Designation: D7886 – 14

Standard Practice for Asbestos Exposure Assessments for Repetitive Maintenance and Installation Tasks[1]

This standard is issued under the fixed designation D7886; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice establishes procedures for assessing the exposure of workers to airborne fibers who perform repetitive tasks of short duration where small quantities of asbestos-containing materials must be disturbed in order to perform maintenance and installation activities.

1.2 This practice describes the facilities and equipment for performing the tasks under controlled conditions for the express purpose of collecting personal air samples to determine worker exposure. The tasks are performed on actual asbestos-containing materials during Exposure Assessment tests and precautions are taken for personal protection and avoiding contamination of adjacent spaces.

1.3 This practice describes the air sample collection procedures, the analytical methods for the air samples, and the calculation of worker exposure including the use of statistical confidence limits. This practice differentiates between the test to obtain exposure data and the current job to which the data are applied, and describes the duties of the individuals who conduct these separate activities.

1.4 The results are applied to the current job as defined herein for determining worker protection such as respiratory protection or for other purposes as determined by the competent person responsible for the current job. The results of the tests shall not be applied to current jobs that are expected to differ substantially from the test conditions in work practices, material properties or other factors that might affect the concentration of airborne asbestos fibers.

1.5 This practice is not intended to be used for asbestos abatement work for which the objective is the removal of asbestos-containing materials. It is designed to assess exposures for short-term repetitive tasks. Compliance with regulatory requirements as to the purpose of the work and limits on the quantity of asbestos-containing materials disturbed is the responsibility of the user.

1.6 This practice describes procedures for determining exposure to airborne asbestos fibers. It does not purport to determine the risk of acquiring an asbestos-related disease for any individual, trade or work practice, nor does it represent that compliance with any criterion constitutes a "safe" level of exposure that is free of such risk.

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

1.8 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

1.9 *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]

E1368 Practice for Visual Inspection of Asbestos Abatement Projects

E2356 Practice for Comprehensive Building Asbestos Surveys

E2394 Practice for Maintenance, Renovation, and Repair of Installed Asbestos Cement Products

D7712 Terminology for Sampling and Analysis of Asbestos

2.2 *Other Documents:*

29 CFR 1926.1101 Occupational Exposure to Asbestos: Construction Industry Standard, August 10, 1994[3]

[1] This practice is under the jurisdiction of ASTM Committee D22 on Air Quality and is the direct responsibility of Subcommittee D22.07 on Sampling and Analysis of Asbestos.

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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 Occupational Safety and Health Administration (OSHA), 200 Constitution Ave., Washington, DC 20210, http://www.osha.gov.

40 CFR Part 763 Asbestos Model Accreditation Plan, Appendix C to Subpart E: Interim Final Rule, February 3, 1994[4]

EPA/600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials, June 1993[4]

NIOSH Method 7400 Asbestos and Other Fibers by PCM, Issue 2, dated 15 August 1994, NIOSH Manual of Analytical Methods (NMAM), Fourth Edition, August 15, 1994[5]

NIOSH Method 7402 Asbestos by TEM, Issue 2, dated 15 August 1994, NIOSH Manual of Analytical Methods (NMAM), Fourth Edition, 8/15/94[5]

3. Terminology

3.1 *Definitions:*

3.1.1 *asbestos, n*—a collective term that describes a group of naturally occurring, inorganic, highly fibrous, silicate dominated minerals, which are easily separated into long, thin, flexible fibers when crushed or processed. **D7712**

3.1.2 *asbestos-containing materials (ACM), n*—materials containing more than one percent asbestos. **E1368**

3.1.2.1 *Discussion—Asbestos-containing materials* include *surfacing material*, *thermal system insulation*, and *miscellaneous material*. See Practice E1368 for definitions of these terms.

3.1.3 *critical barriers, n*—one or more layers of rigidly supported plastic sheeting sealed over all openings into an asbestos work area (with the exception of make-up air provisions and means of entry and exit), designed to prevent airborne asbestos fibers or asbestos-contaminated water from migrating to an adjacent area. **E1368**

3.1.3.1 *Discussion*—For purposes of this practice, *critical barriers* are intended to be used for the exposure assessment tests and not for the current job.

3.1.4 *high efficiency particulate air (HEPA) filter, n*—the final stage filter on a negative pressure ventilation device or on a vacuum cleaner, capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 µm in diameter. **E1368**

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *clean room, n*—an uncontaminated room serving as the entrance to and exit from the shower of a decontamination area.

