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Standard Practice for Comprehensive Building Asbestos Surveys[1]

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ε[1] NOTE—Asbestos warning editorially added in June 2006.

1. Scope

1.1 This practice describes procedures for conducting comprehensive surveys of buildings and facilities for the purpose of locating, identifying, quantifying and assessing asbestos-containing materials.

1.2 The results of a Comprehensive Building Asbestos Survey are intended to be used for ongoing management of asbestos-containing materials, including Operations & Maintenance, removal and other response actions. This includes response actions associated with renovations. A Comprehensive Building Asbestos Survey is also intended to provide information required for removal of asbestos-containing materials prior to demolition of a building or facility.

1.3 This standard practice discusses two types of surveys: Baseline Surveys and Project Design Surveys.

1.4 This standard practice discusses the following activities for each of the above types of surveys:

1.4.1 Planning the survey to meet defined objectives;

1.4.2 Obtaining and reviewing information on the building or facility including previous surveys and response actions;

1.4.3 Conducting the physical activities of inspecting the premises and collecting bulk samples of suspect materials;

1.4.4 Analyzing the bulk samples for asbestos type and content;

1.4.5 Assessing the Current Condition and Potential for Disturbance of asbestos-containing materials; and

1.4.6 Preparing a report that includes a narrative discussion of the findings, tabulations of inspection, sampling and analysis results, graphical depiction of the areas inspected, and the results of the assessment.

1.5 A Comprehensive Building Asbestos Survey provides sufficient information about the asbestos-containing materials in a building or facility for purposes of a real property transaction. In situations where the amount of information required by a party to the transaction is minimal, a Limited Asbestos Screen may suffice in place of the Comprehensive Building Asbestos Survey.

1.6 This standard practice does not include air sampling or surface (dust) sampling for purposes of evaluating a potential exposure hazard from airborne asbestos fibers.

1.7 **Warning—**Asbestos fibers are acknowledged carcinogens. Breathing asbestos fibers can result in disease of the lungs including asbestosis, lung cancer, and mesothelioma. Precautions in this standard practice should be taken to avoid creating and breathing airborne asbestos particles from materials known or suspected to contain asbestos. See 2.2 for regulatory requirements addressing asbestos.

1.8 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E631 Terminology of Building Constructions

E736 Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

E1368 Practice for Visual Inspection of Asbestos Abatement Projects

E1494 Practice for Encapsulants for Spray- or Trowel-Applied Friable Asbestos-Containing Building Materials

MNL-23 Manual on Asbestos Control: Surveys, Removal, and Management, 2005

2.2 *Other Documents:*

EPA 560/5-85-024 Guidance for Controlling Asbestos-Containing Materials in Buildings. ("Purple Book") 1985[3]

EPA 560/5-85-030A Asbestos in Buildings: Simplified Sampling Scheme for Surfacing Materials.("Pink Book") 1985[3]

EPA 20T-2003 Managing Asbestos in Place: A Building Owner's Guide to Operations and Maintenance Programs for Asbestos-Containing Materials. ("Green Book") July, 1990[3]

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

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401.

EPA-600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. June, 1993[3]

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

40 CFR Part 763, Subpart E Asbestos-Containing Materials in Schools (EPA AHERA Regulations)[3]

40 CFR Part 763, Subpart E, Appendix C (EPA Model Accreditation Plan)[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]

State of New York Environmental Laboratory Approval Program (ELAP) Certification Manual, Item No. 198.1 Polarized Light Microscopy Method for identifying and Quantifying Asbestos in Non-Friable Organically Bound Bulk Samples, May 15, 2000[4]

State of New York Environmental Laboratory Approval Program (ELAP) Certification Manual, Item No. 198.4 Transmission Electron Microscopy Method for identifying and Quantifying Asbestos in Non-Friable Organically Bound Bulk Samples, March 1, 1997[4]

Guidance Manual: Asbestos Operations and Maintenance Work Practices [5]

Asbestos Abatement and Management in Buildings: Model Guide Specification [5]

3. Terminology

3.1 *Definitions*—For definitions of building terms, see Terminology E631.

3.2 *Terms Defined in Practice E1368*—The user is referred to Practice E1368 for terms specifically related to asbestos abatement for purposes of a Project Design Survey.

3.2.1 *asbestos-containing materials*, *n*—material containing 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 surfaces. 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 *crawl space*, *n*—an accessible area that may have a dirt floor, usually with low head room.

3.2.3 *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.

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

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

3.2.6 *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.

3.2.7 *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.

3.3 *Definitions of Terms Specific to This Standard:*

3.3.1 *asbestos*, *n*—the asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite (amosite), anthophyllite, and actinolite-tremolite.

3.3.2 *accessible location*, *n*—a functional space or part thereof that can be inspected without requiring destructive testing or presenting an unacceptable health or safety risk to the inspector, and where entry is not prohibited by security or other institutional restrictions.

3.3.3 *building asbestos survey*, *n*—an activity to determine the presence, location, condition, and quantity of asbestos-containing materials in a building or facility, or on the property containing the building or facility.

3.3.4 *bulk sample*, *n*—a sample of suspect asbestos-containing material collected for identification of asbestos and determination of the percent of the components in the sample.

3.3.5 *laboratory*, *n*—an entity that is equipped and qualified to perform one or more of the following analyses, using approved methods: *(1)* identify and quantify asbestos in bulk samples by Polarized Light Microscopy; *(2)* identify and quantify asbestos in bulk samples by Transmission Electron Microscopy, *(3)* identify and quantify airborne fibers with Phase Contrast Microscopy.

3.3.6 *non-friable organically bound (NOB) materials*, *n*—materials that are not friable and that consist of fibers and other particulate matter embedded in a solid matrix of asphaltic, vinyl or other organic substances.

3.3.7 *operations and maintenance (O&M) program*, *n*—a proactive management program to provide periodic surveillance of asbestos-containing materials, maintain them in good condition, mitigate fiber release from existing asbestos-containing materials, and clean up asbestos-containing dust and debris that has been released, in order to minimize worker or occupant exposure to asbestos fibers.

[4] Availble from the Environmental Laboratory Approval Program, Wadsworth Center, P.O. Box 509, Albany, NY 12201.

[5] Available from National Institute of Building Sciences (NIBS), 1090 Vermont Avenue, NW, Suite 700 Washington, DC 20005-4905.

3.3.8 *destructive testing*, *n*—inspection procedures that necessarily involve objectionable or noticeable damage to building surfaces, or require penetration of a surface such as a wall, ceiling, chase or shaft to gain access to a concealed space. Lifting a ceiling tile or opening a hatch is not destructive testing.

3.3.9 *functional space*, *n*—an area within a building or facility that is used for a specific purpose. Examples include a warehouse in a manufacturing plant and a conference room in an office building. A functional space can be vertical in extent, such as a pipe chase, and span several floors.

3.3.10 *homogeneous area*, *n*—surfacing material, thermal system insulation material, or miscellaneous material that is uniform in color and texture, and apparent or known date of installation.

3.3.11 *polarized light microscopy (PLM)*, *n*—a method of analytical mineralogy that uses an optical microscope to determine the optical properties of sample constituents and, in the case of bulk sample analysis for asbestos, to provide positive identification of suspect fibers as asbestos and to quantify the percent of asbestos in the sample.

