

**QUALITY ASSURANCE PROJECT PLAN  
ASBESTOS AND HAZARDOUS SUBSTANCES REMOVAL  
OVERSIGHT  
DUPLEX 60, 61 & 63 BUILDINGS  
FAIRFIELD HILLS CAMPUS  
NEWTOWN, CONNECTICUT**

**JANUARY 11, 2011**

PREPARED FOR:

**TOWN OF NEWTOWN  
NEWTOWN, CONNECTICUT**

PREPARED BY:

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**Document Title:** Quality Assurance Project Plan, Asbestos and Hazardous Substances  
Removal Oversight, Duplex 60, 61 & 63 Buildings, Fairfield Hills  
Campus, Newtown, Connecticut, January 11, 2011

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**Approvals:**

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RUSSELL BARTLEY 2/23/11  
Printed Name/Date

TRC, Project Manager and Field Supervisor: Henry J. Laliberte Signature

Henry J. Laliberte 3/10/11  
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M. Jerry Minor-Gordon 3/22/11  
Printed Name/Date

U.S. EPA Quality Assurance Officer: Nora J. Conlon Signature

Nora J. Conlon 3/22/2011  
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**Distribution List:** The following individuals will receive copies of the approved Quality Assurance Project Plan (QAPP) and subsequent revisions.

M. Jerry Minor-Gordon, EPA, Project Manager  
Elizabeth Stocker, Town of Newtown, Project Manager  
Henry Laliberte, TRC, Project Manager and Field Supervisor  
Russell Bartley, R. W. Bartley & Associates, Project Manager  
Ronald Skomro R. S., Connecticut Department of Public Health

**Project/Task Organization:** The individuals participating in the project and their respective responsibilities are:

**M. Jerry Minor-Gordon, EPA Project Manager** - a decision maker for the project and a primary user of the data to determine if the building materials are properly assessed and re-occupancy cleared. Mr. Minor-Gordon's duties are:

1. Project oversight
2. Reviewing and approving the QAPP and subsequent revisions in terms of program-specific requirements

**Elizabeth Stocker, Town of Newtown, Project Manager** - the primary decision maker for the project and the primary user of the data to determine if the building materials are properly assessed and re-occupancy cleared. Ms. Stocker's duties are

1. Overall responsibility for the assessment and materials abatement
2. Reviewing and approving the QAPP and subsequent revisions in terms of program-specific requirements
3. Reviewing reports and ensuring plans are implemented according to schedule
4. Making final project decisions with the authority to commit the necessary resources to conduct the project

**Russell Bartley, R.W. Bartley & Associates, Project Manager** - The Project Manager will coordinate the project activities and his specific responsibilities will include:

1. Review and approval of the QAPP
2. Reporting to the Town of Newtown's Project Manager regarding the project status per the work order
3. Determination of project direction and making of project decisions
4. Quality assurance review of field information
5. Quality assurance review of project reports

**Henry Laliberte, TRC Project Manager and Field Supervisor** – The TRC Project Manager/Field Supervisor will perform the following duties:

1. Select the field oversight/sampling team
2. Ensure the project activities are conducted in accordance with the QAPP and work scope
3. Ensure the field oversight/sampling activities are conducted per the approved QAPP and supervise the field sampling team
4. Supervision of selection of building materials to be sampled and materials included in homogeneous areas
5. Distribute the approved QAPP and subsequent revisions to the members of the field oversight/sampling team
6. Report field problems to the R.W. Bartley & Associates Project Manager
7. Coordinate field and laboratory activities
8. Validate the field procedures and sampling procedures

**Kathleen Williamson, TRC Laboratory Director** – The TRC Laboratory Director will perform the following duties:

1. Supervising the acceptance of field samples
2. Supervising the analysis of samples including performance of all laboratory and sample analysis QA/QC requirements
3. Reporting of all non-compliance with QAPP procedures
4. Implementation of corrective action for all non-compliant procedures
5. Laboratory data validation and reporting

The TRC Laboratory Director will report to the TRC Project Manager. The TRC Project Manager will report to the R.W. Bartley & Associates Project Manager. The R.W. Bartley & Associates Project Manager will report to the Town of Newtown Project Manager.

The Fairfield Hills Campus is part of the former State of Connecticut Mental Health Hospital property. The hospital was operated by the State of Connecticut from the mid 1930s until it was closed in 1996.

The portion of the property that contained the institutional buildings, the “campus” portion of the property, and a portion of the property along Deep Brook was offered by the State of Connecticut to the Town of Newtown for purchase. The Town purchased the property in 2002. The master plan for development of the property indicates a mix of town use and private use. Private use is to be through the renovation and leasing of existing buildings with the town retaining ownership of the buildings and land.

Private concerns have expressed interest in leasing and renovating existing buildings for various enterprises, but no deals have been consummated. This is likely, in a large part, due to the poor economy and lack of financing, but also because of the cost of building renovations. A significant portion of the cost of these renovations is the removal of hazardous substances and asbestos-containing materials from the buildings.

In 2010 the Valley Council of Governments, Lower Naugatuck Valley (VCOG) received a EPA Brownfields regional grant. In the Fall of 2010 the VCOG made a regional Brownfields sub-grant to the Town of Newtown in the amount of \$100,000. This Brownfields sub-grant awarded to the Town of Newtown by the VCOG is hereinafter referred to as the VCOG/EPA Brownfields grant. The purpose of the grant is to remove hazardous substances and asbestos-containing materials from the Fairfield Hills campus Duplex buildings 60, 61, and 63. The purpose of this project is to eliminate the potential exposure of the public, town personnel, and contractors to these materials, and to facilitate the leasing and renovations of these buildings by lowering the cost of renovation to private party/enterprise(s).

There are two primary phases of the project:

1. The preparation of plans and specifications for asbestos abatement and hazardous substances removal, and
2. Asbestos abatement and hazardous substances removal.

Hazardous substances surveys have previously been completed. In the survey report all asbestos-containing materials (>1% asbestos) were identified for removal; all building components usually containing hazardous substances (e.g., thermostats containing mercury, equipment containing lead acid batteries, fluorescent fixtures containing PCB ballasts, etc.) were identified and cataloged for removal; and lead paint was identified for worker protection purposes, as painted surfaces will be disturbed during abatement activities.

Plans and specifications are being prepared for asbestos abatement, activities impacting lead paint, and removal of items that may contain hazardous substances. The work will then be bid, a contractor selected, and asbestos materials and items that may contain hazardous substances will be removed from the building and recycled or disposed of at appropriately-licensed disposal facilities.

Preparation of the plans and specifications is anticipated to take two weeks. The project will be bid and abatement is expected to begin one month after the completion of the plans and specifications. Abatement will take approximately one month. A completion/compliance report will be issued approximately three weeks after abatement is completed.

