involves removal, the removed material and contaminated water must not be allowed to accumulate inside the regulated area, but must be bagged or otherwise collected in water-tight containers as soon as practicable. Monitor the perimeter of the regulated area from inside and outside the isolation barriers. If the duct tape sealing the plastic sheeting is allowed to become wet, it may loosen and allow contaminated water and debris to run under the barriers to areas outside the regulated area. Similarly, the decontamination area must be kept strictly clean of any visible dust or debris.

8.3.2.3 Review air monitoring data on a regular basis to measure the effectiveness of barrier integrity. The correlation between any observed debris inside a work area and the airborne fiber counts provides an indication of proper wet removal performance. Air samples collected in the decontamination area and load-out area are effective management tools for enforcing the cleanliness provisions for these spaces and complement the visual inspection effort.

8.3.2.4 Negative pressure ventilation devices should be in continual operations in a regulated area throughout the period of abatement work. Record the readings on negative pressure monitoring devices on a regular or continuous basis for comparison to the required pressure differential.

8.4 *Inspection at the Conclusion of the Project*:

8.4.1 *Inspections for Completeness of Abatement*:

8.4.1.1 Enter all spaces where asbestos abatement was performed in order to inspect the work at close range. Get close enough to touch the surface from which asbestos-containing materials were removed, or on which other abatement operations were performed. This may require the use of a ladder or scaffold to reach elevated locations, or entering areas of restricted mobility, such as pipe chases and manholes.

8.4.1.2 The contractor's competent person should always accompany the inspector on any visual inspection. A worker equipped with cleaning materials and a HEPA-filtered vacuum must be present to wet-clean and vacuum the surfaces whenever residue or debris is found. Unless a thorough job of removal and cleaning has been done, this approach can be very time-consuming and inadvertently results in the inspector supervising the final cleaning operation. If the inspector recognizes that this situation is occurring, he should terminate the inspection and direct (or advise) a recleaning of the entire area before repeating the inspection. For small scale, short-duration operations, a final cleaning may be included as a part of the final inspection.

8.4.2 *Completeness of Removal*—Thorough inspection for the presence of unremoved material and residue is essential, and the techniques to be used should be described in detail in the contract documents. Removal implies that all asbestos-containing material has been removed from the surfaces and

components. All areas must be subjected to close scrutiny, and no surfaces or components in the work area should be assumed to be clean.

8.4.2.1 Inspect the work area to determine that no visible unremoved material or residue is present in even minute amounts on the surfaces or components from which asbestos-containing material was supposed to have been removed.

(1) Where the asbestos-containing material had similar appearance to the substrate, even gross removal cannot be satisfactorily determined at a distance of more than a few feet. Touch the substrate to identify small amounts of remaining residue, and deliberately disturb the abated surfaces to release any residue.

(2) The visibility of airborne residue thus released by brushing or wiping the surface in question can be greatly enhanced by using a strong, narrow-beamed flashlight. To use the flashlight effectively, hold it close and parallel to the abated surface to highlight fine adherent debris; thus viewed, small particles can cast long shadows. Minimize the room light temporarily to increase the effectiveness of inspecting a work area in this fashion, and to highlight the contrast of particles on different textures and colors of substrates.

(3) In addition to highlighting and releasing residue to enhance its visibility, the inspector may concentrate dust by wiping a clean cloth or glove across a surface to collect evidence of residue. Also, the inspector may use a filter cassette and sampling pump as a small vacuum cleaner to collect visible residue as evidence of unremoved material.

NOTE 2—The purpose of wiping or vacuuming the surface is not to collect residue for analysis, but to establish its presence and evaluate completion of removal.

8.4.2.2 Pay special attention to areas that are difficult to reach or see to find unremoved material and residue. Use a small screwdriver or other sharp, pointed tool for poking into such places as the spaces between steel beams and the roof or ceiling frames (if left in place), or air duct flanges. Give special care to elbows, valves, and tees on mechanical systems, as insulation usually adheres to these fittings more tightly and becomes trapped in their crevices more readily than on the straight runs of pipe.