3.3.12 *suspect material*, *n*—material that is sampled or is presumed to contain asbestos on the basis of its location, purpose, appearance and other factors considered by the inspector.

3.4 *Acronyms:*

3.4.1 *ACM*—Asbestos-containing material(s)

3.4.2 *AHERA*—Asbestos Hazard Emergency Response Act

3.4.3 *EPA*—U.S. Environmental Protection Agency

3.4.4 *HEPA*—High Efficiency Particulate Air

3.4.5 *NAD*—No Asbestos Detected

3.4.6 *NESHAP*—National Emission Standards for Hazardous Air Pollutants; specifically, the National Emission Standard for Asbestos (40 CFR Part 61, Subpart M)

3.4.7 *NOB*—Non-friable organically-bound

3.4.8 *OSHA*—U.S. Department of Labor, Occupational Safety and Health Administration

3.4.9 *PPE*—Personal Protective Equipment

3.4.10 *PLM*—Polarized Light Microscopy

3.4.11 *TEM*—Transmission Electron Microscopy

4. Significance and Use

4.1 Management of asbestos-containing materials in buildings and facilities requires knowledge of the location, type, quantity, and condition of the material. The more complete and accurate the information available, the more appropriate and cost-effective are the control measures used to reduce possible exposure to airborne asbestos fibers. This is true whether the asbestos-containing materials remain undisturbed and completely intact, are selectively removed for maintenance or prior to renovation, or are removed to the greatest extent feasible before demolishing the building or facility.

4.2 This standard practice describes two types of surveys that support different objectives. These are the Baseline Survey and the Project Design Survey.

4.2.1 The Baseline Survey is a building-wide or facility-wide inspection that provides a general sense of the overall location, type, quantity, and condition of asbestos-containing materials present. It is thorough in that most accessible functional spaces are inspected and bulk samples taken of suspect materials observed. The baseline survey provides information for long-term management of asbestos-containing materials and prioritization of response actions. The presence of asbestos in suspect materials may be assumed or presumed in some cases without bulk samples being taken or analyzed. However, the baseline survey is unobtrusive in that samples are not taken where doing so would result in objectionable damage to surfaces or where institutional barriers preclude access. In a baseline survey, destructive testing is avoided.

NOTE 1—A Baseline Survey is sometimes called an "AHERA" survey because it provides the type of information used for management of asbestos-containing materials in schools. However, the baseline survey described in this standard practice requires inspection, bulk sampling, quantification and assessment and suspect materials that are excluded by virtue of their type and location from the AHERA regulations for schools.

NOTE 2—Suspect material subject to disturbance by planned or emergency maintenance may not always be identified as to asbestos content in a Baseline Survey. Collecting a single bulk sample, or a small number of samples, to determine if the material contains asbestos does not constitute a survey within the meaning of this standard practice. Nonetheless, the sample(s) should be collected according to the methods described in Appendix X1 (this must be done by a properly-credentialed individual) and analyzed as set forth in 6.5.

4.2.2 The Project Design Survey is more focused than a Baseline Survey and is used to provide information to the Project Designer for preparing abatement plans and specifications. The locations inspected are limited to the areas that will be affected by the abatement project. If the project is being done prior to renovation or demolition, the construction plans or at least a clear statement of the scope of the renovation or demolition work are required for a proper Project Design Survey. Destructive testing is often required for a Project Design Survey. The presence of asbestos in suspect materials is always confirmed in a Project Design Survey rather than being assumed or presumed. Other information required for the Project Design is collected during the survey.

4.3 An asbestos survey may be required to meet the EPA NESHAP notification requirements for renovation or demolition, or be required by governmental agencies for issuance of a building permit. The Project Design Survey is most appropriate for this purpose. Posting of signs and labels required for compliance with OSHA regulations would use the information generated during a Baseline Survey.

4.4 This standard practice emphasizes the concept that a Comprehensive Building Asbestos Survey consists of more than the collection and analysis of samples, and the report is more than a compilation of laboratory results. It is important to inspect as many functional spaces as possible and to document the reasons why certain functional spaces were not inspected and locations where no suspect materials were observed and, consequently, no samples were taken. Reasons might include access limitations, the absence of materials to sample, the existence of information from previous surveys, or the availability of reliable documentation such as Material Safety Data Sheets.

4.5 A Comprehensive Building Asbestos Survey is not limited to the class of materials commonly referred to as asbestos-containing building materials (ACBM), defined in the

AHERA regulations as "... found in or on interior structural members or other parts of a building." Items that are difficult to distinguish as such may include cooling towers, laboratory hoods, gaskets, chalkboards and other articles. These may be installed in, attached to, or adjacent to the building or facility but are not as clearly a part of the building or facility as fireproofing or floor tile. Nonetheless, such items still fall within the scope of an asbestos management program and therefore are addressed in this standard practice. Locations outside the building, in particular equipment in industrial facilities and power plants, and crawl spaces underneath the building are within the scope of a Comprehensive Building Asbestos Survey.

4.6 This standard practice is intended to be used by individuals who are conducting a Comprehensive Building Asbestos Survey for the owner or manager of a building or facility under a contractual arrangement for services as well as by employees of the owner or manager. If the individual is conducting the survey under a contractual arrangement (which may be with the firm employing the individual), the owner or manager of the building is still responsible for certain activities as described in this standard practice.

5. Qualifications and Responsibilities

5.1 This section describes the qualifications and responsibilities of the individuals who participate in the Comprehensive Building Asbestos Survey. The requirement for accreditation as an Inspector according to the Model Accreditation Plan applies to the activities covered by this standard practice. Additional accreditations may be required, and qualifications may be imposed by state licensing requirements or the policies of the owner or manager of the building or facility that are beyond the scope of this standard practice. Field experience in performing asbestos building surveys as described in this practice is of paramount importance.

5.2 Not all of the qualifications discussed herein will be required for every Comprehensive Building Asbestos Survey conducted, and in many cases one individual (usually the accredited inspector) will have more than one, and possibly all, of the required credentials.

5.3 Qualifications and responsibilities of individuals conducting the survey:

5.3.1 *Accredited Inspector*—For both types of surveys, accreditation as an Inspector is required for the individual who takes the bulk samples and otherwise performs the physical activities comprising the survey. This includes review of relevant building documentation and preparation of the survey report.

5.3.2 *Management Planner*—For a baseline survey, accreditation as a management planner is only required for hazard assessment and determination of response actions if the survey is performed in a school, but is a desirable credential for all buildings and facilities.

5.3.3 *Project Designer*—For a project design survey, accreditation as a project designer is desirable because this survey will provide information for the plans and specifications to be used on an abatement project.

5.3.4 *Contractor/Supervisor*—For a project design survey, accreditation as a contractor/supervisor would be helpful because of the knowledge of abatement processes such an individual possesses.

5.4 In addition to the above accreditations, the following credentials are evidence of the ability to perform one or more of the aspects of a Comprehensive Building Asbestos Survey.

5.4.1 Credentials that indicate knowledge of building design include experience in building design, construction, or operations and academic degree(s), licensure or registration as an architect or engineer. Academic degree(s) or certification in industrial hygiene, occupational safety or a related field indicates knowledge of the hazardous properties of asbestos and other substances as well as the means of controlling the hazards.