Three types of sampling may/will be performed related to the removal of asbestos-containing building materials, as follows: 1) bulk sampling of building materials not sampled during the asbestos survey may be performed to determine if the specific building materials contain asbestos; 2) paint in the interior and on the exterior of the building may be measured for lead content using on-site XRF technology, if not covered in the existing survey, to identify and quantify lead-based paint so workers that will be impacting materials can be appropriately protected; and 3) air sampling for asbestos fibers will be performed to determine appropriate worker protection, to assess abatement controls, and for building re-occupancy clearance sampling.

No sampling will be performed related to the identification and removal of potential hazardous substances containing items as these will be identified and manifested off of the property based on presumed content. Below are items in the buildings currently identified that can contain hazardous substances:

Quantity	Size	Material/Item	General Location	Potential Hazard
<b>DUPLEX 60</b>				
2		Ballasts	60L <sup>1</sup> – kitchen	CRW <sup>2</sup> – PCB ballasts
3		Bulbs		UW <sup>3</sup> – Hg lamps
1		Thermostat	60L – living room	UW – Hg ampoule
1		Electrical panel box	60L – basement	UW – used electronics (printed circuit boards)
1		Smoke detector	60L – 2 <sup>nd</sup> floor hall	Low-level radioactive source
1		Fuse box	60L – kitchen closet	UW – used electronics (printed circuit boards)
1		Fuse box	60R <sup>4</sup> – kitchen closet	UW – used electronics (printed circuit boards)
1		Electrical panel box	60R – basement	UW – used electronics (printed circuit boards)
1		Smoke detector	60R – 2 <sup>nd</sup> floor hall	Low-level radioactive source
1	250 gal	Oil tank	60R – basement	CRW – oil
11		Bulbs	60R – basement	UW – Hg lamps
1	5 gal	Antifreeze	60R – basement	CRW – waste chemical liquid
<b>DUPLEX 61</b>				
1		Smoke detector	61L – 2 <sup>nd</sup> floor hall	Low-level radioactive source
1	9 volts	Battery	61L – 2 <sup>nd</sup> floor hall	UW – batteries
1		Dial pump soap	61L – 2 <sup>nd</sup> floor bathroom	CRW – waste chemical liquid

<sup>1</sup> Left side of duplex

<sup>2</sup> CRW-Connecticut Regulated Waste – PCBs (CR01), Oils (CR02/CR03), waste chemical liquids - antifreeze, latex & solvent paints, sludges, etc. (CR04), waste chemical solids (CR05)

<sup>3</sup> UW-Universal Waste (batteries, thermostat ampoules, fluorescent lamps, used electronics)

<sup>4</sup> Right side of duplex



Quantity	Size	Material/Item	General Location	Potential Hazard
2		Fluorescent lights w/ballasts	61L – Kitchen	UW – Hg lamps CRW – PCB ballasts
1		Television	61L – Basement	UW – used electronics
1	275 gal	AST	61L – Basement	CRW – oil
1	4 oz	Stain stick	61L – Basement	CRW – waste chemical liquid
2		Halogen bulbs	61 exterior A-side	UW – Hg lamp
1		Halogen light fixture	61 exterior D-side	UW – Hg lamp
Unknown		Deteriorated lead paint	Throughout 61R	T <sup>5</sup> , (Pb)
1		Fluorescent light	61R – kitchen	UW – Hg lamp
1		Ballast	61R – kitchen	CRW – PCB ballasts
1		Mercury thermostat	61R – Living room	UW – Hg ampoule
1		Smoke detector	61R – 2 <sup>nd</sup> floor hall	Low-level radioactive source
<b>DUPLEX 63</b>				
1		Spray-n-wash laundry/stain remover spray can	63L – Basement	I <sup>6</sup>
Various		Circuit board panels	63L – Basement	UW – used electronics (printed circuit boards)
1		Doorbell box	63L – Kitchen	UW – used electronics (printed circuit boards)
1		Fuse box	63L – Kitchen closet	UW – used electronics (printed circuit boards)
1		Smoke detector	63L – 2 <sup>nd</sup> floor hall	Low-level radioactive source
Various		Circuit board panels	63R – Basement	UW – used electronics (printed circuit boards)
1		Fuse box	63R – Kitchen closet	UW – used electronics (printed circuit boards)
1		Mercury thermostat	63R – Living room	UW – Hg ampoule
1		Bar soap	63R – 2 <sup>nd</sup> floor bathroom	CRW – waste chemical solid
1	15 fl oz	Pert Plus shampoo	63R – Master bathroom	CRW – waste chemical liquid
1		Smoke detector	63R – 2 <sup>nd</sup> floor hall	Low-level radioactive source
1	24 fl oz	Signal mouthwash	63R – 2 <sup>nd</sup> floor hall	CRW – waste chemical liquid

A complete sampling survey and inventory of asbestos-containing building materials, lead-based paint, and building components and contents containing miscellaneous hazardous substances has been performed for these buildings. This information will be used in the preparation of the abatement plans and specifications.

<sup>5</sup> T-Toxic - may contain ingredients which are harmful if swallowed or which release vapors that can cause irritation

<sup>6</sup> I-Ignitable - may contain ingredients which are ignitable (materials which have a flashpoint <140°F) (D001)

A Connecticut Certified Asbestos Inspector from the TRC Environmental Corporation performed sampling surveys of the Duplex buildings 60, 61, and 63. The asbestos-containing materials based upon this assessment in each of the buildings are estimated as follows:

**Duplex 60**

<b>Material</b>	<b>Estimated Quantity</b>
Floor tiles and mastic	650 SF <sup>7</sup>
Sink undercoat	2
Ceramic tile glue	450 SF
Attic damp proofing	300 SF
Pipe insulation	350 LF <sup>8</sup>
Floor surfacing plaster	650 SF
Window glazing and caulk	42 Windows
Door caulk	4 Doors
Transite roof shingles	3,400 SF
Flashing cement	200 SF
Tar paper	300 SF

**Duplex 61**

<b>Material</b>	<b>Estimated Quantity</b>
Floor tiles and mastic	650 SF
Glue behind wall tiles	320 SF
Vapor barrier under transite shingles	3400 SF
Pipe insulation	350 LF
Floor surfacing plaster	650 SF
Window glazing and caulk	40 Windows
Door caulk	6 Doors
Transite roof shingles	3,400 SF
Flashing cement	250 SF

<sup>7</sup> Square feet

<sup>8</sup> Linear feet

## Duplex 63

<b>Material</b>	<b>Estimated Quantity</b>
Floor tiles and mastic	650 SF
Sink undercoat	2
Ceramic tile glue	450 SF
Attic damp proofing	300 SF
Pipe insulation	350 LF
Floor surfacing plaster	650 SF
Window glazing and caulk	42 Windows
Door caulk	4 Doors
Transite roof shingles	3,400 SF
Vapor barrier under transite shingles	3400 SF
Flashing cement	250 SF
Tar paper	300 SF

Individuals that conducted and supervised the asbestos sampling surveys were Asbestos Hazard Emergency Response Act (AHERA)/EPA trained, and Connecticut Department of Public Health licensed asbestos inspectors specifically trained to identify and sample building materials that may contain asbestos. Any further sampling will be conducted by personnel with equivalent training and certification.

