



**NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF QUALITY ASSURANCE
ENVIRONMENTAL LABORATORY CERTIFICATION PROGRAM
ON-SITE LABORATORY EVALUATION
ASBESTOS PROCEDURES**

Asbestos Fibers Analysis -- Transmission Electron Microscope (TEM)

- Method(s):**
- EPA 100.1 (SDW)
 - EPA 100.2 (SDW)
 - NIOSH 7402 (Air)
 - ASTM D 6480 (SHW)
 - 40 CFR 763, Sub E, App A (SHW)

Laboratory ID	
Laboratory Name	
Address	
Phone	
Lab Manager/Supervisor	
QA Officer	
Analyst(s)	
Auditor	
Date(s) of Audit	
Type of Audit	<input type="checkbox"/> Initial <input type="checkbox"/> Biennial <input type="checkbox"/> Special <input type="checkbox"/> ELCP <input type="checkbox"/> TNI/NELAP
Notes:	

Question	Reference	Yes	No	N/A	Comments
Analytical Method & SOP					
Does the laboratory maintain an SOP for each accredited method?	TNI V1M2 4.2.8.5(e)				
Do the SOPs refer to the method(s) as certified or applied?	TNI V1M2 4.2.8.5				
Are the SOPs complete and acceptable?	TNI V1M2 4.2.8.5				
On each SOP, does it clearly indicate the effective date of the document, revision number, and signature(s) of approving authority?	TNI V1M2 4.2.8.5(c)				
Are all relevant SOPs readily available to all personnel?	TNI V1M2 4.2.8.5(b)				
Sample Control					
Is the laboratory involved in sampling? (If not, the skip next two questions)	TNIV1M2 5.7.1				
Does the laboratory provide necessary sampling equipment and/or supplies to its clients?	TNIV1M2 5.7.1				
Does the laboratory have a sampling plan and procedures for sampling?	TNI V1M2 5.7.1				
Does the laboratory have a procedure for chain of custody (COC) of samples?	TNI V1M2 5.8.8				
Does the laboratory maintain a COC form for each sample?	TNI V1M2 5.8.7.5				
Does the laboratory have a policy to not accept air filters when shipped with bulk samples?	TNI V1M2 5.8				
Does the laboratory utilize a permanent chronological record to document receipt of all sample containers (e.g., LIMS database)?	TNI V1M2 5.8.7.3				
Does the laboratory assign a unique laboratory ID code to each sample, which is linked to its field ID code?	TNI V1M2 5.8.5a)				
Does the laboratory assign unique ID extension to subsamples? (applies primarily to bulk samples)	TNI V1M2 5.8.5a)				
Drinking Water					
Is a blank run using known fiber-free water and analysis done until it meets a mean fiber concentration of less than 0.05 MFL (or less than 1% of lowest value reported, whichever is greater)?	EPA 100.1 4.1				
Are drinking water sample <i>not</i> preserved with acid in the field? <i>Note: asbestos samples should not be preserved.</i>	EPA 100.1 5.4 EPA 100.2 8.4				
Are samples collected in 1-L glass or polyethylene containers?	EPA 100.1 5.1				
Are samples filtered within 48 hrs of collection?	EPA 100.2 8.5				