5.4.2 Credentials that indicate knowledge of building construction and operations include field experience in building construction, renovation, demolition, or maintenance, or a combination thereof; or formal or on-the-job training in construction technology or management.

5.5 Qualifications and responsibilities of owner or manager of building or facility: To be able to provide the necessary information, access, and other support to the inspector(s), the staff of the building or facility owner or manager should have taken at least a two-hour Asbestos Awareness course.

5.6 Laboratories analyzing the samples shall possess one or more of the following qualifications in addition to, or as part of, any applicable state licensing requirements:

5.6.1 For bulk sample analysis using Polarized Light Microscopy,

5.6.1.1 Accreditation by the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology (NIST);

5.6.1.2 Participation in the American Industrial Hygiene Association (AIHA) Bulk Asbestos Proficiency Analytical Testing Program;

5.6.1.3 Certification under the State of New York Environmental Laboratory Approval Program (ELAP);[4] and

5.6.1.4 Participation in a proficiency testing and certification program similar to 5.6.1.1-5.6.1.3.

5.6.2 For bulk sample analysis of NOBs using Transmission Electron Microscopy, the laboratory shall be certified under the State of New York Environmental Laboratory Approval Program (ELAP) or provide other evidence of capability and experience with the ELAP method[4]or its equivalent acceptable to the consultant.

5.6.3 For air sample analysis using Phase Contrast Microscopy, the laboratory shall demonstrate current proficiency in the NIOSH Proficiency Analytical Testing program administered by the American Industrial Hygiene Association. Accreditation for asbestos analysis by the AIHA is also desirable but not mandatory.

6. Baseline Surveys

6.1 *Planning the Survey*—In today's litigious environment, it is essential that the planning stage of an asbestos survey not only be complete in addressing the following issues, but be documented in a way that will defend, if necessary, the inspector and/or the building owner. It is not possible for the

asbestos inspector to anticipate the reasons project performance may be legally questioned (that is, a change in the financial condition of the building owner; a change in the real estate market; and so forth). Every asbestos inspection should be planned as if it will be questioned, and, consequently, it should be defensible. A well-planned survey will consider other Environmental Health & Safety issues that could be addressed during the survey and will consult other appropriate professionals, trades, or knowledgeable individuals who may provide valuable information regarding systems included in the survey. Typical, non-renovation/demolition surveys will incorporate portions of each of these types of surveys to develop a comprehensive Baseline Survey.

6.1.1 *Establishing the Purpose of the Survey*—The purpose of the Baseline Survey is to identify suspect asbestos-containing materials as defined in the scope of the survey. Management of the ACM will include normal Operations and Maintenance activities over a long term and will include prioritizing asbestos hazards for the purpose of planning future abatement activities. If the inspection is for pending demolition or renovation activities, see Section 7 on Project Design Surveys.

6.1.2 *Deciding who Conducts the Survey*—Whether the inspection is conducted by an outside consultant or in-house staff, the inspector shall be properly-credentialed as an asbestos building inspector by either federal EPA or an EPA approved state program under the Model Accreditation Plan. The inspector may also be required to be licensed by the State, City and/or local jurisdiction of the inspection.

6.1.2.1 In-house staff should have a more intimate knowledge of the locations of suspect materials, and the use and occupancy of the areas containing those materials. Bulk sample collection by in-house inspectors may be useful when dealing with emergency repairs or planning operations and maintenance activities when only a few bulk samples are required. However, in-house staff usually has other responsibilities that may preclude the timely completion of a baseline survey, and may not have the experience necessary to perform a thorough survey.

6.1.2.2 The outside consultant should have insurance covering asbestos operations to insulate the owner from potential liability. In most cases, conflict of interest issues would be best avoided by using an outside consultant. Typically, outside consultants can complete a survey in a more timely fashion and provide a more thorough and unbiased report than in-house personnel. Additionally, building owners and managers can benefit from the consultant's experience gained while inspecting other facilities.

6.1.3 *Establishing the Scope of the Survey*—It is essential that the inspector have documented, in writing, the exact scope of work for which he is responsible. A Baseline Survey would normally be comprehensive in nature. However, if the inspection is to be limited to certain buildings, or portions of buildings, the specific areas to be inspected must be documented in order for the inspector to achieve substantial completion of the contract, and not be held responsible for further work. One of the most important functions in-house personnel can provide is to participate in determining the purpose of the survey, planning the survey and reviewing the results of the inspection done by the outside consultant. In house personnel should also play a role with providing access to all areas of the building/facility to the survey team(s) and be available to answer questions posed by the survey team and the building occupants.

6.1.3.1 Identify buildings, or portions of buildings to be inspected. Each individual building shall be inspected separately and all functional spaces inspected, whether or not bulk samples are taken therein. A separate set of homogeneous areas of suspect material shall be identified, sampled or assumed and determined to be ACM or non-ACM per building. A homogeneous area may not be extended to include more than one building, but may include components exterior to a building such as cooling towers, vessels and piping. Data forms, supplies and equipment must be sufficient to address multiple buildings if necessary.

6.1.3.2 ACM should be identified in the Baseline Survey regardless of whether it is used as a construction material or not, and whether located inside, outside or underneath the building, as long as the area inspected is within the scope of survey. This should specifically include stored materials such as gaskets, packing or insulation not yet installed in or on the facility.

6.1.3.3 In some industrial facilities, there may be gaskets, packing and other ACM installed in equipment (such as furnaces) that is not part of the building systems (such as HVAC). The equipment may be in operation at the time of the survey, or the suspected ACM may be inaccessible for other reasons. For example, the inspector may lack the tools and skills to properly disassemble the equipment for access to the suspected ACM. The scope of work for the survey should be clear as to whether this equipment is to be inspected and under what circumstances. The most convenient, and often the safest, time to inspect such equipment is when it is out of service for maintenance or while production is interrupted. The plant manager should make a list of equipment with suspect ACM and the plant's O&M plan should specify if and when gaskets, packing, etc. are to be sampled.

NOTE 3—Gaskets are usually installed in bolted flange fittings. If only one or two fittings are being worked with, the gaskets can be presumed to be asbestos-containing material (PACM) and the employee instructed to follow appropriate procedures. For such small-scale work, it may be faster and cheaper to follow these procedures rather than to sample and analyze the gaskets. If an inspector were to sample for demolition purposes, the same restrictions would apply. In a demolition situation, it makes more sense to cut the pipe, leave the fittings intact, and dispose of them.

6.1.4 *Inspection Requirements*—A typical scope of work for an asbestos survey will address the following topics: survey protocol, what materials will be sampled, what materials will be presumed/assumed (floor tiles, floor tile mastic, roofing materials, gaskets and packings), what materials will not be included in the survey, quantification of materials, areas of the building/facility to be surveyed, access to specific areas of the building/facility (high ceilings, vaults, computer rooms, roofs, etc.), areas of the building/facility not to be surveyed (pipe chases, wall cavities, roofs), numbers of samples, quality control, follow-up analyses (point-counting, TEM), time schedules, and deliverables (reporting, reporting format, floor

plans or drawing, and so forth). Bulk sampling shall be done to prove that the material in question is not ACM. Otherwise the suspect material shall be presumed to be ACM, and documented and managed accordingly. (See Appendix X1, Sampling Techniques and Equipment)

6.1.4.1 Under this standard practice, a minimum of three bulk samples representative of each different homogeneous area of suspect material to be sampled shall be collected and analyzed to prove that the material sampled is not ACM. See 6.4.6.1 for specific minimum numbers of samples by type of suspect material. Situations that call for more than the accepted minimum should be called to the attention of the building owner.

