

tual test setup in Fig. 2. The brake exhaust air was discharged out of the building.

The first pair of filters was used during the first 82 burnish stops, to represent "break-in" conditions. After further burnishing, a second pair of filters collected samples during 560 "normal use" brake applications. A third set of filters was then utilized in a "high temperature use" test of 41 brake stops.

All brake applications were made from a 40 mph (18 m/s) equivalent speed. Break-in and normal use tests employed brake torques corresponding to $1/4$ "g" (2.45 m/s^2) deceleration. This torque level was doubled for the high temperature tests.

During the normal use procedure, the test filter was located for 20 brake applications at each of 28 grid locations in the exhaust duct throat to insure a representative sampling of the airflow over the brake. This test grid and filter are shown in Fig. 3. A central collection site in the test grid was used for the "break-in test" and the final "high temperature" test.

Samples of the three pairs of filters (break-in, normal use, and high temperature use) were subjected to a clarification process involving low temperature ashing to oxidize all organic material and mechanical action to separate the particles. This assures maximum detectability of asbestos filter (2).

RESULTS AND DISCUSSION

Transmission electron microscopy at 40,000X was used in the search for fibers. At this magnification the ultimate fibrils appear to be above 1 nm (0.040 in) in diameter. Quantity, length, and apparent diameter measurements provided data for calculation of asbestos fiber mass per unit of filter area. Coupled with dimension, mass, and flow determinations from the dynamometer tests, these data were used to calculate the emitted asbestos fiber concentration in the collected wear dust, in the cooling air stream, and from the brake lining worn. The size distribution of collected fibers was not determined by this method, since the clarification process involved suf-

ficient mechanical action to reduce most fiber bundles to the ultimate fibril size.

Additional samples of the "normal use" test filters were examined on the TEM without recourse to the clarification process, in an effort to determine the asbestos fiber size distribution. Roughly 10% of the asbestos fiber was visible on the background sample, based on the results from corresponding samples after clarification. The largest observed fiber bundle was $0.20 \mu\text{m}$ in diameter and over $1.1 \mu\text{m}$ long. A similar direct TEM search of the "normal use" test filter revealed about 2% of the asbestos fibers observed after clarification. This reduced percentage of visible fiber was attributed to the greater concentration of obscuring matter in the test filter. However, the

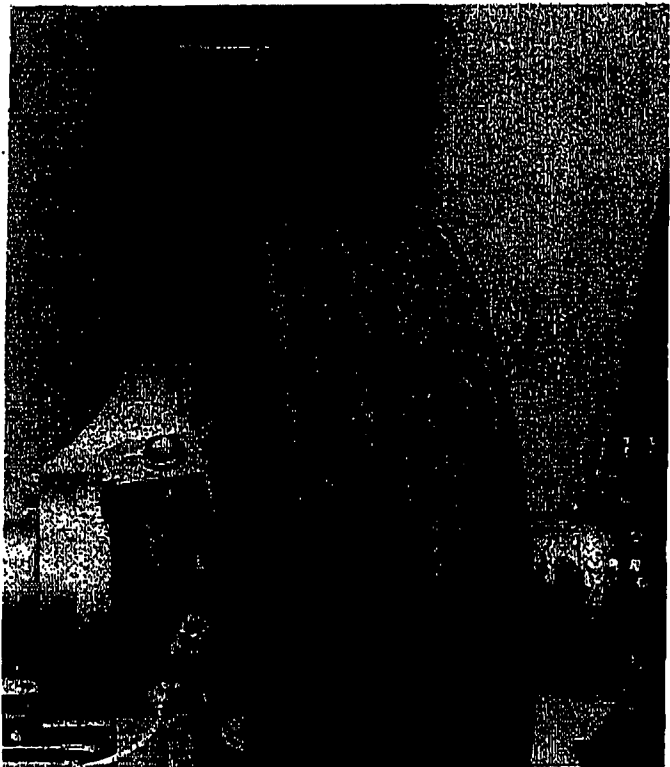


Fig. 3 - View of brake assembly and test grid

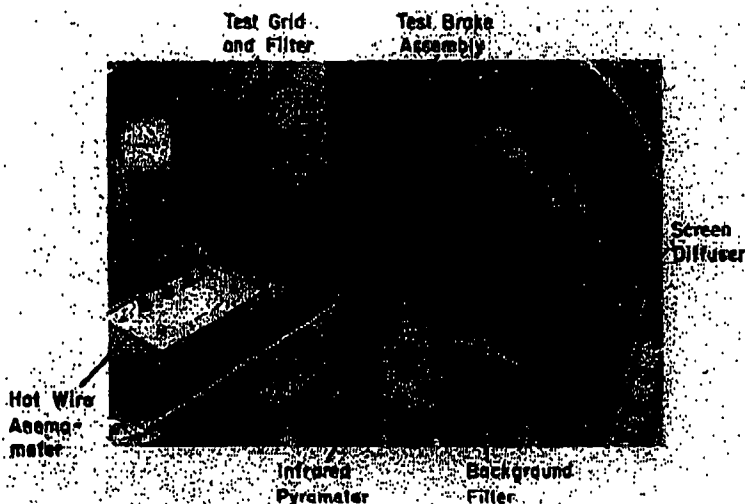


Fig. 2 - Dynamometer test setup