Interior asbestos-containing materials will be removed as part of this project. Exterior asbestos-containing materials such as roofing shingles, window caulking/glazing, and roofing flashing cement will not be removed as removal of these materials would expose the interiors of the buildings to weather conditions.

### **Bulk Sampling**

The asbestos survey was conducted, and all additional asbestos bulk sampling, will be conducted in accordance with the Environmental Protection Agency (EPA) Asbestos National Emission Standard for Hazardous Air Pollutants (NESHAP) regulations for building demolitions or renovations (40 CFR 61 Subpart M). The quantity of samples collected and analyzed will meet the NESHAP and AHERA requirements. Bulk asbestos samples will be analyzed by Polarized Light Microscopy (PLM), EPA Method 600/R-93/116. Some of these samples may require additional analysis by transmission electron microscopy (TEM) via EPA/600/R-93/116 Section 2.5.

Asbestos bulk samples will be collected in accordance with the guidelines established by EPA AHERA (40 CFR 763), OSHA 29 CFR 1926.1101, and EPA Asbestos NESHAP 40 CFR 61, Subpart M. Specifically, samples will be collected in accordance AHERA Federal Regulations Chapter 40, Part 763, Subpart E, Sections 763.86 and 763.87(c)(2) as detailed below.

Material to be sampled will be classified into one of three categories: surfacing material, thermal system insulation, or miscellaneous material, and sampled as follows:

**§ 763.86 Sampling.**

**(a) *Surfacing material.*** An accredited inspector shall collect, in a statistically random manner that is representative of the homogeneous area, bulk samples from each homogeneous area of friable surfacing material that is not assumed to be ACM, and shall collect the samples as follows: (1) At least three bulk samples shall be collected from each homogeneous area that is 1,000 ft<sup>2</sup> or less, except as provided in § 763.87(c)(2). (2) At least five bulk samples shall be collected from each homogeneous area that is greater than 1,000 ft<sup>2</sup> but less than or equal to 5,000 ft<sup>2</sup>, except as provided in § 763.87(c)(2). (3) At least seven bulk samples shall be collected from each homogeneous except as provided in § 763.87(c)(2).

**(b) *Thermal system insulation.*** (1) Except as provided in paragraphs (b) (2) through (4) of this section and § 763.87(c), an accredited inspector shall collect, in a randomly distributed manner, at least three bulk samples from each homogeneous area of thermal system insulation that is not assumed to be ACM. (2) Collect at least one bulk sample from each homogeneous area of patched thermal system insulation that is not assumed to be ACM if the patched section is less than 6 linear or square feet. (3) In a manner sufficient to determine whether the material is ACM or not ACM, collect bulk samples from each insulated mechanical system that is not assumed to be ACM where cement or plaster is used on fittings such as tees, elbows, or valves, except as provided under § 763.87(c)(2). (4) Bulk samples are not required to be collected from any homogeneous area where the accredited inspector has determined that the thermal system insulation is fiberglass, foam glass, rubber, or other non-ACBM.

**(c) *Miscellaneous material.*** In a manner sufficient to determine whether material is ACM or not ACM, an accredited inspector shall collect bulk samples from each homogeneous area of friable miscellaneous material that is not assumed to be ACM.

**(d) *Nonfriable suspected ACBM.*** If any homogeneous area of nonfriable suspected ACBM is not assumed to be ACM, then an accredited inspector shall collect, in a manner sufficient to determine whether the material is ACM or not ACM, bulk samples from the homogeneous area of nonfriable suspected ACBM that is not assumed to be ACM.

**763.87 Analysis.**

**(c) (2)** A homogeneous area shall be determined to contain ACM based on a finding that the results of at least one sample collected from that area shows that asbestos is present in an amount greater than 1 percent.

**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 amounts of 1 percent or less. (2) A homogeneous area shall be determined to contain ACM based on a finding that the results of at least one sample collected from that area shows that asbestos is present in an amount greater than 1 percent.**

Asbestos bulk samples analyzed for asbestos will be by laboratories accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) and the State of Connecticut Department of Public Health (CTDPH).

All additional asbestos bulk sample locations will be documented on building diagrams, labeled on the building material sampled, and documented on the chains-of-custody. Equipment used may include utility knife, wood chisel, scraper, steel trowel, etc.; and amended water mist spray bottles. All non-disposable equipment involved in field sampling will be decontaminated prior to and after sampling. To prevent cross-contamination between samples, the tools used during asbestos sampling will be cleaned with water and wiped dry prior to the collection of each bulk sample.

Bulk asbestos samples will consist of approximately 1 square inch of material to be tested. The sample will be sealed in a plastic bag. There is no holding time for asbestos. There are no preparation or preservative requirements.

### **Air Sampling**

Asbestos air sample collection will be performed in accordance with NIOSH Method 7400 - Asbestos and Other Fibers by PCM, NIOSH Method 7402 - Asbestos by TEM, or the AHERA/CTDPH reoccupancy clearance protocols for TEM clearance testing in 40 CFR Part 763 Subpart E, Appendix A.

Personal exposure samples will be collected at a rate of 1.5-2.5 liters per minute (lpm) for a full workshift (6-8 hours) for a resulting total volume of approximately 0.54-1.2 cubic meters (m<sup>3</sup>). The quantification limit for this volume should be less than the 8-hour time-weighted worker exposure limit of 0.1 fibers per cubic centimeter of air (f/cc).

Air volumes taken for clearance sampling shall be sufficient to accurately determine (to a 95 percent probability) fiber concentrations to 0.01 f/cc of air via PCM or 70 structures per square millimeter (s/mm<sup>2</sup>) via TEM (1,200 liters), and shall be collected at 10 lpm for TEM and between 10-16 lpm for PCM.

Pump flow rates of each sampling pump, with a representative sampler in line, will be measured before and after sample collection with a field rotameter, precalibrated to a primary standard. A suitable rotameter will be connected to the filter inlet, the flow screw adjusted to the desired sampling value, and the flow rate observed on the rotameter will be verified as constant for a minimum of 20 seconds. Flow rates will be recorded on Field Sampling Data Sheets.

Immediately prior to collecting samples, the sampler will be fastened to a location (e.g., on a tripod for indoor samples or attached to the inspector for personal air samples) near the individual's breathing zone (four to six feet above grade). The top cover of the filter cassette cowl extension ("open face") will be removed and positioned "face down" in the sampler.

At the end of the sampling period, the top cover and small end caps are replaced. Samples are transported upright to the laboratory in a rigid container with packing material to prevent jostling or damage. To avoid electrostatic forces from causing fiber loss from the sampling filter, untreated polystyrene foam will not be used for any of the shipping container materials for asbestos samples.