6.1.4.2 Field notebooks should include forms for the collection of information as follows: a complete list and location of functional spaces to be inspected (see 6.4.2); bulk sample logs (see 6.4.3); a complete list and location of suspect materials and homogeneous areas (see 6.4.5); chain of custody (see 6.4.9.1); assessment information (see 6.6). Samples of forms are provided in Appendix X3, Field Data Collection Forms.

6.1.4.3 Destructive inspections (opening walls/ceilings, multiple layers of flooring, etc.) are not performed on a Baseline Survey and therefore concealed suspect materials are not directly sampled, assessed or quantified. However, the inspector may, if specifically requested by the building owner, indirectly infer the location, quantity and condition of concealed suspect materials on the basis of information from accessible confirmed ACM that appears to be part of the same homogeneous area. In this case the concealed material will be treated as ACM. The assumptions on which such extrapolations are based should be clearly spelled out in the survey report.

6.1.5 *Analytical Requirements*—At a minimum, PLM shall be used to analyze bulk samples, as required by both OSHA and EPA. A laboratory qualified according to 5.6.1 should be used. A determination shall be made initially that all samples required to be collected, will be analyzed.

NOTE 4—A time and money saving technique used by some inspectors commonly referred to as "positive stop" is the practice of instructing the laboratory to stop analyses of all samples in a given homogeneous sampling area when one of the samples is found to contain greater than one percent asbestos. This practice may have application when performing Baseline Surveys for the management of ACMs over time. However if this technique is used, the resulting work practices and management program should be structured to adequately control both serpentine and amphibole asbestos. It is possible, and very likely, under the "positive stop" practice to not properly characterize the type and quantity of asbestos in the sample. One should not conclude that based on one analysis, the homogeneous area contains low concentrations of asbestos or even only one type of asbestos, be it serpentine or amphibole. Additionally, areas of non-asbestos containing materials may be identified as ACM when employing the "positive stop" practice due to misidentification of homogeneous areas (see 6.5.3.3). Additional sampling is recommended to fully characterize the asbestos content of the entire homogeneous area when performing the Baseline survey.

6.1.5.1 The determination of whether a sample is ACM or non-ACM shall be consistent with EPA and OSHA definitions: Greater than 1 % is ACM; 1 % or less is not ACM. Samples that are reported to contain detectable amounts of asbestos (for example, trace, <1 %, or 1 %) shall be re-analyzed by the PLM point count technique. If the point count analyses is reported to contain one-percent or less of asbestos, the sample shall be considered to be non-ACM. The determination of whether a homogeneous area of suspect material is ACM or non-ACM shall be consistent with EPA AHERA at 40 CFR 763.87(c): "A homogeneous area is considered not to contain ACM only if the results of all samples required to be collected from the area show asbestos in the amounts of 1 % or less."

6.1.5.2 PLM analyses of non-friable organically bound (NOB) materials such as tar, roofing materials, mastic, glue, and floor tile are frequently reported as being negative for asbestos when in fact significant quantities of asbestos are contained within the material. At least one sample of each distinct homogeneous area of NOB materials shall be re-analyzed by quantitative transmission electron microscopy with gravimetric reduction when all samples in the homogeneous area sample set are reported to be one percent or less asbestos by PLM. The inspector should be familiar with the regulations in the local, state, or county government in which the survey is being performed as some locales require all NOB samples to be analyzed by TEM.

6.1.6 *Survey Report*—A survey report will be generated that should include, at a minimum, the date of the inspection and report, the accreditation number and dates of accreditation for the inspector(s) conducting the survey, identification, quantification and location of all suspect material, an indication of whether the material is ACM or non-ACM, assessment information on condition of ACM, and how the ACM relates to building function. The survey report will include a complete laboratory report detailing the analysis of each bulk sample analyzed. Applicable sections of this Standard Practice, including appendices, should be referenced in the report (see 6.7).

6.1.7 *Schedule*—A schedule must be coordinated with the building owner that will provide access as necessary for a preliminary site visit, as well as the performance of the comprehensive survey. Contractual issues on completion of work and submission of report must also be addressed as planning issues.

6.1.7.1 Preliminary site visits may be scheduled at any time, and should give the inspector an indication of the type and variety of suspect materials present, the scope or extent of the work, and normal use and occupancy of various areas of the facility. Typically the preliminary site visit provides the inspector(s) the opportunity to become familiar with a building/facility and provides an opportunity to ask questions affecting the performance of the survey to develop a cost proposal for the completion of the survey.

6.1.7.2 Bulk sampling activities should be scheduled when the functional spaces to be inspected are unoccupied. This may mean night or weekend work, as the case may be. An inspector shall not disturb suspect material in the unprotected presence of building occupants. Facilities that operate on a 24-h basis may have to isolate or demarcate areas for sampling, or assume all identified suspect materials in areas that may not be isolated to be ACM. Because OSHA regulations requires respirator and protective clothing use in the absence of a negative exposure assessment, sampling in unoccupied areas is least troublesome

to both the building owner as well as the inspector. Security systems and/or escort may also have to be coordinated with the owner.

6.2 *Estimating the Cost of the Survey—Estimated Cost of Survey*—Many factors affect the cost of performing a comprehensive asbestos survey. Some of these factors may vary over time and may be dependent upon regional, state, or other economic factors such as salaries, benefits, cost of living, and the economic condition of the companies, nation, or individuals performing the survey or laboratory analyses. This standard does not attempt to identify or address those issues. This standard attempts to identify the most common components that affect the cost of performing a comprehensive asbestos survey. Companies or individuals purchasing asbestos survey services should clearly define the scope of services to obtain the most accurate and comprehensive price.

6.2.1 The preliminary site visit may or may not affect the price of the survey. Depending upon the contractual arrangement and the company providing the proposal, the time and expense of the preliminary site visit may be absorbed into the cost of doing the survey or provided without charge.

6.2.2 *Document Review*—The review of construction documents including specifications, blueprints and possibly product receipts provide information regarding asbestos-containing products, locations, and quantities. This review is typically performed after the survey contract is awarded; however, a preliminary review of these documents may be helpful in determining the number of samples necessary. The extent and ultimate cost of the review will be dependent upon the scope of the survey, the size of the facility being inspected, organization/accessibility of the documents, and the amount of documents to be reviewed.

6.2.3 *Survey Preparation and Mobilization*—Prior to beginning the survey a number of technical and logistical tasks are required to prepare for the survey. Time is required to gather field supplies and coordinate travel. When surveys require air travel, it may be most cost-effective to ship supplies and materials to the survey site in advance. In this case, shipping fees would apply. If materials are not shipped, additional baggage fees may apply when baggage limits are exceeded, and extra time may be needed to clear airport security.

6.2.4 *Travel*—Travel time is a factor in developing the cost of the survey. The cost may be included in the billing rate of the consultants performing the survey or may be billed at a full hourly/daily rate, or reduced hourly/daily rate.

