Reject a pair of counts if:

$$\left|\sqrt{AC_2}-\sqrt{AC_1}\right| > 2.78 \times \left(\sqrt{AC_{AVG}}\right) \times CV_{FB}$$

Where:
AC_1= lower estimated airborne fiber concentration
AC_2= higher estimated airborne fiber concentration
AC_{avg}= average of the two concentration estimates
CV_{FB}= CV for the average of the two concentration estimates
If a pair of counts are rejected by this criterion then, recount the rest of the filters in the submitted set. Apply the test and reject any other pairs failing the test. Rejection shall include a memo to the industrial hygienist stating that the sample failed a statistical test for homogeneity and the true air concentration may be significantly different than the reported value.

7.4. *Reporting Results*
Report results to the industrial hygienist as fibers/cc. Use two significant figures. If multiple analyses are performed on a sample, an average of the results is to be reported unless any of the results can be rejected for cause.

8. References

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8.3. *Bayer, S.G., Zumwalde, R.D., Brown, T.A.,* Equipment and Procedure for Mounting Millipore Filters and Counting Asbestos Fibers by Phase Contrast Microscopy, Bureau of Occupational Health, U.S. Dept. of Health, Education and Welfare, Cincinnati, OH, 1969.

8.4. *NIOSH Manual of Analytical Methods,* 2nd ed., Vol. 1 (DHEW/NIOSH Pub. No. 77-157-A). National Institute for Occupational Safety and Health, Cincinnati, OH, 1977. pp. 239-1 - 239-21.

8.5. *Asbestos, Code of Federal Regulations 29 CFR 1910.1001. 1971.*

8.6. *Occupational Exposure to Asbestos,* Tremolite, Anthophyllite, and Actinolite. Final Rule, Federal Register 51:119 (20 June 1986). pp. 22612-22790.

8.7. *Asbestos, Tremolite, Anthophyllite, and Actinolite,* Code of Federal Regulations 1910.1001. 1988. pp. 711-752.

8.8. *Criteria for a Recommended Standard* -- Occupational Exposure to Asbestos (DHEW/NIOSH Pub. No. HSM 72-10267), National Institute for Occupational Safety and Health, NIOSH, Cincinnati, OH, 1972. pp. III-1 -- III-24.

8.9. *Leidel, N.A., Bayer, S.G.,* Zumwalde, R.D., Busch, K.A., USPHS/NIOSH Membrane Filter Method for Evaluating Airborne Asbestos Fibers (DHEW/NIOSH Pub. No. 79-127). National Institute for Occupational Safety and Health, Cincinnati, OH, 1979.

8.10. *Dixon, W.C.,* Applications of Optical Microscopy in Analysis of Asbestos and Quartz, Analytical Techniques in Occupational Health Chemistry, edited by D.D. Dollberg and A.W. Verstuyft. Wash. D.C.: American Chemical Society, (ACS Symposium Series 120) 1980. pp. 13-41.

Quality Control

The OSHA asbestos regulations require each laboratory to establish a quality control program. The following is presented as an example of how the OSHA-SLTC constructed its internal CV curve as part of meeting this requirement. Data is from 395 samples collected during OSHA compliance inspections and analyzed from October 1980 through April 1986.

Each sample was counted by 2 to 5 different counters independently of one another. The standard deviation and the CV statistic was calculated for each sample. This data was then plotted on a graph of CV vs. fibers/mm^2. A least squares regression was performed using the following equation:

$CV = \text{antilog}_{10}[A(\log_{10}(x))^2+B(\log_{10}(x))+C]$

Where:
x = the number of fibers/mm^2
Application of least squares gave:
A = 0.182205
B = 0.973343
C = 0.327499
Using these values, the equation becomes:
$CV = \text{antilog}_{10}\,[0.182205(\log_{10}(x))^2 + 0.973343(\log_{10}(x)) + 0.327499]$

Sampling Pump Flow Rate Corrections

This correction is used if a difference greater than 5% in ambient temperature and/or pressure is noted between calibration and sampling sites and the pump does not compensate for the differences.

$$Q_{act} = Q_{cal} \times \sqrt{\left(\frac{P_{cal}}{P_{act}}\right)} \times \left(\frac{T_{act}}{T_{cal}}\right)$$

Where:
Q_{act} = actual flow rate
Q_{cal} = calibrated flow rate (if a rotameter was used, the rotameter value)
P_{cal} = uncorrected air pressure at calibration
P_{act} = uncorrected air pressure at sampling site
T_{act} = temperature at sampling site (K)
T_{cal} = temperature at calibration (K)

Walton-Beckett Graticule

When ordering the Graticule for asbestos counting, specify the exact disc diameter needed to fit the ocular of the microscope and the diameter (mm) of the circular counting area. Instructions for measuring the dimensions necessary are listed:

(1) *Insert any available graticule* into the focusing eyepiece and focus so that the graticule lines are sharp and clear.

(2) *Align the microscope.*

(3) *Place a stage micrometer* on the microscope object stage and focus the microscope on the graduated lines.

(4) *Measure the magnified grid length,* PL (μm), using the stage micrometer.

(5) *Remove the graticule* from the microscope and measure its actual grid length, AL (mm). This can be accomplished by using a mechanical stage fitted with verniers, or a jeweler's loupe with a direct reading scale.

(6) *Let D = 100 μ .* Calculate the circle diameter, d_c(mm), for the Walton-Beckett graticule and specify the diameter when making a purchase:

$$d_c = \frac{AL \times D}{PL}$$

Example: If PL=108 μm, AL=2.93 mm and D=100μm, then,

$$d_c = \frac{2.93 \times 100}{108} = 2.71\text{mm}$$

(7) *Each eyepiece-objective-reticle combination* on the microscope must be calibrated. Should any of the three be changed (by zoom adjustment, disassembly, replacement, etc.), the combination must be recalibrated. Calibration may change if interpupillary distance is changed.

Measure the field diameter, D (acceptable range: 100 plus or minus 2 μm) with a stage micrometer upon receipt of the graticule from the manufacturer. Determine the field area (mm^2).

Field Area = $\Pi(D/2)^2$

If D = 100 μm = 0.1 mm, then

Field Area = $\Pi(0.1\text{ mm}/2)^2 = 0.00785\text{ mm}^2$