3.2.2 *competent person, n*—one who is capable of identifying existing asbestos hazards in the workplace and who has the authority to take prompt corrective measures to eliminate them, who certifies that an Exposure Assessment applies to a current job, and who meets the qualifications in Annex A1.

3.2.3 *current job, n*—a task to which a worker is assigned that "closely resembles" the task for which the Exposure Assessment test was conducted in terms of work practices and similarity of asbestos-containing materials.

3.2.3.1 *Discussion*—The terms "closely resembles" and "current job" appear in 29 CFR 1926.1101(f)(iii)(B).

3.2.4 *decontamination area, n*—an enclosed area adjacent and connected to the enclosure, consisting of an equipment room, shower area, and clean room, which is used for entry to the enclosure and for decontamination upon exiting.

3.2.5 *eight-hour time-weighted-average (8-h TWA), n*—a measurement representing exposure averaged over an eight-hour time period.

3.2.6 *exposure assessment, n*—determination of the airborne fiber concentration to which a worker may be subjected as a result of performing a specific work practice with a specific asbestos-containing material.

3.2.7 *negative pressure enclosure, n*—a space, containing the asbestos-containing materials on which the test is performed, that is maintained under negative pressure by a HEPA-filtered exhaust device to prevent leakage of contaminated air into the surrounding area.

3.2.8 *permissible exposure limits (PELs), n*—regulatory limits to exposure to airborne asbestos fibers as defined below.

3.2.8.1 *time-weighted-average limit (TWA), n*—eight-hour time-weighted employee exposure limit such as 0.1 f/cc in accordance with 29 CFR 1926.1101.

3.2.8.1.1 *Discussion*—Regulatory exposure limits in other countries, or exposure limits for individual employers, may differ from 3.2.8.1 and 3.2.8.2, and may be described as Occupational Exposure Limits or with other terminology.

3.2.8.2 *excursion limit (EL), n*—thirty-minute employee exposure limit such as 1.0 f/cc in accordance with 29 CFR 1926.1101.

3.2.8.2.1 *Discussion*—See 3.2.8.1.1.

3.2.9 *test conductor, n*—the individual who plans the test for the Exposure Assessment, directs the test operations and takes air samples, who calculates worker exposures from the air sampling data, and prepares the Exposure Assessment Report.

3.2.10 *test supervisor, n*—the individual who supervises the test for the Exposure Assessment, including operation of the negative pressure enclosure.

3.2.11 *test worker, n*—the individual who performs the task under the direction of the test conductor and under the supervision of the test supervisor during the Exposure Assessment test.

3.2.11.1 *Discussion*—The duties of the test conductor, test supervisor and test worker are described in Section 6 and their qualifications are described in Annex A1.

4. Significance and Use

4.1 Work practices, engineering controls, personal protective equipment and other precautions to minimize exposure to airborne asbestos fibers have been extensively documented in regulations, training manuals and other publications. The work described in these publications ranges from large-scale abatement projects to minor disturbances and clean-up. Practices E1368 and E2394 address these issues within the context of their subject matter.

[4] Available from United States Environmental Protection Agency (EPA), William Jefferson Clinton Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20004, http://www.epa.gov.

[5] Available from The National Institute for Occupational Safety and Health (NIOSH), a subset of the Centers for Disease Control & Prevention (CDC), 1600 Clifton Rd., Atlanta, GA 30333, http://www.cdc.gov.

4.2 This practice applies to specific types of asbestos work where the same task is performed by various persons without substantial deviation from a documented procedure and with material containing the same type and similar content of asbestos fiber. The exposure from such operations can be expected to remain fairly consistent as long as these parameters do not vary substantially and the workers have received the required training to perform the task.

4.3 Because of the variability in field conditions under which large-scale work such as asbestos abatement is performed, the opportunity to collect sufficient personal air samples under conditions similar enough to establish statistical confidence can be questioned. For this reason, this practice does not address the collection of such samples and their use for determining exposure data to apply on other projects. Users with such requirements are referred to the applicable regulations for guidance.