Equipment and supplies utilized with this sampling approach are as follows:

- Low flow, battery-powered personal sampling pump (or equivalent) - 1.5-2.5 lpm for personnel protection sampling
- Battery pack - rechargeable lithium ion battery pack (or equivalent), fitted with a belt clip, compatible with the personal sampling pump.
- High volume, electric sampling pump – 10-16 lpm for clearance air sampling.
- Filters/asbestos analysis - Open-faced mixed cellulose ester membrane filters, 25 mm, 0.8µm pore size (PCM) or 0.45 µm pore size (TEM), with a non-conductive cowl, suitable for connection with the personal/clearance monitoring pump system.
- Low flow and high flow rotameters pre-calibrated to primary standards.

#### Field Quality Control Samples – Bulk Sampling

Duplicate sampling of homogeneous materials is an integral part of the AHERA bulk sampling protocol and shall be followed per the protocol.

#### Field Quality Control Samples – Air Sampling

A minimum of two field blanks or 10% will be collected each day in accordance with NIOSH 7400.

### **Asbestos Bulk Samples**

All collected bulk asbestos samples shall be initially analyzed by the PLM Method, EPA Method 600/R-93/116.

Non friable organically bound (NOB) materials (e.g., floor tile, mastics, window glazing, and roofing materials) are difficult to analyze by PLM and these samples will have additional confirmatory analysis by TEM via EPA/600/R-93/116 Section 2.5, if PLM analyses are negative.

Building plaster will be analyzed by specific procedures within the EPA PLM method EPA/600/R-93/116, July 1993. These specific procedures have been developed and tested by the laboratory that will perform the PLM testing (TRC's laboratory), the State of Connecticut Department of Health, and EPA Region 1. The reason for these specific procedures is to improve the accuracy of analyses for determining asbestos in plaster when the content of asbestos is expected to be near 1%, which is usually the case for historical on-the-job batch mixing of plaster. This procedure is as follows:

**This recommended best practice neither intends to, nor authorizes, deviations from the EPA-approved "Test Method, Method for the Determination of Asbestos in Bulk Building Materials, June 1993, (EPA/600/R-93/116, July 1993). This Recommended Best Practices for Analyzing Low Concentration Plaster Bulk Asbestos Samples identifies specific practices and procedures identified in EPA/600/R-93/116, July 1993 that when followed should result in improved precision and accuracy when analyzing low concentration plaster bulk asbestos samples.**

**This recommend best practice contains direct quotations from EPA/600/R-93/116, July 1993. Direct quotations are in italics with the section and page number(s) given.**

**This recommended best practice for low level bulk asbestos samples has been developed because *the diversity of bulk materials necessitates the use of several different methods of sample preparation and analysis, Section 1.0 Introduction, page 1.***

**Specifically this recommended best practice for low level bulk asbestos samples has been developed because: 1) plaster often contains concentrations of asbestos fibers near the regulatory standard for asbestos-containing materials of 1%, as a consequence, precise and accurate analyses are crucial for proper regulatory classification, and 2) achieving appropriate homogeneity of plaster samples requires particular care.**

***The precision and accuracy of the technique (i.e., this proposed gravimetric method) are dependent upon the homogeneity of the material, the accuracy of the weight measurements, and the effectiveness of the sample reduction and filtering procedures. In practice, the precision can be equal to  $\pm 1\%$ , and the accuracy at 1 wt% asbestos can be less than or equal to  $\pm 10\%$  relative, Section 2.0 Methods, 2.3 Gravimetry, 2.3.3 Quantitation, page 25. Because this***

precision and accuracy is at the limit of acceptable precision and accuracy for samples containing asbestos in the 1% range, extreme care must be taken in the procedures and techniques utilized for the analysis of plaster samples.

**Applicable Definitions, Appendix A Glossary of Terms**

*Accuracy – The degree of agreement of a measured value with the true or expected value.*

*Homogeneous – Uniform in composition and distribution of all components of a material, such that multiple sub samples taken for analysis will contain the same components in approximately the same relative concentrations.*

*Heterogeneous – Lacking uniformity in composition and or distribution of material; component is not uniform. Does not satisfy the conditions stated for homogeneous; e.g., layered or in clumps, very coarse-grained, etc.*

*Precision - The degree of mutual agreement characteristic of independent measurements as the result of repeated application of the process under specified conditions. It is concerned with the variability of results.*

**Analysis Procedure Steps**

1. Sample Volume
2. Initial Stereoscopic Examination
3. Drying
4. Separation of Layers
5. Homogenization I
6. Gravimetry (Ashing & Acid Dissolution)
7. Post Gravimetric Reduction Stereoscopic Examination
8. Homogenization II
9. PLM Identification
10. Point Count Quantification
11. % Asbestos Calculation

**Recommended Best Practices**

1. **Sample Volume**

Plaster base coat sample size should be approximately one cubic inch (15cc). A smaller size may be suitable for skim coats and spray plasters. *Generally, samples of insufficient volume should be rejected, and further analysis curtailed until the client is contacted. The quantity of sample affects the sensitivity of the analysis and reliability of the quantitation steps. If there is a question whether the sample is representative due to inhomogeneity, the sample should be rejected, at least until contacting the client to see if: 1) the client can provide more material or 2) the client wishes the laboratory to go ahead with the analysis, but with the laboratory including a statement on the limited sensitivity and reliability of quantitation. If the latter is the case, the report of analysis should state that the client was contacted, that the client decided that the lab should use*



*less material than recommended by the method, and that the client acknowledges that this may have limited the sensitivity and quantitation of the method. At the time the client is contacted about the material, he or she should be informed that a statement reflecting these facts will be placed in the report, Section 2.0 Methods, 2.1 Stereomicroscopic Examination, page 3.*

## 2. Initial Stereoscopic Examination

*No sample preparation should be undertaken before initial stereomicroscopic examination, Section 2.0 Methods, 2.1 Stereomicroscopic Examination, 2.1.5 Procedures, 2.1.5.1 Sample Preparation, page 5.*

**Conduct an initial stereoscopic examination of the sample as outlined in EPA/600/R-93/116, Section 2.1. Samples should be examined with a simple stereomicroscope by viewing multiple fields of view over the entire sample. The whole sample should be observed after placement in a suitable container (watchglass, weigh boat, etc.) substrate. Samples that are very large should be subsampled. The sample should be probed, by turning pieces over and breaking open large clumps. The purpose of the stereomicroscopic analysis is to determine homogeneity, texture, friability, color, and the extent of fibrous components of the sample. Homogeneity refers to whether each subsample made for other analytical techniques (e.g. the "pinch" mount used for the PLM analysis), is likely to be similar or dissimilar. Texture refers to size, shape and arrangement of sample components, Section 2.0 Methods, 2.1 Stereomicroscopic Examination, 2.1.5 Procedures, 2.1.5.2 Analysis, page 6. Texture's constituents' relative particle sizes are particularly important in the precision and accuracy of plaster samples.**

*Each layer or material should be checked for homogeneity during the stereomicroscopic analysis to determine the extent of sample preparation and homogenization necessary for successful PLM or other analysis. Fibers and other components should be removed for further qualitative PLM examination, Section 2.0 Methods, 2.1 Stereomicroscopic Examination, 2.1.5 Procedures, 2.1.5.2 Analysis, page 7.*