8.4.2.3 If unremoved material or residue is found during the visual inspection, recleaning and reinspection are mandatory until all residue has been removed. Any residue that absolutely cannot be removed must be securely adhered to the substrate so that it may not be rendered airborne during aggressive air sampling or by any conceivable future building operations, renovations, maintenance, or demolition of the building.

8.4.2.4 The application of a sealer should not be allowed until after all abated surfaces have passed by visual inspection for completion of removal. Conduct another inspection after the sealer has dried to confirm that all surfaces have been completely covered. Insufficiently sealed residue can often be dislodged from a pipe by shaking it. If a “removal encapsulant” (a liquid combining a wetting agent and adhesive) is used, inspect before the encapsulant dries so that excessive amounts of residue can still be removed.

8.4.2.5 The sealer must be readily visible against the pipe or substrate so that complete coverage of the surface is apparent to the inspector and subsequent occupants of the space. Any tinting agents added to enhance visibility of the sealer must not compromise its compatibility with retrofit materials.

8.4.2.6 If the scope of the project does not require the complete removal of asbestos from the building, and if the remaining asbestos is accessible from the removal area, inspect the perimeter of the enclosure carefully to determine the fiber release potential for this material. Sprayed materials (fire proofing and acoustical treatments) should be treated with an encapsulant specified in the construction documents, or sealed behind a rigid, permanent barrier. Pipe insulation that crosses the enclosure perimeter should be removed to a joint or fitting and the exposed ends sealed to prevent fiber release.

8.4.2.7 This inspection should occur prior to clearance sampling and should be performed with all the seals on windows, doors, and vents intact and the isolation barriers separating the work area from the adjacent areas in place. If the final air samples are not acceptable, as defined in the contract documents, another visual inspection must be made after recleaning by the contractor.

8.4.3 *Completeness of Encapsulation*:

8.4.3.1 Visually inspect the surface at a distance of 1 to 2 ft. (0.3 to 0.6 m), to evaluate the uniformity of encapsulation. Verify the amount of encapsulant used over the surface area and depth of penetration to determine mathematically if the total amount applied was in compliance with the manufacturer’s instructions. Test the surface by brushing it with the hand or by compressing it, to determine the rigidity or resilience of the encapsulated material and to detect the release of any untreated material. If any release of material occurs upon brushing, or if the encapsulated surface is easily damaged by pressing or rubbing with a finger, reject the encapsulation as inadequate.

8.4.3.2 If a penetrating encapsulant has been used, take core samples to determine if the encapsulant has penetrated to the depth established in pre-abatement testing (see 8.2.2) for acceptable application. Coloring the encapsulant aids in determining the depth of penetration, especially if several applications (with different colors for each application) are made and if the coloring agent added to the encapsulant does not affect its efficiency. The coloring agent should be selected for high contrast with the substrate color.

(1) Inspect the application of a penetrating encapsulant thoroughly after the proper drying or curing time. Obtain a core sample of the encapsulated material to establish that the required depth of penetration as determined in preabatement testing has been achieved (see 8.2.2). Collect core samples in at least one location per thousand square feet (93 m^2) of each encapsulated material, or a minimum of three randomly distributed samples across the surface of the material, if the total area is less than 3000 $ft.^2$(279 m^2). Collect additional samples where there is any question of adequate penetration or sealing.

(2) Evaluate each core sample according to Annex A2 of Practice E 1494 to determine the depth of penetration for a penetrating encapsulant.

8.4.3.3 If a bridging encapsulant is used, measure the thickness of the resulting film at several different sites and compare the thickness to the requirement in the contract

documents as confirmed during preabatement testing (see 8.2.2). Remove plugs of the encapsulated material at representative locations to measure the thickness of the surface film, and reseal the penetrations to prevent fiber release.

8.4.3.4 The effectiveness of an encapsulation abatement can also be evaluated for cohesiveness and adhesiveness in accordance with Test Method E 736. Glue a jar lid, with a cup hook attached, onto a suspect sample of the encapsulated surfaces and suspend weights from the cup hook. A cured material should be able to withstand the weight specified in the contract documents or manufacturer's specification, and the encapsulated material should separate from the substrate as a solid core without peeling, flaking, or otherwise disintegrating into debris. See also Practice E 1494.