6.2.5 *Survey Personnel*—Surveys should preferably be performed in teams of two or more individuals in order to provide a more thorough inspection and to provide an added safety for the team members. Persons involved in the survey may include a Principal or Technical Director, Project Manager, and Survey Team Members.

6.2.5.1 The Principal/Technical Director has the overall authority and responsibility for the successful completion of the survey. The Principal/Technical Director should insure that the scope and technical aspects of the survey conform to regulatory and professional standards. The Principal/Technical Director is also responsible for the fiscal aspects of the survey and should insure that the budget for the survey is appropriate. The Principal/Technical Director typically has the highest billing rate of the personnel on the survey. His involvement is necessary at the beginning of the survey to review the proposed scope of work and budget, during the survey to review technical and budgetary progress, and at the completion of the survey to review the final work product to insure it is technically sound. On large surveys, the Principal/Technical Director may want to attend the Preliminary Site Visit (see 6.1.7.1).

6.2.5.2 The Project Manager has the responsibility for the survey team and the performance of the scope of work. The Project Manager should possess the experience and knowledge to complete the survey in the given survey environment. Accordingly, the Project Manager will have the highest billing rate for those in the field performing the work. The Project Manager is utilized in all phases of the survey.

6.2.5.3 Survey Team Members work with the Project Manager on-site to complete the scope of the survey. Team Members typically, have a lesser degree of experience than the Project Manager and as such have a lower hourly/daily rate. The Team member is utilized during the field survey and may be used to prepare sections of the report.

6.2.6 *Sample Login*—Sufficient time should be allowed to perform sample login following each sampling shift to insure that all samples are accounted for and proper chain-of-custody is maintained. Shipping to the laboratory will be determined by the time schedule of the survey or by the need to identify specific asbestos, or non-asbestos-containing material (see 6.4.9).

6.2.7 *Quantifying Asbestos-containing Materials*—Asbestos-containing materials (presumed and confirmed) should be quantified as part of the comprehensive asbestos survey. It may be possible to reduce the budget of the survey by postponing the quantification process until the laboratory reports are received allowing for the quantification of only the confirmed ACMs rather than all suspect materials. However, it may be most cost effective to develop quantities of limited homogeneous areas or when limited numbers of suspect ACMs are sampled, rather than returning to the survey site a second time. The Project Manager should determine the most cost-effective method of quantification of ACMs based on the specifics of the survey.

6.2.8 *Assessing Asbestos-containing Materials*—Physical and hazard assessments should be performed for asbestos-containing materials (presumed and confirmed) as part of the comprehensive asbestos survey. It may be possible to reduce the budget of the survey by performing these assessments after the laboratory reports are received so that only the confirmed ACMs are assessed rather than all suspect materials. However, it may be more cost effective to perform these assessments at the time of the survey when limited functional spaces, homogeneous areas or numbers of suspect ACMs are identified. The Project Manager should determine the most cost-effective method of assessment of ACMs based on the specifics of the survey.

6.2.9 *Data Review and Interpretation*—It is important to provide sufficient time to review the survey laboratory data and interpret the results. Time is needed to determine if appropriate

homogenous areas have been identified and to identify the need for follow up analyses such as PLM point count or confirmatory TEM.

6.2.10 Report preparation is performed by the Project Manager and the Survey Team members. Other individuals that may be utilized during report preparation include a draftsman/computer aided drafting designer and clerical staff. Completed reports should always be reviewed by a Principal/Technical Director or the Project Manager to insure compliance with the scope of work, standards of the industry, and technical competence.

6.2.11 *Laboratory Fees*—Laboratory fees will vary depending upon the location of the laboratory, the workload of the laboratory, the number of samples being submitted, the type of analyses requested, and the turn-around time for the results. Complete budgets for comprehensive surveys should include all analyses required for the completion of the survey. PLM analyses for a comprehensive building survey will include visual estimation at a minimum, and may include point count analyses. Quality control for PLM visual estimation will include sending duplicate samples to a second accredited laboratory.

6.2.11.1 *PCM Air Sample Analyses*—Personal air samples are required to comply with the OSHA asbestos in construction standard (29 CFR 1926.1101) for individuals who take bulk samples (see 8.2). Collection of area air samples may also be requested by the building owner. Collection of air samples is outside the scope of this Standard Practice.

6.2.11.2 *TEM Bulk Sample Analyses*—TEM analyses of bulk samples may be necessary for surveys located in specific cities or states. Additionally, TEM analyses is commonly used to verify a reported no asbestos detected result for non-friable materials by PLM.

6.2.12 *Travel/Subsistence Expenses*:

6.2.12.1 Survey budgets should identify appropriate travel costs. The cost to travel between locations will depend upon many factors, the main issues being the type of travel, the amount of travel time required and the billing rates of the individuals, and the distance traveled.

6.2.12.2 *Subsistence*—Subsistence is typically provided through a daily per diem for those traveling, which may or may not include lodging costs. The government rate of per diem for each city in the country is useful for planning purposes.

6.2.13 *Miscellaneous Expenses*—Additional factors contributing to the cost of a comprehensive survey include:

6.2.13.1 *Ladders, Lifts, Scaffolds*—It may be necessary to rent such equipment or to hire contractors with specialized equipment or expertise to access elevated materials or areas.

6.2.13.2 *Electricians*—It may be necessary to contract an electrician to de-energize systems prior to sampling, subject to the approval of the building owner.

6.2.13.3 *Abatement Contractors*—Abatement contractors may be utilized to assist with the construction of mini-enclosures to control fibers during sampling. Additionally, contractors may be hired to assist with abatement/removal budgets.

6.2.14 *Survey and Reporting Expenses*:

6.2.14.1 *Shipping*—It may be necessary to ship equipment and supplies to and from the survey site. The budget should also include sufficient resources to ship samples to the laboratory.

6.2.14.2 *Copying*—The survey budget should provide resources for copying the appropriate number of reports. The building owner may request the use of color in drawings and photographs, in which case it would be necessary to include appropriate reproduction charges.

6.2.14.3 *Film and Photograph Processing*, including preparation of digital files for a report in electronic format.

6.2.14.4 *Sampling Equipment and Supplies*, per X1.1.

6.3 *Obtaining and reviewing information*:

6.3.1 *Building or Facility Information*—Floor plans and drawings, records of construction, renovation and maintenance, and lists of equipment and furnishings should be reviewed when readily available for information that may indicate the existence of suspect ACM in functional spaces.

6.3.2 Records of asbestos activities, including previous surveys and occasional bulk sampling, should be reviewed. If samples taken during a previous survey confirmed the presence of more than one percent asbestos in a material, there is no need to re-sample that material during the present Baseline Survey, providing a sufficient number of samples were taken. For a material where samples taken during a previous survey reported less than one percent asbestos for the samples collected for the homogeneous area, the accredited inspector should determine whether there is a need to re-sample that material during the present Baseline Survey. The decision should take into account whether a sufficient number of samples were previously taken and if analytical methods were adequate.

6.3.3 Records of abatement and O&M work should be reviewed briefly for an indication of where ACM may have been removed or repaired. However, statements by the building owner regarding the absence of ACM due to previous abatement should be viewed with skepticism in the absence of suitable documentation and not used as the sole reason to dispense with inspecting any functional spaces.