*Stereomicroscopic examination should typically be performed again after any change or major preparation (ashing, acid dissolution, milling, etc.) to the sample, Section 2.0 Methods, 2.1 Stereomicroscopic Examination, 2.1.5 Procedures, 2.1.5.2 Analysis, page 7. Observations of homogeneity, texture (size, shape, and arrangement of sample components), and preliminary fiber identification, made after each stereomicroscopic examination should be recorded, and included in the sample analysis report provided to the client.*

## 3. Drying

**Dry the sample as outlined in EPA/600/R-93/116, Section 2.3.5.1 to remove moisture from the sample such that gravimetric measurements will not be influenced. Drying Temperature should not exceed 60 degrees C.**

**4. Separation of Layers**

**For samples composed of distinct layers each layer must be separated and analyzed individually as outlined in EPA/600/R-93/116, Section 2.1.5.2 and as stipulated in Federal Register Publications from the USEPA *Asbestos NESHAP Clarification Regarding Analysis of Multi-Layered Systems*, January 5, 1994 and December 19, 1995.**

**5. Homogenization I**

**Homogenize each sample prior to further preparation/analysis as outlined in EPA/600/R-93/116, Section 2.3.5.2 to help increase the effectiveness of the gravimetric techniques, to ensure any subsample material removed for analysis will more likely be representative of the entire sample, and to reduce variations in grain/particle size. The primary purpose of this initial homogenization is to prepare the sample for gravimetric ashing and acid dissolution, and to reduce constituent variations in grain/particle size, optimally to a 1:1 ratio.**

**Special care must be taken in the homogenization of plaster samples that contain significant matrix particles that are large relative to asbestos fiber diameters (e.g., sand particles in plaster base coat samples). A PLM asbestos area percent determination will not approximate a volume or weight percentage unless all the sample constituents are of similar size. The homogenization technique should be chosen such that asbestos fibers are not destroyed during the process.**

**6. Gravimetry (Ashing & Acid Dissolution)**

**Perform gravimetric reduction via both Ashing and Acid Dissolution techniques as outlined in EPA/600/R-93/116, Sections 2.3.6 and 2.3.8. Initial subsample weight should be >0.5 g. Ashing should be performed at 480 degrees C for 4 to 6 hours. Acid Dissolution should utilize concentrated HCl to completely soak the material and allow the reaction to proceed to completion (~5-10 minutes), then dilute with distilled water, and filter onto a pre-weighed 0.4-0.45 micron polycarbonate or mixed cellulose ester filter. Perform ashing first, followed by acid dissolution. Track weight removals from the sample/residue as noted to allow for gravimetric weight corrections to the % asbestos content reported. All weight reductions, PLM results, and the final sample asbestos content calculations should be recorded in a standard table and provided to the client with the final result. An example table is attached.**

**7. Post Gravimetric Reduction Stereoscopic Examination**

Conduct a stereoscopic examination in accordance with the initial stereoscopic examination procedures. The primary purpose of this post-gravimetric examination is to observe and record the characteristics of the sample gravimetric residue to determine if the sample is homogenous, and grain size variation is limited, such that the sample is prepared appropriately for effective PLM analysis.

8. **Homogenization II**

Upon the performance of the post gravimetric reduction stereoscopic examination, if the analyst observes that the sample constituents contain significant variations in grain/particle size, the subsample should be voided and the sample preparation technique re-initiated from Step 5 above, with further care exercised in homogenizing the subsample to reduce particle size variation. If after repeat attempts, the sample constituent particle size variation cannot be reduced to a ratio of less than two without destroying asbestos fibers, it should be noted that optimum sample preparation was not possible, with the laboratory including a statement on the limited sensitivity and reliability of quantitation.

9. **PLM Identification**

Identify asbestos fibers via Polarized Light Microscopy Techniques as outlined in EPA/600/R-93/116, Section 2.2.

10. **Point Count Quantification**

Quantify asbestos content (% projected area) using Point Counting Procedures outlined in EPA/600/R-93/116, Section 2.2.5.2.2, with the following stipulations:

- Use only a cross-line reticle (not a Chalkly point array), as preferred in the EPA Method, as it requires the scanning of most, if not all of the slide area, thereby minimizing bias that might result from lack of homogeneity in the slide preparation, and when point counting is used, the detection limit is directly proportional to the amount of sample analyzed.
- A minimum of 600 non-empty counts (eight slide mounts with 75 counts each) per sample is required, as accuracy and precision improve with number of counts.

Point count quantification is preferred to visual area estimation, as point counting introduces less analyst bias than visual area estimation, is not dependent on analysts experience with estimation based on comparison to calibration slides, and studies have indicated visual estimation tends to overestimate asbestos content. In addition, the USEPA Asbestos NESHAP Standard requires point count quantification in samples where the asbestos content is below 10% (unless presumed as >1%), and in the USEPA Memo of May 8, 1991, Clarification of Asbestos NESHAP Requirement to Perform Point Counting, the USEPA states, "... if a result obtained by point count is different from a result obtained by visual estimation, the point count result will be used."

### **11. % Asbestos Calculation**

**Report the sample % asbestos content using the results of the point count, corrected for % weight removed during the gravimetric preparation. Include such calculations with the final report.**

### **Asbestos Air Samples**

Air samples to be analyzed for asbestos content shall be collected and analyzed in accordance with either the NIOSH Method 7400, Asbestos and Other Fibers by PCM, Fourth Edition 8/15/94., NIOSH Method 7402, Asbestos by TEM, or the AHERA/CTDPH reoccupancy clearance protocols for TEM clearance testing in 40 CFR Part 763 Subpart E, Appendix A, as appropriate for the type of sample collected.

### **Lead Paint XRF Measurements**

Lead paint analysis will not be considered definitive data. The purpose of the sampling is to identify lead-containing paint so that the contractor performing abatement activities can appropriately protect workers that may disturb this material in accordance with OSHA construction standards. Lead paint screening will be conducted by State of Connecticut licensed lead inspectors. The method used for the inspection will be X-Ray Fluorescence (XRF) utilizing an on-site Niton XL 309 L&K shell spectrum analyzer with a detection limit of 0.1 mg/cm<sup>2</sup>. Use of the Niton XL will be in accordance with the manufacturer's protocols for lead inspecting in construction settings dated 6/98 and the EPA/HUD Performance Characteristic Sheet (PCS) for the Niton. Representative measurements of the painted building components will be conducted throughout the subject buildings to determine the general presence of any detectable amounts of lead. The sampler will have specific Niton training and manufacturer certification.

The field supervisor will have the responsibility for ensuring that the field equipment preventative maintenance program is implemented and carried out. Field personnel will be responsible for daily field checks and for reporting any problems with the equipment. The maintenance schedule will follow the manufacturer's recommendations. Field personnel will also be responsible for ensuring that critical parts are included with the field equipment. Critical spare parts will be immediately available to reduce potential downtime. The inventory will primarily contain parts that are subject to frequent failure, have limited useful lifetimes, and/or cannot be obtained in a timely manner. Backup equipment will be available within 1-day shipment to avoid delays in the field schedule.