Question	Reference	Yes	No	N/A	Comments
Are water samples kept at 4°C without freezing?	EPA 100.1 5.4				
Is the exterior of the collection container washed before opening?	EPA 100.1 5.4				
Is the original collection container placed in an ultrasonic bath for 15 min prior to ozone-UV treatment and filtration?	EPA 100.1 6.2				
Is the sample treated in original collection container using ozone-UV treatment to oxidize organic materials? (4% ozone in O ₂ , 1 L/min gas for 3 hr)	EPA 100.1 6.2				
Is the sample filtered immediately after ozone-UV and ultrasonic bath treatment?	EPA 100.1 6.3				
After filtration is the sample placed in a loosely covered petri dish and dried under an infra-red heat lamp before closing the petri dish?	EPA 100.1 6.3.2(d)				
Is the sample thus filtered placed in a covered petri dish, left ajar, and dried in a HEPA filtered hood, an asbestos-free oven, or a desiccator?	EPA 100.2 11.14				
Are there both 25- and 47-mm filter funnels available for use?	EPA 100.1 4.3.6				
Are both polycarbonate capillary-pore membrane (0.1-µm) and mixed cellulose ester (MCE) membrane filters (0.45-µm) used?	EPA 100.1 4.3.9				
Are MCE membrane filters used (≤ 0.22- and 5-µm)?	EPA 100.2				
Is the glassware used exclusively for asbestos analysis?	EPA 100.2				
Is all glassware cleaned with high purity acids prior to analysis?	EPA100.1				
Is the procedure for cleaning glassware documented?	TNI V1M3 1.7.8.2				
Air Filter					
Are representative filters analyzed before use to determine filter background? If there are > 5 fibers/100 fields, are the filters discarded?	NIOSH 7402 Equipment 1				
Is the laboratory involved in air sampling?	TNI V1M2 5.7.1				
Does the client supply air sampling data?	TNI V1M2 5.7.3				
Is each personal sampling pump calibrated?	NIOSH 7402 Sampling 1				
Is there a calibration certificate for the air pump(s)?					
Is the flow rate documented on the COC?	TNI V1M3 1.7.7.1.2				

Question	Reference	Yes	No	N/A	Comments
Were samples taken at 0.5-16 L/min?	NIOSH 7402				
Is 0.5 mg total dust loading on the filter not exceeded?	NIOSH 7402				
Does the laboratory use 25 mm MCE or polycarbonate filter for sampling?	NIOSH 7402				
Is the filter contained in a conductive holder with 50 mm cowl?	NIOSH 7402				
Are at least 2 field blanks (or 10% of total samples) submitted for each set of samples?	NIOSH 7402 Item 3				
Are sample filters 0.45-1.2- μ m pore size cellulose ester membranes and have a 25-mm diameter?	NIOSH 7402 EQPT1				
Are circular sections removed from any three quadrants of each sample and blank filter using a cork borer?	NIOSH 7402 Item 7				
Are circular filter sections affixed to a clean glass slide (no more than 8 sections per slide) then placed in a petri dish which contains several paper filters soaked with acetone and left, covered for 2-4 min for the filters to fuse and clear?	NIOSH 7402 Item 8				
Are photos taken of standard patterns for comparison to unknowns?	NIOSH 7402				
Solid Hazardous Waste					
Are all areas sampled identified and document? a) General sampling site description b) Project or client name, address, and city/state location c) Sample location (include building, floor, room number, and room name) d) Surface type e) Surface material f) Surface description g) The area of surface wiped (in cm^2) h) Post-sampling cleanliness of surface i) Sampling procedure used	ASTM D6480				
Are samples shipped to laboratory, separately from any air samples?	ASTM D6480				
Is the exterior of sample containers wet-wiped before taken into a clean preparation area?	ASTM D6480				
Is sample preparation performed in a clean facility that has a separate work area for bulk, air and DW sample preparation?	ASTM D6480				
Is at least one blank processed along	ASTM				

Question	Reference	Yes	No	N/A	Comments
with each batch of samples? Is the sample set rejected if the blank contains more than 53 structures/mm ² ?	D6480				
Is a wipe placed in a clean specimen bottle with the rinse from the original sample container and water to 500 mL?	ASTM D6480				
Is the pH of the suspension adjusted to 3-4 using 10.0% acetic acid solution?	ASTM D6480				
Is the specimen bottle then sonicated for 5 min?	ASTM D6480				
Transmission Electron Microscope					
Make/Model/Serial Number of the TEM					
Is the TEM in good working condition?	Generic				
Does the laboratory have more than one TEM?	Generic				
Does TEM have a min. accelerating potential of 80 kV?	EPA100.1				
Does TEM have a resolution > 1 nm?	EPA100.1				
Does TEM have magnification range of 300 to 100,000?	EPA100.1				
Is magnification at least 20,000x at the screen?	EPA100.1				
Does TEM have a fluorescent screen with inscribed or overlaid calibrated scale?	EPA100.2				
Is TEM equipped with a camera?	EPA100.1&2				Digital or film?
Is TEM have electron diffraction and energy-dispersive X-ray capabilities?	EPA100.1&2				
Does EDXA provide the means for subtraction of background, ID of elemental peaks, and calculation of net peaks areas?	EPA 100.1 4.2.2				
TEM Calibration					
Are all calibrations performed under the same analytical conditions used for routine asbestos analysis and recorded including data and analyst's signature?	TNI V1M3 1.7.1.1.1				
Are magnification calibrations done monthly at the fluorescent screen with the specimen at the eucentric position at magnification used for fiber counting?	TNI V1M3 1.7.1.1.1(a)				
Is EDXA calibrated prior to each analysis of samples and recalibrated if out of the specific range?	TNI V1M3 1.7.1.1.1(e)i				
Is EDXA calibrated to within 20eV for at least two peaks between 0.7 keV and 10 keV?	TNI V1M3 1.7.1.1.1(e)i				
Are calibrations performed monthly to establish the stability of the camera constant?	TNI V1M3 1.7.1.1.1(b)				
Is beam dose calibrated quarterly?	TNI V1M3 1.7.1.1.1(d)				

