Occupational Hazards of Pipe Insulators

WILLIAM T. KEANE, MS, AND MITCHELL R. ZAVON, MD, CINCINNATI

THE DEATH of a member of the International Association of Heat and Frost Insulators and Asbestos Workers, resulting from a *Bacillus anthracis* infection, focused attention on the potential occupational hazards of this trade. An investigation of the work which these men perform and the materials with which they come in contact was undertaken in order to determine the nature of the hazard, if any, of this trade. To initiate the study, all materials used by union members in the Cincinnati area were first reviewed and evaluated. These materials were divided into five major categories (A to E) according to their chemical composition. Each of these will be dealt with individually.

An analysis of the job indicated that the handling of fibrous glass, magnesium carbonate and calcium silicate materials containing asbestos fibers, adhesives, and cements occupies 80% to 90% of the average insulator's working time. Accordingly, these materials were of particular interest and have been reviewed in detail within the framework of the major category in which they reside.

Glass Insulating Materials

The term glass has traditionally been linked in the minds of men, with lacerations and other forms of physical injury. In addition to such physical insults, there is reason to be concerned with the possible effects from the ingestion and inhalation of airborne particles of glass, since glass insulating materials are produced in forms that may give rise to airborne fibers and flakes of glass.

Submitted for publication Aug 30, 1963; accepted Nov 11.
From the Kettering Laboratory, University of Cincinnati College of Medicine, Cincinnati.
Reprint requests to Kettering Laboratory, College of Medicine, Eden and Bethesda Avenues, Cincinnati 45219 (Dr Zavon).

Review of Literature Concerning Glass Fibers.—Glass fiber materials were first developed by Owens-Corning Fiberglas Corporation in 1932, and in 1938 this company opened the first plant in the world for the production of fibrous glass.

Glass fibers are silicates and have the following general composition:

Silicon dioxide (SiO_2)	54-65%
Oxides of aluminum	1-15%
Calcium (Ca)	0-22%
Magnesium (Mg)	0-6%
Boron	0-10%

Others additives: sodium (Na), phosphorus (P), iron (Fe), barium (Ba), titanium (Ti).

A phenol formaldehyde resin is applied to the glass fibers to bond and hold them in boards, mats, or wool-like masses. The resin is bonded securely to the glass fiber by heating to temperatures ranging from 450 F to 550 F, in order to prevent its removal from the glass and vice versa. Thus, the resin is not an airborne hazard in itself. Glass fiber insulating materials have the following properties: they are incombustible and resistant to high temperatures (600 to 700 C); they are nonhygroscopic, imputrescible, and do not deteriorate; they are stable, not attacked by oils, corrosive fumes and acids (except hydrofluric); they are not attacked by parasites, mites, termites, or rodents; they are resistant to traction, but are not elastic and have little resistance to friction and impact. Glass fibers commercially serve as thermal, electrical, and acoustical insulators.

Under the influence of sufficient friction or impact, the insulating material shatters into small glass fibers of varying lengths with jagged ends. Some of these fibers are of sufficiently small size to remain airborne for appreciable periods of time, thus