Air Sampling Media

Visually inspect upon receipt for breakage and cleanliness. Media must be accompanied by a certificate of analysis.

Air Sampling Pumps

Perform daily visual inspection for defective parts. Replace valves, diaphragm and damper every 2000 hours, or as needed. Replace the pump motor every 4500 hours, or as needed.

XRF Analyzer

Perform daily visual inspection for defective parts. Inspect sampling window and test guard for dirty parts between sample analyses. If dirty, clean or replace.

A daily log, or equivalent documentation, will be used to record which instruments are calibrated each day (identified by manufacturer, and model number, and serial or specific unit identification number), the individual who performs the calibration, and any notes regarding the maintenance of the instrument.

A rotameter will be used to calibrate field sampling pumps. This will be performed each day prior to sampling and after sampling has been completed. RPD between pre and post flow rates must be  $\leq 20\%$ . If greater than 20%, the pump should be serviced or replaced. The rotameter used for calibration will be calibrated semi-annually from a bubble buret/gilibrator primary standard.

A Niton XRF spectrum analyzer will be used to conduct the lead-based paint screening. Use of the Niton XL will be in accordance with the manufacturer's protocols for lead inspecting in construction settings, dated June 1998, and the EPA/HUD Performance Characteristic Sheet (PCS) for the Niton.

The XRF analyzer will be calibrated with NIST reference standards which will be supplied by Niton; this calibration will be performed in the field. The following procedure will be utilized in the calibration of the XRF:

- Allow the instrument to warm up.
- Perform the Energy Calibration Check: This is used to check that the XRF is operating within resolution and stability tolerances and provides a check on potential instrument drift. Perform instrument self calibration (equivalent to energy calibration) by pressing "Calibrate and Test" from the Main Menu. When ready, the instrument will display "ready to test". This must be performed at the beginning of the day, after the batteries are changed or the instrument is shut off, and any time the operator suspects the instrument is drifting.
- Perform Calibration Verification Checks: These are used to check the accuracy of the instrument. These checks must be performed at the beginning and end of testing and every four hours during the testing period - perform a calibration check with 3 NIST test standard sheets, each at different concentrations (including 0 mg/cm<sup>2</sup> and two other levels). Verify results are within the specified QC limits. If outside QC limits, reset the instrument and repeat the measurement. If still outside the QC limits, contact Niton technical support.

**FORM I-~~PREVENTATIVE MAINTENANCE~~-LABORATORY EQUIPMENT**

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PLM laboratory equipment maintenance will consist of a daily scope alignment and a daily contamination check.

Preventative maintenance for the TEM equipment shall consist of a daily inspection and alignment.

**FORM J-CALIBRATION AND CORRECTIVE ACTION-LABORATORY EQUIPMENT**

Daily calibration of the PLM microscopes includes a check of the polarizer and analyzer to ensure they are at 90 degrees to each other, and centering of the condenser, the stage and objectives. Monthly calibrations include measuring the refractive indices of chrysotile, amosite, crocidolite, actinolite, anthophyllite and tremolite asbestos.

Calibration of the TEM equipment shall consist of the following:

Calibration	Frequency	Acceptance Criteria	Corrective Action
Al/Cu EDX spectrum	Daily	Peaks centered at 1.48 and 8.04, both within +/- 0.02 keV	Calibrate instrument
SAED	As needed	Cumulative 80% accuracy rating for each analyst	Calibrate instrument
Magnification	Monthly	2x SD must be <5% cumulative mean	Perform necessary equipment maintenance
Camera Constants	Monthly	2x SD must be <5% cumulative mean	Perform necessary equipment maintenance
Chrysotile Beam Dose	Monthly	Fibrils must be visible for a minimum of 15 seconds	Perform necessary equipment maintenance
Spot Diameter	Quarterly	Variation of spot diameters must be <25% of the mean	Perform necessary equipment maintenance
EDXA Resolution	Quarterly	Mn K peak has resolution less than or equal to 175eV at full width half maximum	Perform necessary equipment maintenance
Plasma Asher	Quarterly	Used to calculate time needed to remove 10% of collapsed mixed cellulose ester filter	Perform necessary equipment maintenance
Grid Opening Measurement	Performed on 2% of the grid lot to determine average grid opening in mm <sup>2</sup>	Variation of grid openings must not be > 5% of the mean	Perform necessary equipment maintenance



**FORM K –SAMPLE HANDLING AND CUSTODY REQUIREMENTS**

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**Sample Custody**

A sample is considered to be under a person's custody if: (a) it is in a person's physical possession, (b) in view of that person after he/she has taken possession, (c) secured by that person so that no one can tamper with the sample, or (d) secured by that person in an area which is restricted to authorized personnel. A person who has samples under their custody must always comply with these procedures in order to assure sample integrity.

**Sample Documentation**

The building from which each asbestos bulk sample was collected will be identified. The samples from each building will be numbered sequentially starting with the last number used in the initial survey. The location of each sample and type of material sampled will be logged on the chain of custody form. The location of each sample taken will also be marked in the field and on a figure/drawing of the building with its identifying sample number. Building locations where samples were taken will be marked with the sample number using a suitable permanent marker. Any corrections or revisions to sample documentation shall be made by lining through the original entry and initialing any changes.

**Sample Labels**

Sample labels are always to be securely affixed to the sample container. Writing the information in indelible ink on a plastic bag is also acceptable, if a plastic bag is used for the sample container. The label or markings must always clearly identify the particular sample, and delineate the following information:

1. Building name
2. Sample identification number

**Chain of Custody Record**

A chain of custody record must always be maintained from the time of sample collection until final sample deposition. Every transfer of custody will be noted and signed for with a copy of the record being kept by each individual which endorsed it. It is integral that the chain-of-custody record should always include the following information:

1. Consultant name and address
2. Sample identification number
3. Sample location
4. Sample collection date and time
5. Sample information (matrix type, building material, etc)
6. Names and signatures of samplers
7. Signatures of all individuals who have had custody of the samples

The inspector (sampler) is responsible for the care and custody of the samples until they are transferred or dispatched properly. For asbestos bulk samples, sample ID information will be noted directly on the plastic bag that contains the sample. Sample labels will be completed for each sample using waterproof ink. Samples will be accompanied by the properly completed chain-of-custody form.

**FORM K –SAMPLE HANDLING AND CUSTODY REQUIREMENTS**

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**Sample Handling and Shipment**

Samples will be properly packaged for shipment and transported to the laboratory for analysis with a separate signed chain-of-custody record enclosed in each sample box. Shipping containers will be secured for shipment to the laboratory. For this project all samples will be hand-carried to the TRC laboratory. No preservatives are necessary for the asbestos samples. Care should be taken in the packing of the samples to minimize the possibility of a breach in a sample container.