Question	Reference	Yes	No	N/A	Comments
Is spot size < 250 nm as calibrated quarterly?	TNI V1M3 1.7.1.1.1(c)				
Does the laboratory maintain control charts for TEM magnification, spot size, and camera constant?	TNIV1M3 1.7.1.1.1a), b) and c)				
Standards and Reagents					
Are all reagents used analytical reagent grade or better?	TNI V1M3 1.7.6.1(d)				
Are reference standards obtained from and traceable by NIST?	TNI V1M3 1.7.6.1(b)				
Are reference standards accompanied by a certificate of calibration?	TNI V1M3 1.7.6.1(c)				
Are the containers marked with expiration date(s)?					
Does the laboratory maintain a catalogue of non-asbestos mineral fibers to differentiate between fibers?	TNI V1M3 1.7.6.1(e)				
Are there previously analyzed and statistically validated PT sample records available?	TNI V1M3 1.7.3.1.1c)				
Is there a source of fiber-free water that is checked daily and a record kept?	EPA 100.1 4.3.5				
Are standards made from NIST SRM 1866 and 1867 reference material and is NIST SRM 1866b analyzed annually?	TNI V1M3 1.7.4.1(a)				
Laboratory Environment					
Does the facility have a clean room with no asbestos-containing materials and work surfaces that are stainless-steel or plastic-laminate?	EPA 100.1 4.1				
Is there a working fume hood with HEPA filter?	EPA 100.1 4.1				
Does the room operate under positive pressure?	EPA 100.1 4.1				
Does the laboratory have procedures to minimize cross-contamination?					
Does the laboratory have an ultrasonic bath for sonication?	EPA 100.1 4.3.13				
Does the laboratory have an ozone generator capable of generating 400 g ozone/day at a concentration of 12 by weight when supplied with dry oxygen?	EPA 100.1 4.2.5				
Demonstration of Capability (DOC)					
Has the laboratory conducted an initial DOC prior to using any method and at any time there is a change in instrument type, personnel, or method or any time it hasn't been performed in a 12 month period?	TNI V1M3 1.6.2				
Does the laboratory have a documented procedure for on-going DOC?	TNI V1M3 1.6.3				
Quality Control - Laboratory Blanks					