8.4.3.5 If penetrating encapsulants do not reach the depth required in the specification, if particles are easily removed from the matrix of the encapsulated core, or if the film thickness specified in the contract documents is not achieved with a bridging encapsulant, the encapsulation abatement should not be considered satisfactory and re-application (if possible on an already cured surface) is required. If reapplication is not feasible, then removal of the incompletely encapsulated material is required.

8.4.3.6 Inspect the work area for dust and debris in accordance with 8.4.5 before final air tests are taken. If the air tests indicate a fiber concentration inside the work area below specification limits, the critical barriers can be dismantled and the area returned to service.

8.4.4 *Completeness of Enclosure*—When used as an abatement technique, enclosure refers to a permanent, rigid structure or structural element installed to protect asbestos-containing material from damage and to prevent fiber release to areas outside the enclosure. The enclosure should bear warning labels that asbestos-containing materials are contained within and that the integrity of the enclosure must not be compromised.

8.4.4.1 Inspect enclosures at close range to ensure that the asbestos-containing material is completely inaccessible from outside the enclosure, and that joints, seams, and imperfections are sealed. Inspect the structure to confirm that any material that becomes dislodged cannot fall or filter through the cracks, air currents cannot aspirate fibers out of the enclosure, and water is not likely to enter the enclosure to wash out any material. Ascertain that the enclosure system is affixed permanently to the building structure as specified in the contract documents.

8.4.4.2 Inspect the enclosure to determine the integrity of the seals. An acceptable technique is to drill a hole in the enclosure and put the enclosure under a slight vacuum by using a HEPA-filtered vacuum or an air sampling pump, depending on the volume of the enclosure. Test the perimeter and all joints using smoke tubes; if smoke is drawn into the enclosure, it is not airtight. Any leaks should be sealed with materials indicated in the contract documents or procedure. Seal the hole for the vacuum outlet with a permanent, airtight plug once the tests are finished.

8.4.4.3 Before any critical barriers are removed from the work area in which an asbestos enclosure project was done, inspect the work area to determine that it is clean of any dust or debris generated by the building of the enclosure. Acceptable clearance air tests demonstrating fiber levels within specification limits will then allow the removal of the isolation and area containment system, so that the area can be returned to service.

8.4.5 *Completeness of Cleanup*—Following final cleanup, make an inspection for visible dust and debris on the walls, floors, furniture, equipment, and any other surface in the work area. There shall be no dust or debris on these surfaces, and the final barriers and decontamination facilities shall be clean at this time. This inspection should occur prior to clearance sampling and should be performed with all the seals on windows, doors, and vents intact and the isolation barriers separating the work area from the adjacent areas in place. If the final air samples are not acceptable, as defined in the contract documents, another visual inspection must be made after recleaning by the contractor.

8.4.5.1 No unremoved material, residue, dust, or debris should be visually detectable on the visual inspection for completeness of cleanup. Carefully examine all permanent fixtures of the work area, such as walls, ducts, conduits, pipes, and ceiling tile grid bars, as well as the contractor's equipment.

8.4.5.2 The presence of dust or debris on floors and other surfaces can be made clearly visible in the glare of a strong light shown parallel to the surface in question or by wiping it with a glove or cloth to render any residue more readily evident. Use an air sampling pump and filter cassette as a miniature vacuum cleaner to collect visible dust or debris as evidence of incomplete cleanup (see Note 2). Folds, creases, and crevices in plastic isolation barriers and taped seams are likely places where water and debris can accumulate and be concealed. On the visual inspection for completeness of cleanup, no unremoved material or visible residue, dust, or debris shall remain to contaminate the work area after the critical barriers are dismantled.

8.4.5.3 The inspector should wear protective clothing, including a pair of disposable booties, during the final visual inspection. The amount of debris that accumulates on the bottom of the booties is a good indication of the cleanliness of the area.

8.4.5.4 Although residue, dirt, dust, and debris may be present from other construction materials that do not contain asbestos, such as cement or plaster, as well as lint from the rags used for the final cleaning. All shall be assumed to be contaminated and must be removed from a work area before it can be considered acceptably clean. Statements in contract documents such as "remove all asbestos-containing insulation and debris" are misleading in that they imply that the contractor may exercise his judgment as to which materials contain asbestos and which do not. At the stage of final visual inspection, all unremoved material, residue, dust, and debris are assumed to be asbestos and therefore must be removed from abated surfaces and the removal area. No discussion should take place as to whether the remaining unremoved material, residue, dust, or debris does or does not contain asbestos and no samples should be analyzed for this purpose.