At the laboratory the samples will be received and logged in by a laboratory sample custodian. Upon sample receipt, the sample custodian will:

1. Examine all sample containers for damage
2. Compare samples received against those listed on the chain of custody
3. Examine all shipping records for accuracy and completeness
4. Sign and date the chain of custody
5. Attach laboratory sample container labels as appropriate
6. Place samples in the proper laboratory storage
7. Note any problems and notify the Laboratory Director

### **General**

All measurements should be made so that results are reflective of the environmental media and conditions being measured. To assess if environmental monitoring measurements are of an appropriate quality, "acceptance and/or performance criteria" are typically established.

#### Common definitions associated with measurement quality are:

**Precision** - a measure of the reproducibility of analyses under a given set or conditions

**Accuracy** - a measure of the bias that exists in a measurement system

**Representativeness** - the degree sampling data accurately and precisely depict selected characteristics

**Completeness** - the measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under "normal" conditions

**Comparability** - the degree of confidence with which one data set can be compared to another

#### Sample Collection Precision

Collecting field duplicate samples customarily assesses sample collection precision. Field duplicate samples are used to evaluate errors associated with sample heterogeneity, sampling methodology and analytical procedures. The analytical results from these samples are important because they provide data to evaluate overall measurement precision.

#### Sample Collection Accuracy

To assess sample accuracy, field QC samples such as rinsate, trip, and/or field blanks, are typically incorporated into the sampling scheme. The data acquired from the analysis of blanks are useful in their ability to evaluate errors, which can arise from cross-contamination. The occurrence of cross-contamination can result from the improper handling of samples by field and/or lab personnel, improper decontamination procedures, improper shipment and storage, and on-site atmospheric contaminants. Therefore, to facilitate sample collection accuracy, it is essential to maintain frequent and thorough review of field procedures so that deficiencies can be quickly documented and corrected.

#### Sample Collection Representativeness

Representativeness is an expression of the degree to which a sample accurately and precisely represents a characteristic of a population, parameter variations at a sampling point or an environmental condition. Representativeness is a qualitative parameter, which relies upon the proper design of a sampling program and proper laboratory protocol. Making certain that sampling locations are selected properly and a sufficient number of samples are collected that best satisfies this criterion. Therefore, collecting field duplicates will assess sample representativeness. Traditionally, field duplicates are by definition, equally representative of a given point in space and time.

Sample Collection Comparability

Comparability is defined as an expression of the confidence with which one data set can be compared to another. In most instances, the proficiency of field sampling efforts will be the determining factor that affects the overall comparability of environmental measurement data. To optimize the comparability of environmental measurement data, sample collection activities should always be performed using standardized procedures whenever possible. When performing a site investigation, adhering to the quality control criteria will facilitate these efforts.

Sample Collection Completeness

Completeness is defined as the measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions. Data completeness is often expressed as the percentage of valid data obtained from a given measurement system. To consider data valid, it is customary to assess if a set of data satisfies all of the specified acceptance/performance criteria (accuracy measures, precision measures, etc.) to render a determination. This necessitates that the data acquired for all confirmatory analyses critical to a site investigation sampling program be validated (100%).

The following table provides laboratory measurement performance criteria for asbestos analyses by Polarized Light Microscopy (PLM) Method, EPA Method 600/R-93/116; Transmission Electron Microscopy (TEM) via EPA/600/R-93/116 Section 2.5; by NIOSH Method 7400 - Asbestos and Other Fibers by PCM, and NIOSH Method 7402 - Asbestos by TEM. The quantification limit for all bulk samples shall be  $\leq 1\%$ . The quantification limit for air samples taken for personnel protection shall be  $\leq 0.1$  f/cc. The quantification limit for air samples taken for re-occupancy clearance shall be  $\leq 0.01$  f/cc (PCM) and  $< 70$  s/mm<sup>2</sup> (TEM).

Data Quality Indicator	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
<b>Bulk Samples</b>			
Precision – Laboratory (TEM)	$\geq 80\%$ true positive $\leq 20\%$ false negative $\leq 10\%$ false positive	Verified Analysis	A
Precision – Laboratory (PLM/TEM)	TEM: <5 structures $\pm 1$ structure 5-20 structures $\pm 2$ structure >20 structures $\pm 3$ structure PLM: RPD $\leq 100$	Inter-analyst QC	A
Accuracy/Bias (PLM/TEM)	Vendor-specific Limits	Standard Reference Materials	A
Accuracy/Bias – Contamination (PLM/TEM)	Asbestos < QL	Method Blanks	A
Data Completeness (PLM/TEM)	Field 90%; Laboratory 95%	Data Completeness Check	S&A
Precision – Laboratory (PLM)	RPD $\leq 100$	Intra-analyst QC	A
Precision – Laboratory (PLM/TEM)	TEM: <5 structures $\pm 1$ structure 5-20 structures $\pm 2$ structure >20 structures $\pm 3$ structure PLM: RPD $\leq 100$	Laboratory Duplicate	A

Data Quality Indicator	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
<b>Air Samples</b>			
Precision – Laboratory (PCM/TEM)	TEM: <5 structures ±1structure 5-20 structures ±2structure >20 structures ±3structure PCM the following must be false: $ (E_1)^{1/2} - (E_2)^{1/2}  >$ $2.8 \times ((E_1)^{1/2} + (E_2)^{1/2}) \times CV/2$	Replicate Analyses	A
Accuracy/Bias (PCM)	Vendor-specific Limits	Daily Reference Sample	A
Accuracy/Bias-Contamination	Asbestos < QL	Method Blanks, Field Blanks	S&A
Accuracy/Bias-Contamination	Asbestos < QL	Media Certification Check	S&A
Data Completeness (PLM/TEM)	Field 90%; Laboratory 95%	Data Completeness Check	S&A

The following table details the Laboratory analytical quality assurance samples for asbestos analyses:

Laboratory QC	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for CA	Data Quality Indicator
<b>Bilk Samples</b>					
Method Blank (PLM/TEM)	One per day	Asbestos < QL	Re-clean, retest, reanalyze, and/or qualify data	Analyst and Data Validator	Accuracy/bias-Contamination
Verified Analyses (TEM)	1%	≥ 80% true positive ≤ 20% false negative ≤ 10% false positive	Reanalyze and qualify data	Analyst	Precision
Inter-analyst QC (PLM/TEM)	4% TEM 7% PLM	Vendor-specific limits	Reanalyze and qualify data	Analyst and Data Validator	Accuracy/bias
Standard Reference Materials (PLM/TEM)	TEM: Annually PLM: 1%	Vendor-specific limits	Reanalyze and qualify data	Analyst and Data Validator	Accuracy/bias
Intra-analyst QC (PLM)	2%	RPD≤100	Reanalyze and qualify data	Analyst and Data Validator	Precision
Laboratory duplicate (PLM/TEM)	One per 10 samples	TEM: <5 structures ±1structure 5-20 structures ±2structure >20 structures ±3structure PLM: RPD≤100	Reanalyze and qualify data	Analyst and Data Validator	Precision
<b>Air Samples</b>					
Method Blank (PCM/TEM)	One per day	Asbestos < QL	Re-clean, retest, reanalyze, and/or qualify data	Analyst and Data Validator	Accuracy/bias-Contamination

Laboratory QC	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for CA	Data Quality Indicator
Replicate Analyses (PCM/TEM)	One per 10 samples	TEM: <5 structures ±1 structure 5-20 structures ±2 structure >20 structures ±3 structure PCM the following must be false: $ (E_1)^{1/2} - (E_2)^{1/2}  > 2.8 \times ((E_1)^{1/2} + (E_2)^{1/2}) \times CV/2$	Reanalyze and qualify data	Analyst and Data Validator	Precision
Daily Reference Sample	One per day	Vendor-specific limits	Reanalyze and qualify data	Analyst and Data Validator	Accuracy/bias



The following are the field analytical quality assurance samples to be collected for asbestos analyses:

Field Quality Control Samples – Bulk Sampling

Duplicate sampling of homogeneous materials is an integral part of the AHERA bulk sampling protocol and shall be followed.

