DESCRIPTION OF SURVEY METHODS

Personal and general air samples were collected. Brake repair operations were monitored to provide asbestos exposure data. Personal air samples were collected in the breathing zone of the brake mechanics and other shop personnel using Millipore type AA, 37mm diameter, 0.8 μm pore size, membrane filters and MSA Model G pumps at a sampling flow rate of 2.0 liters per minute (lpm). The filters were changed periodically during the work shift to prevent overloading of the sampling media. Peak samples were also collected using 25mm diameter Millipore type AA membrane filters of 0.8 μm pore size at 4.0 lpm using Dupont P-4000 sampling pumps when workers were blowing dust from backing plates and assemblies. General area Hi-volume samples were collected on Wattman 81 mm 0.8 μm membrane filters with Staplex high-volume air samplers at a sampling rate of 10 to 15 cubic feet of air per minute for trace metal analysis. Analysis of the membrane filters for asbestos fibers was conducted in accordance with the procedures outlined by the Occupational Safety and Health Administration[3] and the NIOSH P&CAM No. 239.[4] These procedures entail the counting of fibers greater than 5 micrometers (μm) in length and with at least a 3 to 1 length to width (aspect) ratio using phase contrast optical microscopy at a magnification of 400-450X.

Fiber Characterization

Personal and area samples collected at the shop were analyzed on a transmission electron microscope (TEM) utilizing selected area electron diffraction (SAED) and an energy dispersive X-ray analyzer. Sample preparation and analysis were performed using the NIOSH methods described in the Technical Report, "Review and Evaluation of Analytical Methods for Environmental Studies of Fibrous Particulate Exposure".[5] Samples were observed at 17,000X magnification with fibers (≥3:1 aspect ratio) sized by length and diameter. SAED was attempted on all observed fibers for possible identification. In addition, energy dispersive X-ray analysis was performed on individual fibers to determine their elemental composition. Forty-five percent of the fibers analyzed by SAED could not be identified due to ambiguous diffraction patterns. The remaining fibers were identified as chrysotile. Those fibers which revealed ambiguous SAED patterns were either too small for diffraction analysis or had undergone elemental metamorphosis probably as a result of the intense heat generated during braking. The elemental composition of many of these fibers appeared to indicate a stage of metamorphosis between chrysotile and forsterite.

Also, the fiber concentration (fibers/cc) of each sample was determined by TEM for fibers >5 μm in length and for total fibers observed. These concentrations were compared to those found by the optical microscopy method and are reported in Table 3. In 7 of 11 samples fiber concentrations (>5 μm) determined by phase contrast optical microscopy were