Question	Reference	Yes	No	N/A	Comments
Are blank determinations made prior to water sample collection? (1 of every 24 for polyethylene and 4 of every 24 for glass) (Acceptable bottle blank level < 0.01 MFL > 10 µm)	TNI V1M3 1.7.2.1.1				
Does the laboratory analyze one blank per batch of 20 samples, at minimum?	TNI V1M3 1.7.2.1.1				
For air samples, the maximum contamination of a single blank filter is < 53 structures/mm ² and maximum average contamination for all blank filters < 18 structures/mm ² ?	TNI V1M3 1.7.2.1.1(b)ii				
For bulk sample analysis, does the contamination not exceed 0.1%?	TNI V1M3 1.7.2.1.1(c)i				
Does the laboratory have a library of non-asbestos fibers that can be confused for asbestos?	TNI V1M3 1.7.2.1.1(c)ii				
Does the laboratory have a set of reference asbestos materials, from which a set of reference diffraction and X-ray spectra may be developed?	TNI V1M3 1.7.2.1.1 (c)iii				
Are all analyses performed on relocater grids so that it is repeatable?	TNI V1M3 1.7.3.1				
Are replicate and duplicate analysis performed at a frequency of 1 per 100 samples?	TNI V1M3 1.7.3.1				
Are verified analyses performed 1 per 20 samples and compared according to NISTIR 5351? (maintain an average of ≥ 80% true positives, ≤ 20% false negatives, and ≤ 10% false positives)	TNI V1M3 1.7.3.1				
When analyzing non-friable material, does the laboratory prepare one non-ACM with every 20 samples analyzed?	TNI V1M3 1.7				
Does the laboratory select samples at random for QA analysis?	TNI V1M3 1.7.3.1				
Does the laboratory perform checks on personnel to establish their performance whenever possible?	TNI V1M3 1.7.3.1				
Does the laboratory not analyze disproportionate number of samples prior to internal/external audits?	TNI V1M3 1.7.3.1				
Does the laboratory maintain a minimum 10% of QC samples analyzed?	TNI V1M3 1.7.3.1				
Are X-ray spectra (EDXA) acquired and recorded on fibers exceeding 0.25 µm diameter for each variety?	TNI V1M3 1.7.4				
Are at least 40 grid opening or 100 fibers counted for light loading?	NIOSH 7402 20b(1)				
Are at least 6 grid openings or 100 fibers counted for heavy loading?	NIOSH 7402 20b(2)				
Proficiency Testing (PT)					

Question	Reference	Yes	No	N/A	Comments
Does the laboratory participate in the appropriate field of proficiency testing (FoPT) for initial and continued accreditation?	TNI V1M1 4.0				
Is PT analyses <i>not</i> contracted out to another laboratory?	TNI V1M1 5.1.2				
Does the laboratory analyze PT sample in the same manner as used for routine environmental samples?	TNI V1M1 5.1.1				
Are there previously analyzed and statistically validated PT sample records available?	TNI V1M1 5.3				
Do all the analysts participate in all PT rounds?	TNI V1M1 5.1.1				
Who is the PT provider (PTP)?					
Does the laboratory report results for accreditation and experimental FoPTs to the PTP on or before the closing date of the study?	TNI V1M1 5.2.2				
Does the laboratory have plans for resolving analytical problems when it receives a "not acceptable" performance score from a PTP?	TNI V1M1 6.1				
Are PT results used to verify accuracy and precision for each analyst and to judge the analyst's overall performance?	TNI V1M3 1.7.3.1				
Reports					
Are the reports complete and accurate?	TNI V1M2 5.10.2				
Are there any data qualifiers on reports?	TNI V1M2 5.10.2(g)				
Does the report have authorized signatures?	TNI V1M2 5.10.2(j)				
Is the following information included in the report of water samples: a) Total number of fibers counted b) Concentration in MFL with upper and lower 95% confidence limits c) 2 sig figs for concentrations >1 MFL; 1 sig fig for concentrations <1 MFL d) Micrograph and calibrated diffraction pattern from typical filter for confirmation of chrysotile e) Micrograph, calibration zone axis SAED patterns, and EDXA spectrum for confirmation of amphibole f) Length, width, and aspect ratio distributions g) Estimated mass concentration in	EPA 100.1				

Question	Reference	Yes	No	N/A	Comments
<p>µm/L</p> <p>h) Number of filter aggregates not included in fiber count</p> <p>i) Total area of filter examined</p> <p>j) Special circumstances or observations</p>					
Does the final report include the type of asbestos fibers identified?	NIOSH 7402				
Is the model and manufacturer of the TEM and EDXA system included in the report?	NIOSH 7402				
Records					
Does the laboratory establish and maintain procedures for identification, collection, indexing, access, filing, storage, maintenance and disposal of quality and technical records?	TNI V1M2 4.13.1.1				
Do quality records include reports from internal audits and management reviews and records of corrective and preventive actions?	TNI V1M2 4.13.1.1				
Does the laboratory retain records concerning analyses including raw data records, quality control data records, chain-of-custody forms, and laboratory reports for at least five years?	N.J.A.C. 7:18-4.6, 5.6, 6.7, 8.5(a)				