8.4.5.5 Closely inspect places where the isolation barriers

may have fallen away from the walls during the course of a removal project. Asbestos-containing materials that fall between the sheeting and the wall should have been cleaned up immediately, and then the plastic reattached, so that the wall does not become contaminated. Carefully check such locations during the inspection for completeness of cleanup to ensure that no residue remains.

8.4.5.6 Debris and contaminated water frequently seep under the plastic covering the floor and onto the actual floor surfaces underneath, necessitating further cleanup. Make a very thorough visual inspection of the area to determine if: (*1*) the debris has run underneath floor tiles loosened by water, (*2*) the debris is lying on or has been ground into carpets (the carpet should be dry before clearance air samples are taken), or (*3*) the debris has run under the doorways or barriers at the perimeter of the work area. Such situations require very close scrutiny to determine that no debris is present.

8.4.5.7 This inspection should occur prior to clearance sampling and should be performed with all the seals on windows, doors, and vents intact and the critical barriers separating the work area from the adjacent areas in place.

8.4.5.8 Air samples for clearance purposes are normally specified in the contract to be taken after the final visual inspection, when the work area meets the criteria for completeness of abatement and cleanliness. This takes place when the area is completely dry, but the isolation barriers are still in place. Aggressive sampling should be conducted, with the surfaces agitated by sweeping or brushing, by fans used to circulate the air, or by electric leaf-blowers directed at the surfaces (see EPA 560/5-85-024, Appendix M). For clearance air sampling in crawl spaces, see 11.1.6.

8.4.5.9 After the area has passed air sampling for final clearance and critical barriers have been dismantled, another visual inspection must be performed. If dust and debris are found, recleaning and reinspection of the contaminated locations must be performed. In most cases, cleanup can be done using small-scale (O&M) procedures for a fiber release episode without re-establishing a negative pressure enclosure.

9. Visual Inspection Schedule, Procedures and Acceptance Criteria for Operations and Maintenance

9.1 *Small-Scale, Short-Duration Operations*—Small-scale operations must be performed to meet the standards of completion as set forth in the procedures used by the workers.

NOTE 3—Work covered by this section is defined as Class III work by OSHA in 29 CFR 1926.1101.

9.1.1 When repairing leaking valves, patching water-damaged ceilings, and performing similar operations, it is often necessary to remove asbestos to gain access to a component or to remove unstable material. In these cases, asbestos removal is not the primary purpose of the operation; hence, they are not properly called asbestos abatement projects.

9.1.2 Visual inspection is an important procedure in determining that small-scale operations have been properly performed; therefore: (*1*) the person doing the inspection should be qualified according to Section 6, (*2*) air monitoring data for similar projects should establish that fiber levels during the operation do not exceed the OSHA Permissible Exposure Limit of 1.0 fibers/cc for a 30–minute duration (and also the 8–hr. Time-Weighted Average of 0.1 fibers/cc if the task exceeds 30 minutes), (*3*) that fiber levels following the operation do not exceed established clearance levels, and (*4*) the inspection must be performed in accordance with Section 8 of this practice. See 29 CFR 1910.1001, 1915.1001, and 1926.1001.

9.1.3 Prior to releasing an area where a glove bag has been used to repair a valve or for similar maintenance work, ensure that all of the steps in 11.3 have been followed and that the tools have been completely cleaned before removal from the glove bag.

9.1.4 The controls of a regulated area (negative pressure and contiguous decontamination facilities) may not be in use during small-scale operations. Visual inspection is an important means of determining whether the removal or repair and subsequent cleanup have been accomplished in a way that minimizes potential exposure of building occupants. Small-scale operations should therefore be inspected to the same standards for completeness of removal and completeness of cleanup provided in 8.4.2 and 8.4.5.