4.4 There are many tasks, however, that are of short duration and amenable to testing under controlled conditions for assessing worker exposure. These tasks are performed by equipment installers and other tradesmen in the course of their ordinary duties in what this practice refers to as the current job. The following list of potential tasks where ACMs can be disturbed is by no means inclusive and the feasibility of conducting an Exposure Assessment is the responsibility of the user:

4.4.1 Drilling holes through asbestos floor tile and sheet vinyl flooring,

4.4.2 Removing small pieces of floor tile and sheet vinyl flooring to expose the substrate,

4.4.3 Drilling holes through asbestos-cement roofing, siding, ceiling panels, ducts and pipes,

4.4.4 Drilling and cutting holes in wallboard,

4.4.5 Drilling holes in ceiling tiles,

4.4.6 Removing and replacing ceiling tiles,

4.4.7 Patching roofing materials,

4.4.8 Removing window putty and caulking,

4.4.9 Cleaning asbestos-lined or contaminated ducts,

4.4.10 Removing gaskets and packing,

4.4.11 Removing and installing locksets in fire doors,

4.4.12 Taking bulk samples of suspect ACM,

4.4.13 Removing and patching acoustical ceiling texture and fireproofing, and

4.4.14 Removing and replacing insulation on pipes, tanks, boilers, ducts, etc.

4.5 The Exposure Assessment is based on personal air samples taken over a full or partial shift to determine an 8-h TWA exposure and a short-term Excursion Limit exposure, which requires that two sampling pumps be worn.

4.6 Samples are taken for comparison with criteria determined by the user, including but not limited to the following:

4.6.1 Permissible Exposure Limits (PELs), including the 8-h TWA of 0.1 f/cc and the 30-min EL of 1.0 f/cc, or to establish engineering controls, respiratory and personal protection, and other requirements in accordance with 29 CFR 1926.1101;

NOTE 1—These OSHA PELs will be used for illustration purposes in this practice.

4.6.2 National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit of 0.1 f/cc;

4.6.3 American Conference of Governmental Industrial Hygienists (ACGIH[6]) Threshold Limit Value (TLV[7]) of 0.1 f/cc for respirable fibers;

4.6.4 Employee exposure limits imposed by other governmental jurisdictions;

4.6.5 Employee exposure limits to establish engineering controls, respiratory and personal protection, and other requirements of an employer's policy or the requirements of a specification or procedure that applies to the current job; and

4.6.6 Non-occupational exposure limits for building occupants and other affected persons.

4.7 Compliance with the PELs and other criteria is typically determined by analyzing the air samples using NIOSH Method 7400 for Phase Contrast Microscopy, which reports all fibers meeting the counting criteria and does not distinguish between asbestos and non-asbestos fibers. The Exposure Assessment can be based on analysis using NIOSH Method 7402 for Transmission Electron Microscopy, which identifies asbestos fibers and adjusts the fiber count from a NIOSH Method 7400 analysis.

4.8 An important aspect of an Exposure Assessment is determining a margin of safety between the exposures measured during the test and criteria for respiratory protection, regulatory compliance or other purposes. This practice therefore includes a statistical test (Confidence Factor) for the exposure based on the air sample results from a test as described in Section 7.

4.9 The responsibility for comparing the results of the test performed for the Exposure Assessment is given to the competent person, usually but not necessarily someone in a supervisory capacity, who compares the conditions under which the test was performed to those for the current job to which a worker has been assigned. If the work practices and asbestos-containing materials are sufficiently similar in the judgment of the competent person, and the worker has been trained on the work practice using simulated asbestos-containing materials, the competent person certifies that the Exposure Assessment applies to the current job for purposes of respiratory protection and other precautions. A form is provided in Appendix X1 for this purpose.

NOTE 2—OSHA regulations in 29 CFR 1926.1101 permit an employer to dispense with respiratory protection and other precautions on the basis of an Exposure Assessment (sometimes called a Negative Exposure Assessment) or on the basis of "objective data." This practice does not use the terms "Negative Exposure Assessment" and "objective data," and the responsibility for elimination of protective measures based on an Exposure Assessment remains with the competent person. 29 CFR 1926.1101 requires a "high degree of certainty" that the PELs will not be exceeded, but does not define this parameter.

[6] ACGHI is a trademark of American Conference of Governmental Industrial Hygienists, Inc., Cincinnati, OH.

[7] TLV is a trademark of American Conference of Governmental Industrial Hygienists, Inc., Cincinnati, OH.

5. Qualifications

5.1 The Exposure Assessment test and application of its results are performed by the test conductor, test supervisor test worker and competent person who must meet the qualifications in Annex A1, including but not limited to applicable training requirements set forth in the Model Accreditation Plan and OSHA regulations.