Field Quality Control Samples – Air Sampling

A minimum of two field blanks or 10% will be collected each day in accordance with NIOSH 7400.

### **Sampling Figure**

Prior to beginning sampling, building plans/figures will be obtained or created. All sampling locations will be identified on these figures providing the location, sample number, and description of material sampled. The locations of all air samples will also be marked.

### **Chain of Custody Form**

A sample chain-of-custody form will be maintained that will include all relevant information. It is integral that the chain-of-custody record should always include the following information:

1. Consultant name and address
2. Sample identification number
3. Sample location
4. Sample collection date and time
5. Sample information (matrix type, building material, etc)
6. Names and signatures of samplers
7. Signatures of all individuals who have had custody of the samples

### **Marked Sample Locations**

In addition, the number of each sample will be written at the location from which the sample was taken. Building locations where samples were taken will be marked with the sample number using a suitable permanent marker.

### **Laboratory Reports**

The laboratory will report all quality control sample results for each batch of samples. Data for all samples will be returned with a copy of the chain of custody form. For each record sample, the laboratory report will include, at a minimum:

- Sample identification number assigned by the field sampling team;
- Date the sample was analyzed;
- The type of asbestos in the sample;
- The concentration (%) found in sample;
- The quantification limit;
- Non-conformance summary identifying any known failure to comply with the QAPP such as the following:
  - unidentified samples or custody forms,
  - failure to achieve any of the laboratory quality control parameters and the actions taken,
  - compromised sample containers,
  - broken custody seals, and/or
  - uncalibrated or improperly calibrated instruments.

The TRC laboratory reports will be reviewed by the TRC Laboratory Director for errors and QC validation and then sent to the TRC Project Manager for review. TEM laboratory reports from the laboratory to which TRC subcontracts will be sent to the TRC Laboratory

Director for review and validation prior to being sent to the TRC Project Manager. These reports will include a copy of the chain-of-custody form. The laboratory will retain a copy of all data reports and chain-of-custody forms.

For the field analyses associated with this program, which consists of XRF screening of painted surfaces, data packages are not required. All field and QC sample results, calibrations, and calibration verification will be recorded on field screening forms, and/or on equipment calibration forms to ensure proper verification of the sample results.

**Fieldwork**

The TRC Project Manager/Field Supervisor will be responsible for monitoring the field effort against the work plan and QAPP. As soon as a necessary, or accidental, deviation from the planned field effort or QAPP procedures is identified, the Project Manager/Field Supervisor will contact the R. W. Bartley & Associates Project Manager who will take the lead on determining corrective measures. This determination may be carried out in consultation with the TRC Laboratory Director, as appropriate. As the survey field effort is short, a cell phone will be available to the field personnel and the R. W. Bartley & Associates Project Manager will be on call during the field effort.

**Laboratory Analysis**

The Laboratory Director will be responsible for immediately notifying the R. W. Bartley & Associates Project Manager of any data that does not meet the data quality objectives so that the Laboratory Director and Project Managers can decide upon corrective action, if appropriate.

As bulk sampling can be easily replicated, no deviations or “qualified” samples will be accepted. If necessary, additional sample volume will be obtained and the analysis(es) repeated. The exceptions are where a separate analysis of a sample of the same homogeneous material meeting quality assurance requirements has already identified the material as asbestos-containing (>1%) and where the result is clearly greater than 1%. The material will be classified as asbestos-containing material and the result of the sample not meeting QA/QC requirements will be moot.

Interim reports will not be issued for this project work as the field effort is relatively short.

During abatement air samples are taken and immediately analyzed. A quality assurance review of each sample result related to worker protection will be performed by the TRC Laboratory Director at the time of analysis. All of these individual analyses will be included in the abatement report. All air clearance samples quality assurance data will be reviewed by the TRC Laboratory Director, and the TRC and R.W. Bartley & Associates Project Managers prior to the removal of containment. All field and laboratory documentation will be included into the final abatement report or placed into the project files, as appropriate.

The TRC Project Manager/Field Supervisor will monitor and verify that all QAPP field procedures are appropriately applied.

Upon production of the laboratory data package the TRC Project Manager/Field Supervisor and the R. W. Bartley & Associates Project Manager will meet at the site with all project documentation. The sampling locations and all project quality assurance documentation will be reviewed at that time to ensure that the data is usable and that the project objectives have been met. A summary of this review and the conclusions along with all quality assurance documentation will be included in the project report.

The TRC Laboratory Director will validate the laboratory analytical results against all applicable and appropriate QAPP criteria. The QA data will be supplied with the laboratory data. A summary and certification of the data will also be supplied by the Laboratory Director and included with the laboratory data reports. The TRC and R.W. Bartley & Associates Project Managers will review this information for compliance with the QAPP requirements. The TRC and R.W. Bartley & Associates Project Managers will also analyze the results of all blind field blanks and duplicates for compliance with the QA criteria. The TRC and R.W. Bartley & Associates Project Managers will also determine if each result, related samples, and the sampling as a whole fulfills the project information needs and objectives.

Evaluation of the data usability will be based on a review of the data verification and DQOs.

Air samples taken to evaluate sampler's exposure will be considered usable if the detection limits are below the 8-hour time-weighted-average worker protection criteria of 0.1 fibers per cubic centimeter of air (f/cc) and all other quality assurance requirements have been met. Air samples to determine if the building can be reoccupied after asbestos abatement will be considered usable if the detection limits are below the re-occupancy standard of 0.01 f/cc (PCM) or 70 s/mm<sup>2</sup> (TEM) and all other quality assurance requirements have been met.

Bulk samples of specific building materials to determine if the asbestos material is asbestos-containing (>1% asbestos) will be considered usable if the quantification limits are below 1% asbestos and all other quality assurance requirements have been met.

Lead XRF samples will be considered usable if the readings were taken by a calibrated instrument in good working order.

The TRC and R.W. Bartley & Associates Project Managers will assess the variability and representativeness of the sampling results by media to determine if sufficient information with the appropriate statistical validity is present to draw definitive conclusions and to determine what additional data may be required. The minimum requirement is sufficient usable data so that all applicable NESHAP and AHERA requirements have been met by usable data.