9.1.5 Remote decontamination facilities may be used for small-scale operations. Inspect these facilities and the spaces leading from the asbestos work site to ensure that they are free from visible debris.

9.1.6 For small-scale operations which are released on the basis of visual inspection without final air sampling, provide a certificate of release for the maintenance files describing the work done and noting the date and results of the visual inspection.

10. Documentation Requirements

10.1 The file for an abatement project should contain the following documents, provided by the owner's representative and the abatement contractor according to the terms of their respective contracts.

10.1.1 *Documents Prepared Before the Abatement Contractor Commences Work*:

10.1.1.1 Building asbestos survey report (with laboratory results) and report on additional inspections performed for project design purposes. This may include inspections for additional, concealed and inaccessible asbestos-containing materials.

10.1.1.2 Project design documents, including the specifications and drawings for abatement that define the scope of work and limits of abatement.

10.1.2 *Documents Prepared After the Abatement Contractor Commences Work*:

10.1.2.1 A list of all personnel on the job site, the type of abatement work in progress, the approximate percentage of work completed, a description of work progress and problems encountered, and air monitoring locations, sampling data and laboratory results.

10.1.2.2 During preparation of the work area, the inspector's and contractor's daily logs, including the inspector's report on completeness of preparations.

10.1.2.3 During removal, encapsulation or enclosure of asbestos-containing materials, the inspector's and contractor's daily logs, including the inspector's report on completeness of removal.

10.1.2.4 During the contractor's clean up of the area, the inspector's and contractor's daily logs including the inspector's report on completeness of clean up.

10.1.3 Documents related to final air sampling including the sample collection data sheets and laboratory results.

10.1.3.1 If the area does not pass final air sampling, the re-cleaning and re-inspection shall be documented in accordance with 10.1.2.3.

10.1.4 Following dismantling of critical barriers and decontamination facilities, the inspector's report on inspection for debris and cleanup conducted.

10.1.5 As each area is released for occupancy or work by other trades, the owner's representative shall provide the building owner and contractor with a written and signed release for that area. The signed certificate of clearance shall reference the results of visual inspections and final air sampling.

10.1.6 Following delivery of asbestos-containing waste material to an approved landfill, a Waste Shipment Record with the signature of the landfill operator and quantities (bags and drums of material) matching the quantities that left the job site.

10.1.6.1 Following receipt of the final Waste Shipment Record, a certificate of completion for the total project signed by owner's representative shall be provided to the owner. This certiticate releases the entire area for occupancy or construction and is part of the process of approving final payment for the abatement contractor.

10.1.6.2 Annotate the building plans at this time to reflect the results of the asbestos abatement project and to indicate those inaccessible locations where asbestos-containing materials may still be in place, so that any future building modification and operations can be undertaken with knowledge of the continued presence of asbestos.

11. Special Considerations

11.1 *Crawl Spaces*:

11.1.1 Crawl spaces merit special concern because most have dirt floors which may contain pulverized or impacted asbestos debris. There are practical limitations to the amount of soil that can be removed, and the use of concrete or soil encapsulants has limitations as well.

11.1.2 Visual inspection for completeness of removal of asbestos materials from surfaces, pipes, and components within the crawl space shall comply with the requirements of 8.4.2. Crawl spaces having a concrete or other hard-surfaced floor shall be inspected for completeness of cleanup and shall not have any visible debris in the areas where removal was performed.

11.1.3 Crawl spaces having a dirt floor shall be inspected for removal of asbestos material that was present before the abatement project, or was removed during the project. For the visual inspection for completeness of removal of a crawl space after debris and contaminated soil have been removed, make a close examination (on hands and knees) of the entire area with a strong (75 watt minimum) light. Use a small screwdriver or other pointed tool to dislodge pieces of impacted material from the soil as they are found. The crawl space shall be as dry as practicable during the visual inspection.

11.1.3.1 No pieces of insulation shall be present on top of the dirt or mixed in with loose soil.

11.1.3.2 Visibly contaminated loose soil, or soil which is suspected of being contaminated by asbestos prior to or during the abatement project, shall be removed down to the underlying sub-grade.

11.1.3.3 Pieces of asbestos-containing material which have been impacted into the surface of the sub-grade shall be removed to the extent that no such material is visible.