5.2 It is not expected that the competent person who applies the Exposure Assessment test results to the current job will act in the capacity of test conductor for the tests, but the employer, a trade association or other affected organization may arrange for the tests to be done.

5.3 Regulations of the country, state or local jurisdiction in which the tests are conducted and the current job is performed may also apply and are the responsibility of the user to determine and comply with.

6. Exposure Assessment Testing

6.1 The Exposure Assessment test is conducted at a site where conditions can be controlled, usually in a negative pressure enclosure inside of a building.[8] For materials installed outside of a building, the test should be conducted away from windows and ventilation intakes. Because the Exposure Assessment is done without knowing if exposures exceed the TWA or EL, it must be assumed for purposes of the test that these limits will be exceeded and appropriate precautions taken. This means that the test worker and test conductor must wear respirators and protective clothing. The test supervisor may not be the person who performs the testing because he must remain outside the negative pressure enclosure during the test. "Double-suiting" — wearing two sets of disposable coveralls with the outer contaminated set discarded while exiting the negative pressure enclosure — may be used if a decontamination shower is not provided.

6.2 The test plan should describe the work practice to be followed and the intervals to repeat the task; for example, drill a hole through the floor tile and clean up the debris, then repeat the task every ten minutes for the duration of the test. The test plan should specify the duration of each test and the number of tests to be conducted during one shift. To determine compliance with the OSHA PELs a minimum of three 90-min or 120-min tests are required and a fourth test may be added at the discretion of the test conductor to obtain sufficient data for statistical confidence.

6.3 For tests performed inside a building the negative pressure enclosure is set up in a room or area with the required type of asbestos-containing materials in sufficient amounts for purposes of the test. This might consist of a floor covered with vinyl asbestos tile through which holes will be drilled, or asbestos-cement panels on a wall in which holes for electrical outlets will be cut. A space that is scheduled for asbestos abatement, or which will not be functionally compromised by the test, serves well as a test location. It may be necessary to bring in asbestos-containing materials and attach them to a temporary fixture constructed for purposes of the test. Surfaces that are not part of the test shall be covered with 6-mil plastic and critical barriers established between the enclosure and occupied areas as necessary. Any asbestos-containing materials inside the enclosure that may release airborne fibers other than those being tested must be isolated during the test. Emergency egress from the enclosure shall be indicated.

NOTE 3—If the asbestos type and content of the material has not been previously determined, bulk samples shall be collected and analyzed prior to conducting the tests. Bulk samples should be collected and analyzed according to Practice E2356 and EPA/600/R-93/116.

6.4 Exhausting air from the enclosure to maintain it under negative pressure scavenges airborne fibers and reduces their concentration inside the enclosure. While this is desirable for an abatement project, it could lead to artificially low measurements in an Exposure Assessment test that is meant to simulate fiber concentrations in relatively still air. Rather than maintain the usual four air changes per hour and 0.02 inches of water pressure differential, the rate of exhaust is set just high enough to make the plastic sheeting and flaps bulge inward as evidence of negative pressure inside the enclosure. The ventilation rate may be increased before the first test, between tests and at the conclusion of testing to scavenge airborne fibers inside the enclosure. The test conductor may adjust the ventilation conditions to simulate those expected on the current job if such conditions can be determined.

6.5 The test conductor personally directs the testing activities, including the set-up and operation of the negative pressure enclosure and collecting the personal and other air samples required. The test conductor must control the pace of the work to ensure consistent results from test to test, and this is more readily accomplished under a simulated test set-up than at an actual job site. The test worker may need to be reminded that consistency is important for the purpose of obtaining exposure data.

6.6 The worker wears two pumps with 25-mm filter cassettes. For the sample called the "TWA sample" the cassette remains on for the entire 90-min or 120-min duration of a test. The cassettes for the samples called the "EL samples" are changed every 30 minutes, providing three or four EL samples per test. The flow rate is set as high as possible in order to maximize air sample volume collected. For compliance with the sampling requirements in Appendix A to 29 CFR 1926.1101, the maximum allowable flow rate is 2.5 L/min.

6.7 In addition to the personal samples, the test conductor may collect area samples outside the negative pressure enclosure or critical barriers to monitor for a possible breach of containment. If the exhaust of the negative pressure ventilation device cannot be discharged outside the building, he may also monitor the area inside the building into which the exhaust is discharged. Three field blank cassettes are opened outside the enclosure during each test.