6.4 *Conducting Field Work*:

6.4.1 *Mobilizing Equipment and Supplies*—See Appendix X1 for a detailed list of equipment needed for a sampling inspection. Respirators and other personal protective equipment needed are discussed in Section 8, and standard forms on which to gather information are presented in Appendix X3. The needs will be determined by the Preliminary Site Visit discussed in 6.1.7.1.

6.4.2 *Identifying and Inspecting Functional Spaces*—Functional spaces are identified for the purpose of locating homogeneous areas of suspect ACM and non-ACM, and the subsequent management of the ACM in a building. All functional spaces must be identified and located, with occupancy and use data if possible. Functional space identification should be by normal use label, or by blueprint identification. The labeling system used should be one familiar to building management.

6.4.3 *Identifying Suspect ACM*—It is important that suspect materials be classified as Surfacing Material, Thermal System

Insulation (TSI) or Miscellaneous Material as determined by direct application of the definitions in 3.2, as EPA and OSHA compliance depend on these classifications. Any other regulatory determination that may vary these classifications may be applied in addition to the referenced definition as a specific case may require.

6.4.3.1 Most building materials shall be considered suspect ACM and any person may assume that a suspect material contains asbestos. However, EPA and OSHA regulations permit only an accredited inspector to determine that thermal system insulation is fiberglass, foam glass, rubber, or other non-ACM without bulk sampling. The inspector must use his judgment in excluding apparently obvious non-asbestos materials such as glass, steel, concrete, porcelain and wood from sampling. The complete identification and location of all suspect materials in a building is basic and essential to a comprehensive building asbestos survey, and if in doubt as to possible asbestos content, the inspector should sample the material.

6.4.3.2 Record the date, manner of sampling, sample identification number, exact sample location, and sampling inspector identification and certification. The location of each bulk sample shall be recorded on a sample log and a schematic drawing of the building or space of the building from which the sample was collected if available. The sample location description should provide sufficient detail that a person unfamiliar with the building could locate the exact sample location without undue difficulty.

6.4.3.3 The suspect material must also be described in a useful and functional way, such as: floor tile, fireproofing, or pipe insulation. Avoid the use of in-house, company or construction industry acronyms in the report documents. Use material descriptions that will be meaningful to a person who may not be familiar with construction terminology.

6.4.4 *Quantifying Suspect ACM*—All suspect ACM must be quantified for bulk sampling procedures and for regulatory applicability and compliance purposes under the various federal regulations. Since the NESHAP regulation specifies a quantification standard applicable to renovation and demolition and annual O&M reporting, all suspect ACM shall be quantified according to that standard. This will facilitate preparing an annual O&M notification as well as laying the foundation for a possible Project Design Survey in event of an abatement project.

6.4.4.1 Pipe insulation must be quantified in linear feet (meters), and a notation made if fittings are included or quantified separately.

6.4.4.2 Other thermal system insulation, miscellaneous material, surfacing material and all other suspect material on facility components must be quantified in square feet (square meters).

6.4.4.3 Bulk waste or material not installed on facility components must be quantified in cubic feet (cubic meters).

6.4.5 *Identifying Homogeneous Areas and Sampling Locations*—All suspect ACM must be identified by homogeneous area of material. A homogeneous area is an area of material that is the same in color, texture, date of application and general appearance, wherever it may appear in the building. It must either be assumed to be ACM and managed as such, or sampled and proven to be ACM or non-ACM. The homogeneous area is the basis of identification of suspect ACM. To aid in determining homogeneous areas the color, texture, and appearance of the suspect materials should be described for all layers of the material when viewed from different vantage points. For example, when describing a suspect ceiling tile, the inspector should provide a description of the exposed surface when viewed from below, the composition of the interior of the ceiling tile and the concealed (top) portion of the ceiling tile. An appropriate description in this example could be: white 2 by 4 ft ceiling tile with small gouges and small holes producing a flower pattern on the exposed surface of the ceiling tile visible from beneath. The interior of the ceiling tile is tan with visible fibrous material. The top of the tile is red in color.

6.4.5.1 *Sample Locations*—Where feasible, the manner used to determine sample locations for any suspect material within a homogeneous area shall be the random sampling manner described in the EPA "Pink Book."

6.4.5.2 Without compromising safety, disturbing occupants or aesthetically damaging surfaces, use random sample locations for materials that may have been batch-mixed at the site. Such materials, which may vary in asbestos content throughout a homogeneous area, include fireproofing, ceiling and wall texture, acoustical plaster, hard plaster and pipe fitting insulation.

NOTE 5—The "Pink Book" describes a random sampling scheme for flat surfaces such as ceilings. For large cylindrical objects such as tanks and vessels, an equivalent "flat" surface is an area defined by the height or length of the object and its circumference. For homogeneous areas that are one-dimensional (linear), such as pipe insulation and fireproofed beams and columns, use a random number table to select sampling locations along the length of the item.

6.4.5.3 Random sample locations are less important for homogeneous areas where the asbestos content is expected to be relatively uniform due to product specifications. Such materials include floor tile and mastic, ceiling tiles, straight runs of pipe insulation and asbestos-cement products. Sheet vinyl flooring should be sampled randomly due to the uneven absorption of adhesive by the backing.

6.4.6 *Collecting Bulk Samples*, (also see Appendix X1). Bulk sample collection and analysis is used to determine the asbestos content of suspect materials identified during a survey. Sampling and analyses also distinguishes between suspect materials that appear identical in the field but may actually be different products. The proper homogeneous determination is of utmost importance to the person developing asbestos O&M programs and designing removal projects and other response actions. A sufficient number of bulk samples should be collected of suspect materials throughout a facility to thoroughly characterize the asbestos content. The samples should be spaced throughout the facility in such a manner to adequately cover all elevations, wings, additions, and renovations.

6.4.6.1 *Number of Samples to be Collected*—This standard practice encourages the collection of samples beyond the minimum numbers recommended below to ensure that homogeneous areas are defined as accurately as practical.

6.4.6.2 A minimum of three bulk samples representative of each distinct homogeneous area of suspect thermal system insulation material (TSI) should be collected. One sample should be collected of each TSI patch. For the purpose of this standard, a patch is a distinct location or replacement or repair which is less than or equal to 6.0 ft (1.82 m) or 6.0 ft^2(0.557m^2).

6.4.6.3 A minimum of three bulk samples shall be collected of each homogeneous miscellaneous material, except that a single sample may suffice for small manufactured items such as HVAC vibration dampeners, gaskets and friction products.

6.4.6.4 A minimum of three bulk samples shall be collected of surfacing materials of less than 1000 ft^2 (93 m^2). A minimum of five bulk samples shall be collected of homogeneous surfacing materials ranging between 1000 to 5000 ft^2 (93 to 465 m^2) and a minimum of seven bulk samples shall be collected of surfacing material >5000 ft^2 (465 m^2). The inspector should attempt to collect samples of surfacing from each wing, floor and/or level of large facilities.

6.4.6.5 Collection methods and equipment are provided in Appendix X1 for a wide range of suspect materials. For many materials, disposable coring devices are the most practical means of talking a bulk sample. Maintaining the integrity of layered samples, sample containers for friable and non-friable materials, labeling of sample containers, sample packaging and sample labeling are discussed in detail in Appendix X1.