11.1.4 If an excessive amount of debris or contaminated soil is visible, terminate the inspection and direct the contractor to reclean the crawl space. Have the competent person and a worker assist with the inspection and with minor cleanup.

11.1.5 If a survey of the crawl space prior to the abatement project indicates that asbestos-containing materials may be present below the surface of the sub-grade through previous construction activities or water seepage, a sufficient amount of soil shall be removed in those specified locations to demonstrate to the satisfaction of the inspector that asbestos-containing material and contaminated soil have been removed.

11.1.6 The crawl space atmosphere must be free of airborne fibers to the extent specified in the contract documents. A personal air sampler worn by the inspector while performing the final inspection that simulates typical area activity provides a representative indication of airborne fiber exposure following re-occupancy.

11.2 *Dry Removal*:

11.2.1 Dry removal of asbestos-containing material is necessary on rare occasion, due to the proximity of high voltage transformers or electrical panels, delicate instrumentation that cannot be relocated, steam or hot process pipes that cannot be depressurized, or other extraordinary circumstances. A variance from the Environmental Protection Agency authorizing dry removal must be supplied by the contractor as part of his submittal package.

11.2.2 The removal itself must be done in work areas of minimal size and doubly insulated, under negative pressure, with enough ventilation units in operation to capture the airborne fibers that are generated by the work. Visual inspection during the removal procedure to enforce prompt cleanup of debris and barrier integrity is even more essential under dry removal conditions due to the potential for generating high airborne fiber concentrations.

11.3 *Glove Bag Operations*:

11.3.1 This section addresses the inspection requirements where glove bags are used as part of an abatement project. Inspection of glove bag work for small-scale operations (maintenance and repair) is addressed in 9.1.3.

11.3.2 Prior to the start of work, visually inspect the area in which glove bags are to be used to determine if debris is already present. Such debris may have come from insulation that has already deteriorated and must be cleaned up with a HEPA-filtered vacuum and wet-cleaned before the glove bag procedure is started.

11.3.3 If ceiling tiles have to be removed to gain access to the pipes, inspect the top surfaces to determine if they are clean. Contaminated tiles should be discarded as asbestos-containing materials; if they must be reused, they should be cleaned with a HEPA-filtered vacuum and sprayed with an encapsulant.

11.3.4 Monitor the glove bag operation carefully for proper execution. The correct glove bag(s) to be used and the procedure for pipe insulation removal should be described in detail in the contract documents. Workers using glove bags must be required to demonstrate their competence through training and experience.

11.3.4.1 Misuse of the glove bag procedure invites the contamination of the entire building with asbestos, because negative pressure normally is not used concurrently in connection with this removal technique.

11.3.5 Observe the glove bag attachment and use smoke tubes to check for any leaks. After insulation removal by glove bags, inspect thoroughly for debris from leaking, broken, or poorly sealed bags. Inspect the pipes and fittings closely for residue and for the adequate application of sealer.

11.3.6 Observe the method of evacuating the bag before it is removed from the pipe, making sure that a HEPA-filtered vacuum is used for evacuation. Observe the means of removing tools, and cleaning them or transferring them to another bag.

11.3.7 Observe the disposal of the glove bags in properly labelled sealed containers, and then record subsequent disposal of these containers in appropriate manifests.

11.4 *Mini-enclosures*:

11.4.1 Mini-enclosures are typically used for removal of asbestos-containing materials that are distributed throughout a building in widely-scattered locations, during “spot removal” as part of preparation of a full enclosure for abatement, and for “spot removal” to provide access by unprotected trades.

11.4.2 Activity in mini-enclosures may be noticeable to building occupants during removal in occupied buildings. Alternatively, mini-enclosure operations are often done overnight and under tight time constraints. In such cases, the inspector must be on-site and respond quickly to requests for visual inspections.

11.4.3 During preparation of the mini-enclosure, inspect to determine that existing debris and contamination have been cleaned up, that equipment and furnishings in the surrounding area are protected, and that negative pressure has been established and verified by smoke tests. Closely inspect the interfaces with building surfaces where the mini-enclosure is in contact with asbestos-containing materials.