6.8 After the task is completed the test worker collects all removed asbestos-containing material and debris and places it in disposal bags. He then cleans the inside of the negative

[8] Oberta, A. F., and Fischer, K. E., "Negative Exposure Assessments for Special Floor Tile Work Practices," *Advances in Environmental Measurement Methods for Asbestos*, ASTM STP 1342. American Society for Testing and Materials, West Conshohocken, PA, January 2000.

pressure enclosure and places contaminated cleaning materials in the disposal bags. The surfaces inside the enclosure are then HEPA-vacuumed.

6.9 After the last test is completed the test conductor shall take air samples inside the enclosure to clear it for disassembly. The test conductor shall specify the clearance level and method in the test plan.

7. Exposure Calculations

7.1 Air samples are analyzed by Phase Contrast Microscopy according to NIOSH Method 7400, supplemented by analysis according to NIOSH Method 7402 at the discretion of the test conductor. To permit the required statistical calculations to be performed, it is imperative that the laboratory report the number of fibers counted on each filter and not just the calculated concentration in fibers/cc or the fiber density in fibers/mm^2. The number of fibers counted on the three blank filters submitted with the personal and area samples should similarly be reported.

7.2 The test conductor performs the 8-h TWA and 30-min EL calculations for the tests. An example of data and calculations for a set of three 90-min tests of lifting asbestos-containing floor tile with asbestos-containing mastic is shown in Table 1 and Table 2.

7.3 The 8-h TWA calculation takes into account the part of an 8-h work shift during which no exposure occurs. For a set of three 90-min tests, the duration of no exposure is 210 minutes and the 8-h TWA exposure is:

$$\text{8-hrTWA} = \frac{(\text{Test}_1 * 90 + \text{Test}_2 * 90 + \text{Test}_3 * 90 + 0 * 210)}{480} \quad (1)$$

or simply:

$$\text{8-hrTWA} = \frac{(\text{Test}_1 * 90 + \text{Test}_2 * 90 + \text{Test}_3 * 90)}{480} \quad (2)$$

On the left side of Table 2:

$$\text{8-hrTWA} = \frac{(0.0595 * 90 + 0.0132 * 90 + 0.0430 * 90)}{480} = 0.0217 \text{ f/cc} \quad (3)$$

TABLE 1 Test Data for Tile Lifting Exposure Assessment

	Running Time, min	Flow Rate, L/min	Volume, L	Fibers Counted	Fields Counted	Fibers/cc
TWA–Test 1	90	2.47	222.3	27.0	100	0.0595
EL–Test 1	30	2.46	73.8	5.0	100	0.0332
EL–Test 1	30	2.46	73.8	13.0	100	0.0863
EL–Test 1	30	2.46	73.8	7.5	100	0.0498
TWA–Test 2	90	2.47	222.3	6.0	100	0.0132
EL–Test 2	30	2.46	73.8	7.0	100	0.0465
EL–Test 2	30	2.46	73.8	9.0	100	0.0598
EL–Test 2	30	2.46	73.8	11.0	100	0.0730
TWA–Test 3	90	2.47	222.3	19.5	100	0.0430
EL–Test 3	30	2.46	73.8	8.0	100	0.0531
EL–Test 3	30	2.46	73.8	3.0	100	0.0199
EL–Test 3	30	2.46	73.8	2.0	100	0.0133
Blank	. . .	. . .	. . .	0.0	100	. . .
Blank	. . .	. . .	. . .	0.0	100	. . .
Blank	. . .	. . .	. . .	0.0	100	. . .

TABLE 2 Statistical Calculations for Table 1 TWA Data

8-hr TWA Calculations		CF Calculations	
Test 1	0.0595	Test 1	0.0595
Test 2	0.0132	Test 2	0.0132
Test 3	0.0430	Test 3	0.0430
No Monitoring	0.0000	SD	0.0076
8-hr TWA	0.0217	CF	0.0342

For a set of four tests, 0 * 120 replaces 0 * 210 in Eq 1 and a fourth term, Test$_4$ * 90, is added to Eq 1 and Eq 2. A similar calculation methodology would be used for 120-min tests.