6.4.7 *Identifying Presumed/Assumed ACM*—When conducting a baseline survey for asbestos management and planning in a building that will remain occupied, it may be more appropriate to assume that some suspect materials are ACM, rather than sample to prove that they are not. When this is done, these materials must be listed in the report as "Assumed ACM" rather than "ACM." This means that they have never been sampled, but must be treated as ACM. In most cases, they would then be sampled later in a Project Design Survey (see Section 7). It may be more appropriate to assume rather than sample when maintaining the integrity of a fire rated assembly, maintaining an undamaged aesthetic appearance, complying with restrictions on sampling for safety reasons, or if access is not provided to a functional space or a concealed space. An example of such an assumption for a concealed space would be an inaccessible chase where the insulation on the pipes in the chase resembles that on the pipes to which they connect in the plenum and the insulation of the pipes in the plenum is confirmed, assumed or presumed to be ACM." Regulatory requirements on presuming (OSHA) or assuming (EPA) materials to contain asbestos must be followed.

6.4.8 *Documentation of Field Work*—See Appendix X3 for sample forms with which to document field work.

6.4.9 *Sample Processing*—After the samples are collected, they must be processed for shipment to the laboratory.

6.4.9.1 *Chain of Custody*—The control and custody of the bulk samples from collection to submission to an accredited laboratory should be documented with a chain-of-custody document. The bulk sample numbers for each sample set should be entered on the chain of custody. The action taken on the sample at the time when the custody of the samples change should be documented and attested to by the signature by those participating in the custody change. This standard practice understands that shipping of bulk samples to laboratories is common practice. Prior to shipping the samples should be properly labeled and sealed to prevent tampering or inadvertent opening by those other than the intended recipient. It is not necessary for the courier to sign the original chain of custody as their handling of the samples is documented with the routing paper work provided through billing. When samples are shipped, it is the recipients' responsibility to inspect the sample packaging to ensure that tampering has not taken place. A signature of receipt signifies that the package was inspected and the samples had not been damaged or tampered during shipping.

6.4.9.2 Quality control samples, split samples and archived samples should be prepared during sample processing and sent to the proper laboratories for analysis or stored in a secure location under the control of the accredited inspector.

6.5 *Bulk Sample Analysis*—Analysis of the bulk samples must consider the type(s) of analysis to be performed and whether it is necessary to analyze all of the samples collected. Reporting of laboratory results is an integral part of the analytical effort.

6.5.1 *Analytical Methods*—For most materials, PLM is adequate to establish the presence of asbestos in materials and to quantify it to a reasonable degree of precision by the technique known as visual estimation. PLM and visual estimation of asbestos content may be relied on to establish the presence of asbestos in amounts greater than one percent for any material, which means it must be treated as asbestos-containing. Additionally, analyses by PLM with visual estimation may be relied upon to conclude that friable suspect materials do not contain asbestos with a result of "no asbestos detected." In the event the laboratory reports a result of trace, less than one percent or one percent, additional analyses is necessary as discussed below.

6.5.2 PLM with visual estimation of asbestos content may not be relied on for establishing the amount of asbestos in a material as being equal to or less than one percent, which would exclude it from consideration as asbestos-containing. To do this, analytical procedures such as point-counting, gravimetric methods, Transmission Electron Microscopy, or the "Chatfield method" must be used. These procedures are required to confirm that asbestos is not present above one percent in materials sometimes referred to as "Non-friable Organically Bound" or "NOB" materials. The most common application of this requirement is vinyl asbestos floor tile, but these procedures should be considered for any material where small fiber size and the presence of interfering substances render Polarized Light Microscopy unreliable for definitive confirmation of asbestos content below one percent. It is common for laboratories to include a disclaimer to this effect on the sample results.

NOTE 6—Although not considered an "NOB" material, loose fill insulation containing vermiculite presents difficulties in the detection of amphibole asbestos using conventional PLM techniques. This standard practice recommends that loose fill insulation be analyzed for the presence of vermiculite and, if it is found, that the presence of asbestos contamination be assumed regardless of whether asbestos in any form and at any concentration is identified. The survey report should include appropriate

precautions against exposure to asbestos fibers that may be present in vermiculite loose fill insulation. Archive samples of the insulation should be retained for analysis at such future time when more definitive and accurate analytical methods become available.

6.5.3 *Protocol for Confirmation of Results*—Protocols exist for the number of samples required to be analyzed for the confirmation of positive (>1 % asbestos) and negative (≤1 % asbestos, including "NAD") results. One positive sample from a homogeneous area can be considered evidence that all suspect material in that homogeneous area contains asbestos without analyzing he remaining samples. This is sometimes referred to as the "positive stop" approach. Factors to consider in deciding whether to use this approach include the following:

6.5.3.1 *The Inherent Homogeneity of the Material*—Straight runs of pipe insulation, ceiling tiles, pipes, ducts and panels of siding, for example, were manufactured to specifications that included the amount of asbestos in the product. Therefore, if one sample from such a material contained asbestos, the remaining samples from similar-appearing materials could reasonably be expected to do so as well. On the other hand, batch-mixed materials such as fireproofing, ceiling and wall texture, acoustical plaster, hard plaster and pipe fitting insulation ("mudded joints") are more likely to vary in their asbestos content. This will not be apparent to the inspector who is taking the samples, and is due to adding the asbestos fiber at the job site or mixing asbestos-containing products with other materials, thereby diluting the asbestos content. For this reason, a single positive sample may not be indicative of the overall homogeneous area and all samples should be analyzed to determine if more than one homogeneous area actually exists, including some where no asbestos is present.

6.5.3.2 *The Relative Uncertainty of Analytical Results*—If a sample contains more than ten percent asbestos, it is highly unlikely that another sample from the same homogeneous area will have ≤1 % asbestos, or no asbestos at all. As the reported asbestos content approaches 1 %, the variability of the reported asbestos content increases to the point where confirmation by analyzing more samples is advisable.

6.5.3.3 *The Uncertainty of Identifying Homogeneous Areas*—Identification of homogeneous areas is a matter of judgment, and using "positive stop" could result in treating material as asbestos-containing because it was incorrectly included in a homogeneous area from which only one sample was positive. If there is any doubt as to the homogeneity of a sampling area, all samples from that area should be analyzed. For example, fireproofing in a facility may appear identical in color and texture (tan high density); however, it is possible that the fireproofing may be two distinct materials, one with intentionally added asbestos and the other a non-asbestos containing replacement product. In this example, the inspector would identify the two distinct homogeneous materials (products) as one homogeneous area and could cause unnecessary expense to the facility owner by removing or performing other response actions on non-ACM materials. Complete and proper sampling of these materials should be performed to identify inconsistencies within designated homogeneous areas.

6.5.3.4 *The Ultimate Value of the Information*—For purposes of managing asbestos, the elimination of functional spaces from consideration reduces the number of employees and contractors affected. The resultant cost saving and other intangible benefits can easily outweigh the additional analysis and documentation costs. If a decision is made to abate the ACM, reducing the quantities reported on the NESHAP notification will, in some jurisdictions, reduce the notification fees. Of course, other abatement costs will also be reduced.

6.5.4 *Reporting Analytical Results*—To confirm the absence of asbestos in amounts greater than one percent, the minimum number of negative (≤1 % or "NAD") samples required is set by various regulatory requirements.

