

adjustments were sometimes required to compensate for drift which appeared to be external wind initiated.

A third test was performed to provide an estimate of the fiber emissions from a hot brake assembly. As in the break-in test, the test filter was positioned in a central location for this procedure. Thirty-one stops were made at 0.5 "g" (4.9 m/s^2) and minimal time interval until the rotor attained 410°C (770°F). This temperature was then maintained by adjusting the application time interval. Ten additional stops were made as the brake was allowed to cool.

All filter weight determinations were performed at equilibrium conditions and then corrected for humidity. After use,

the filters were individually stored in covered glass containers. Lining weights were taken after removal of wear debris but before they had cooled completely, to minimize weight changes from water absorption. Between tests the linings were stored in a dry jar.

The relevant test data are included in the Table A-1. A slight pad drag caused the outboard lining to wear above expectations on the "normal use" test. Since this added work was not included in the lining wear rate calculations, the specific wear is above the usual range for this lining. No adverse effect on the test results would be expected to have resulted from this drag. Similar pad drag effects may occur on cars, when smooth road conditions prevent "pad knockback."

APPENDIX B

SAMPLE EXAMINATION

PREPARATION AND EXAMINATION OF ASBESTOS CARRYING SAMPLES FROM TEST FILTERS*

1. All slides, dishes, scalpels, and other utensils used in the following preparations were cleaned in acetone, followed by rinse in 200 proof ethanol.
2. An area of measured dimension was selected at random from the test filter, cut, and placed particle side down on a clean glass slide.
3. Several drops of acetone were placed on the filter segment to dissolve it partially and secure it to the plate.
4. The samples were ashed for a period of 2 h by using a low temperature asher at a chamber pressure of 0.5 torr (70 Pa) oxygen and power of 200 W.
5. Several drops of a 1% solution of nitro-cellulose in amyl acetate were placed on the residue, and a clean watch glass was used to grind the mixture for a period of 5 min.
6. A second clean glass slide was then placed over the mixture of nitro-cellulose and residue, and a "smear" obtained by pressing the two slides together and then sliding them apart.
7. The films thus formed were permitted to dry and then were removed by scoring the edge of the slide with a scalpel and "floating" the film free from the slide in a distilled water bath. It was found that the film was most easily removed from the slide introduced in Step 6.
8. Approximately 10 electron microscope grids (3 mm, finder grids) were placed at random on the floating film, and the film was lifted by putting a clean slide on top of the film and drawing the slide down through the water so as to trap the grids between the slide and the film (which should now cling to the slide).

9. A carbon layer of approximately $0.06 \mu\text{m}$ was deposited on the film to prevent charging during examination in the TEM.

Direct examination specimens were prepared by depositing a carbon layer on the dust side of the test filter and dissolving the filter in acetone. Electron microscope grids were used, both to support the sample and to provide grid location reference marks.

TEM EXAMINATION AND COUNTING PROCEDURES

Approximately 10 electron microscope grids were prepared for each of the five filter samples analyzed. Four grids were arbitrarily selected from each sample and two grid squares on each grid were scanned for asbestos. The individual grid squares are approximately $90 \mu\text{m}$ on each side and were examined at a TEM magnification of about 40,000. For each grid area scanned, photographs were taken where possible of the first, last, and one randomly chosen fibril for the purpose of determining an average fibril diameter accurately. Measurements were then made visually, that is, each fibril, fiber, or asbestos bundle was compared to known calibration marks on the electron microscope screen to estimate the lengths. The length could be estimated to within 20%, as determined by the photographic measurements. The marks on the screen are 0.5 cm apart corresponding to $0.125 \mu\text{m}$ when a magnification of 40,000 is used. This approach was taken because it was impractical to photograph all the fibrils and, furthermore, length measurements were not as critical as diameter measurements in determining fiber volume. Where both measurement methods were used, the values providing the greatest indicated brake asbestos levels were chosen. The results are shown in Table B-1.

From photographic measurements of 120 chrysotile fibrils,

*Sample preparation techniques outlined are similar to those reported by Selikoff, et al. in Ref. 2.