7.4 The Exposure Assessment also compares the test results to the evaluation criteria (in 4.6) by establishing a Confidence Factor (CF) of the test data. The Confidence Factor is calculated as:

$$\text{CF} = \text{8-hr TWA} + 1.645 * \text{SD} \quad (4)$$

where the standard deviation, SD:

$$\text{SD} = (t / 480) * n^{1/2} * \text{STDEV}(\text{Test}_1 , \text{Test}_2 , \text{Test}_3) \quad (5)$$

For the example on the right side of Table 2:

$$\text{SD} = (90 / 480) * \text{SQRT}(3) * \text{STDEV}(0.0595 , 0.0132 , 0.0430) = 0.0076 \quad (6)$$

and:

$$\text{CF} = 0.0217 + 1.645 * 0.0076 = 0.0342 \text{ f/cc} \quad (7)$$

Although the 210 minutes of no exposure in Table 2 reduces the 8-h TWA exposure, the variability in the TWA sample fiber counts results in a CF one and a half times the 8-h TWA fiber concentration. A similar calculation methodology would be used for 120-min tests or four 90-min tests.

7.5 The CF for a set of nine 30-min EL samples in Table 3 is calculated using Eq 8 below:

$$\text{CF} = \text{AVG} + 1.645 * \text{STDEV} \quad (8)$$

where:

AVG = average EL concentration, f/cc, and
STDEV = standard deviation of the EL samples.

Note that the CF of the EL samples does not depend on the duration of no exposure as each sample represents a discrete value representing the exposure during that portion of the task, and the duration of each task is always 30 minutes.

NOTE 4—These calculations are facilitated by using a spreadsheet with statistical algorithms.

TABLE 3 Statistical Calculations for Table 1 EL Data

EL–1	0.0332
EL–1	0.0863
EL–1	0.0498
EL–2	0.0465
EL–2	0.0598
EL–2	0.0730
EL–3	0.0531
EL–3	0.0199
EL–3	0.0133
Average	0.0483
STDEV	0.0237
CF	0.0872

8. Exposure Assessment Test Report

8.1 The report prepared by the test conductor shall include the following:

8.1.1 A description of the test facility including its location, size, dimensions, layout, and other descriptive information.

8.1.2 The names and credentials of the test supervisor, test worker(s) and test conductor, including training, licensing, and other credentials.

8.1.3 The date, time, and duration of each test.

8.1.4 A description of the asbestos-containing material used including the type and percent of asbestos fiber(s), with a bulk sample report attached if available.

8.1.5 A description of the work practice including tools, supplies and equipment used, the duration of each task and the interval between tasks during the test.

8.1.6 A table of air sampling data including the sample numbers, the type of sample (TWA or EL), the time on and time off for the pumps, the pump running times, flow rates and sample volumes, the number of fibers and fields counted, and the calculated fiber concentrations adjusted for blanks. A copy of the laboratory report shall be attached.

8.1.7 Tabulated calculations of the CFs for the TWA and EL sample sets and a comparison to the Permissible Exposure Limits or other criteria in 4.6.

8.2 The report and, if requested, recommendations of the test conductor shall be provided to the competent person or other designated recipient.

9. Exposure Assessment Application

9.1 The competent person determines if the following conditions at an actual job site — the current job — are met (see Fig. 1):

9.1.1 The type of asbestos-containing material and the type of asbestos fiber and its content in the material "closely resemble" those of the Exposure Assessment test;

9.1.2 The work practices used "closely resemble" those of the Exposure Assessment test; and

9.1.3 The workers assigned to the current job have been trained on these work practices, including appropriate "hands-on exercises."

NOTE 5—It is not necessary that the number of tasks performed on the current job be the same as the number of tasks performed during the Exposure Assessment tests, or that the duration of the current job be the same as the Exposure Assessment tests.

9.2 If the above conditions are met at the actual job site, the competent person may certify that the Exposure Assessment applies to the current job and make appropriate decisions on respiratory protection for the workers or other measures to comply with the evaluation criteria in 4.6. The competent person may specify that respirators or other precautions are not needed as long as the appropriate work practice is followed, or may require their use regardless. If the Exposure Assessment does not apply the competent person will specify the use of respirators or other precautions.

NOTE 6—The use of respirators and other personal protective equipment (PPE) requires training and other compliance actions by the employer that are beyond the scope of this practice. The user is advised to seek the assistance of qualified professionals if respirators and other PPE are used.

9.3 The form in Appendix X1 or an equivalent form may be used by the competent person to certify that the Exposure Assessment applies to the current job.

10. Keywords

10.1 asbestos exposure; assessment application; assessment testing; certification; competent person; exposure assessment; exposure calculations; exposure criteria; installation; maintenance; qualifications; statistical analysis; training