11.4.4 During removal operations, the inspector’s ability to enter the mini-enclosure to observe the work may be limited by the size constraints. The inspector should concentrate on protection of the surrounding area and verify that negative pressure is maintained until the enclosure is dismantled.

11.4.5 An inspection for completeness of removal is performed prior to tearing down or moving the mini-enclosure, using the same procedures and criteria as in 8.4.2.

11.4.6 An inspection for completeness of cleanup is performed after tearing down or moving the mini-enclosure, using the same procedures and criteria as in 8.4.5. This inspection is limited to the area where the mini-enclosure was used.

11.4.7 Remote decontamination facilities must be used for mini-enclosure operations. Inspect these facilities and the spaces leading from the asbestos work site to ensure that they are free from visible debris.

11.4.8 For small-scale mini-enclosure operations which are released on the basis of visual inspection without final air sampling, provide a certificate of release for the maintenance files describing the work done and noting the date and results of the visual inspection.

12. Personal Protective Measures and Safety

12.1 *Personal Protective Equipment and Procedures (Apply to Abatement Projects and O&M Work)*:

12.1.1 The person performing the visual inspections must comply with all applicable regulatory and contractual requirements for personal protection, respiratory protection, and decontamination. The type of respirator required for visual inspections may depend upon the stage of abatement when the inspection takes place. The inspector must always follow the appropriate decontamination procedure.

12.1.2 During pre-abatement inspections, there exists the very real potential for exposure to asbestos fibers above drop ceilings or in mechanical rooms if asbestos-containing material is disturbed or loose debris is encountered. In such locations, the inspector shall use, at a minimum, a half-mask air purifying respirator with P100 (HEPA) filter cartridges. If overhead areas are inspected, the inspector shall wear head covering. Disposable coveralls shall be worn when entering crawl spaces and attics, or other constricted areas where direct contact with asbestos is highly probable.

12.1.3 Inspection activities during abatement will require the same protective clothing and respiratory protection procedures for the inspector that are used by the personnel performing the abatement work.

12.1.4 After the abatement is finished, the work area is still considered contaminated. While inspecting for completeness of removal and cleanup, personnel shall wear disposable coveralls, hood, foot covering, and respiratory protection.

12.2 *Safety Considerations*—The inspector must comply with all safety requirements in the contract documents and all applicable OSHA regulations while performing visual inspections.

12.2.1 110VAC lights used for visual inspections must be properly grounded and, if used in wet areas, connected to a circuit with ground fault protection.

12.2.2 Ladders and scaffolds must be in good condition and comply with OSHA regulations for guardrails, structural integrity, stability, and conditions of use. Exercise care on wet plastic surfaces, which are very slick and potentially hazardous to walk or climb on. Comply with OSHA regulations and facility safety policies for fall protection, including harnesses and restraint devices, as applicable.

12.2.3 Attics present not only special mobility problems during inspection due to the presence of such hazards as wires, ducts, pipes, and limited vertical and horizontal maneuverability, but also the danger of slipping off joists and breaking through the ceiling, unless suitable walking surfaces are provided. Be sure that adequate and dependable lighting is available for personal safety as well as for effective completion of the inspection.

12.2.4 There is a very real risk that the inspector may become stuck in both crawl spaces and attics. This is a particularly critical consideration in the case of injury. If such areas must be entered alone, the inspector should maintain

continual communication with someone on the outside of the area by radio or other means. Comply with OSHA regulations and facility safety policies for confined space entry as applicable.

12.2.5 Heat stress is a concern for the inspector, who is subjected to the same hot, humid environment as the abatement workers. The work area is often hottest at the conclusion of the project when, for example, pipes and the roof deck are uninsulated. The inspector should recognize the symptoms of heat stress (heat rash—reddening of skin; heat cramps—pain in joints; heat exhaustion—profuse sweating, nausea and disorientation; and heat stroke—hot dry skin, coma, death). He should protect against heat stress by acclimatizing to higher temperatures for longer times during the course of the project, wearing breathable clothing, replacing lost fluids with drink containing electrolyte, and leaving the enclosure if heat stress symptoms arise.

13. Keywords

13.1 abatement; asbestos; cleanup; operations and maintenance; procedures; removal; responsibilities; visual inspection