6.5.4.1 The NESHAP regulation requires that visual estimation of asbestos content reported as ≤1 % or trace quantities be confirmed by "point-counting" to exclude a material from treatment as ACM. Confirmation by gravimetric methods or the "Chatfield method" for NOB and other materials is also acceptable. A result of "NAD" for "No Asbestos Detected" means that no asbestos fibers were identified on three replicate slide mounts from the same sample under Polarized Light Microscopy. Point-count analyses are not required for samples reported as having no asbestos detected.

6.5.4.2 Given the acceptability of the analytical procedure, regulations require that a minimum number of samples be analyzed as negative for asbestos. The most familiar of these requirements are found in the AHERA regulations at 40 CFR Part 763, §763.86, which are also referenced for surfacing material and thermal system insulation in the OSHA construction standard at 29 CFR 1926.1101(k)(5). The number of samples required to exclude a material from treatment as asbestos-containing depends on the type of material and, for surfacing material, the area. Compliance with these requirements may dictate analysis of all samples collected per 6.4.6.1-6.4.6.4 to verify the absence of asbestos at the regulated level.

6.5.4.3 The laboratory results should be very clear on what is meant by "trace" and "NAD" if these terms are used. The accepted definition of "NAD" is given in 6.5.4.1. "Trace" usually means that at least one asbestos fiber was identified in the sample but the amount was estimated at one percent or less. However, the use of this term varies among laboratories and the specific meaning assigned to the analytical results should be requested. In no case should a "Trace" result based on PLM with visual estimation be used to exclude material from treatment as asbestos-containing without confirmation by point-counting, gravimetric or TEM analysis.

6.6 *Assessment of ACM*—For purposes of deciding whether to abate ACM or continue managing it in place, and to select the appropriate response actions, the ACM must be assessed according to one of the protocols in Appendix X2. Particularly when a large number of functional spaces and homogeneous areas are included in the survey, assessments are a valuable tool in setting priorities for response actions. Assessments complement, but do not replace, experience and common sense when determining priorities for response actions.

6.6.1 Qualitative assessments include the "AHERA" categories (undamaged, damaged, significant damaged, potential for damage, potential for significant damage, and remaining undamaged ACBM with low potential for damage) and other classification systems (good/fair/poor, accessible, etc.), hazard

ranking, response action priorities and recommendations (abatement, O&M) for controlling the asbestos hazard.

6.6.2 Quantitative assessments are based on numerical ratings for Current Condition and Potential for Disturbance. Tabulation of assessment ratings and preparation of Abatement versus O&M decision charts are used to develop recommendations for response actions.

6.7 *Preparing a Report*—The Baseline Survey report is developed from the information collected during the field work, the laboratory results and the assessment. Using forms compatible with the survey report requirements, including electronic formats and file structures, for data collection and manipulation facilitates this process.

6.7.1 Appendix X3 contains a set of forms that can be used as templates for collecting and manipulating the survey information, as well as compiling it in the form of the survey report. In addition to the forms in this appendix, drawings must be prepared (or marked up) showing the functional spaces inspected, locations of samples taken and the locations of confirmed or presumed ACM.

6.7.2 Copies of field data sheets filled in during the inspection, copies of laboratory results and copies of inspector and laboratory credentials should be included as appendices to the hardcopy version of the survey report, or scanned for inclusion in an electronic copy. Unless the building owner has specified the use of color in the survey documentation, homogeneous areas and functional spaces should be identified in black and white on the survey drawings to facilitate copying survey reports without a loss of information in the reproduction process.

6.7.3 Before submitting the survey report to the building owner, it should be reviewed by the Survey Team Members who conducted the field work and by the person who performed the assessments. If applicable, it should also be reviewed by the Project Manager and Principal/Technical Director (see 6.2.5).

7. Project Design Surveys

7.1 The Project Design Survey differs from the Baseline Survey in that it is limited to the functional space(s) in the building or facility that are going to be affected by an abatement project. Besides this limitation, other factors define the scope and conduct of a Project Design Survey.

7.1.1 OSHA regulations require that certain persons and agencies be notified of the presence of ACM whenever abatement takes place. For renovation and demolition, the NESHAP regulation requires verification that asbestos-containing materials were looked for and, if any are found, the categories and quantities must be reported. The AHERA regulations require that a project design be prepared for abatement of friable ACM in schools. Some local agencies require that an asbestos survey be conducted as a condition of issuing a building permit for renovation.

7.1.2 If a Baseline Survey has provided sufficient information on ACM in an area to be impacted by an abatement project, the information from that survey will satisfy the regulatory notification requirements without conducting additional survey activities. However, a Project Design Survey is still needed for other purposes as described herein.

7.1.3 As the main purpose of the Project Design Survey is to provide information for preparing abatement plans and specifications, the person who conducts the survey should be accredited as a Project Designer. If he signs the contract documents, accreditation is mandatory.

NOTE 7—ACM is frequently removed without the preparation of plans and specifications, particularly from industrial facilities. Unless the abatement contractor or an in-house staff member is accredited as a Project Designer, it is prudent to avoid using the term “project design” or similar terminology when documenting the work. While the concepts and approaches in this section may still be useful in such cases, reference to this standard in project documents is discouraged to avoid the appearance of a project design being prepared by an unqualified person. The best course of action is to have the plans and specifications prepared by an accredited Project Designer.

7.1.4 Presumption or assumption of asbestos content is not permitted for a Project Design Survey. All suspect materials are sampled and analyzed so that materials which were not determined to be asbestos-containing may be left in place.

7.1.5 Unless decisions still remain to be made as to whether to remove ACM or leave it in place, assessments as described in Appendix X2 are not performed for a Project Design Survey.

7.2 *Perform the Planning Activities Necessary for the Survey*:

7.2.1 If a Baseline Survey has been conducted, review the portions of the survey report pertaining to the functional space(s) that may be affected by the abatement project. The scope of the project may be determined by renovation or demolition, in which case the plans and specifications prepared by the architect or engineer should be consulted, regardless of whether or not a Baseline Survey has been performed.

NOTE 8—If the abatement project will precede a renovation or partial demolition, consult the architectural or engineering drawings to determine the “limits of construction.” The Project Design Survey should include all spaces within these limits, as well as adjacent areas where ACM may be disturbed by construction activities. ACM within this expanded area must also be abated, and the survey must define these “limits of abatement.” It may be necessary, for example, to abate ACM on floors above and below the floor on which renovation is taking place, or in an adjacent attic or crawl space.

7.2.2 Decide who conducts the survey—a consultant or in-house staff—and select the analytical laboratory to be used. Whoever conducts the survey must be qualified according to Section 5 and the laboratory must be qualified to perform the type of bulk sample analysis required.

7.2.3 Establish the scope of the survey to include the buildings and facilities or portions thereof impacted by the abatement requirements.

7.2.4 Determine the required number of bulk samples by type and location of suspect ACM that may be present in the areas affected by the abatement. It may not be necessary to sample some materials if the contemplated abatement will not disturb them. However the design team may make the determination that it may be beneficial, from a cost standpoint, to include these materials in the abatement project.

7.2.5 Determine the analytical requirements and decide whether the primary method of analysis—PLM—must be supplemented by PLM with point-counting or by TEM. Establish a protocol for results with ≤1 % asbestos.