

FILE NAME: Concrete (CONC)

DATE: 1939 June

DOC#: CONC006

DOCUMENT DESCRIPTION: Journal Article - Mechanical-Filter Type of Respirators

Charter Member



Associated Business Papers

CONCRETE, with which has been combined Cement Age, New York, and Concrete Engineering, Cleveland, is devoted to the Proper Use of Concrete and the Manufacture of Cement.

Published Monthly by

CONCRETE PUBLISHING CORPORATION
400 West Madison Street
Chicago, Illinois
Telephone CENTral 8822

Louis Brookman, Jr., *Business Manager*
L. Moeller, *Circulation Manager*
Harold O. Hayes, *Promotion Manager*

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The Cement Mill Edition of CONCRETE is edited exclusively for those interested in the manufacture of portland cement and related products.

Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition.

The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

The subscription price is \$4.00 a year in the United States and its possessions, and Mexico. One dollar additional for postage in all other countries. Current copies, 50 cents each.

Charter Member



Audit Bureau of Circulations

CONCRETE—Cement Mill Section—June, 1939

CEMENT MILL SECTION of

Concrete

Established 1904

Volume 47

June, 1939

Number 6

NORMAN M. STINEMAN, *Editor*J. C. WITT, *Consulting Editor*A. C. BAMBERGER, *Assistant Editor*

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Mechanical-Filter Type of Respirators

RESPIRATORS of the mechanical-filter type are discussed in the final report of the committee on the prevention of silicosis through engineering control, published by the United States Department of Labor as *Bulletin No. 21, Part 2*. The sections dealing with respirators of the mechanical-filter type are a part of the portion of the report prepared by the subcommittee on personal respiratory protection, of which W. P. Yant is chairman. Other members of the subcommittee are Philip Drinker and E. G. Meiter.

Classification

Mechanical-filter type respirators are sub-classified in accordance with the conventional classification of atmospheric particulate matter, namely, dusts, fumes, and mists. This classification of matter embodies variations in physical state and particle size, and consequently the factors that have a direct relation to the arresting of the particles with filters, within the scope of our present knowledge of dust-filtering phenomena and filter materials. The objective of the subdivision in accordance with the classification of matter is to provide more suitable filters for the particular kind of matter to be dealt with.

Owing to similarity of design and operating principles, the purpose of these three classes of respirators are presented briefly, with a summary discussion of the essential features, uses, and limitations.

These respirators are for mechanically generated dusts resulting primarily from the mechanical disintegration of a solid, such as dust produced in the various processes of mining, construction, and manufacturing, and the various industrial operations, such as drilling, blasting, crushing, grinding, handling, and processing of rock strata and minerals; abrasive grinding; the handling, screening, and use of sand or other pulverized or dusty siliceous materials; stone and granite cutting and all similar operations and processes.

Operation of Respirators

Mechanical-filter type respirators remove by mechanical or physical filtration the dusts, fumes, or mists of hygienic sig-

nificance from the air drawn by the individual's normal inspiration from his surrounding contaminated atmosphere. The usual design of a filter-type respirator is a half-mask facepiece covering over the nose and mouth, directly connected to a filter element in forms such as a disk, pad, bag, or cylinder; although it may also be a half-mask or full-mask facepiece connected by a breathing tube to a filter element on the chest, back, or even on the head in the form of a cap. The filter elements are usually constructed from specially selected or processed paper, cellulose fiber, cloth, or felt materials.

The primary principle of dust removal by mechanical filters, appears to be simple physical trapping, filtration, or straining. Air laden with dust is passed through mats of fine fibers criss-crossed to form mesh-like entanglements with exceedingly small tortuous paths in which the particulate matter is trapped by entanglement, impingement, and adhesion, by simple screening, or more possibly, a combination of these processes. Electrostatic influences are undoubtedly present, but the extent of their importance has not been determined for filters in present-day use.

Studies of Filtering Efficiencies

Studies of comparative filtering efficiencies of various filter fabrics have shown that both the filtering efficiency and the resistance to air flow increase with continued passage of particulate matter-laden air through the filter. This is the result of deposition of particles with attending reduction in size and plugging of the paths through the filters. Obviously, a respirator which utilizes simple filtration provides its poorest protection and its lowest resistance to inhalation (greatest breathing comfort) at the beginning of use; also that its life period is determined by the time required for the plugging to increase the resistance to breathing to a point where it is laborious and uncomfortable.

The basis which has been almost universally used in this country in the past for indicating the efficiency of a respirator filter for removing particulate matter

is the percentage of the total suspension in the air drawn through the filter that is trapped or retained by the filter, or as commonly expressed, the percentage efficiency.

An efficiency determined in this manner is influenced by the dust concentration, size of dust particles, rate at which the dust-laden air is drawn into the filter, and the interval of the service life of the filter that is tested. For these reasons an efficiency value is meaningless as a measure of protection afforded, unless the conditions of the determination represent conditions of usage with respect to the aforementioned variables and influences. Further, the efficiency value determined under even representative conditions is no measure of adequate protection for a particular situation, without consideration of whether or not the amount of dust represented by the percentage inefficiency (10 per cent minus the percentage efficiency) exceeds the amount that can be breathed without harm. It is further evident that a comparison of percentage efficiency values is not a dependable basis for judging the relative efficacy of protection of two different filters unless all the conditions of test are identical and the same method (and preferably the same investigator) is used for determining the dust.

The fundamental basis for judging the suitability of a respirator is whether or not the amount of dust that is unretained or escapes through the filter under conditions of practical use is below the amount that would be harmful to breathe. This is not related to any general statement of percentage efficiency.

Quarry Blasting Leads to Damage Suit

BLASTING in a cement company quarry again forms the basis for damage claims in court, the defendant in this instance being the Lone Star Cement Corporation.

The court action is directed against this company's quarry near Dallas. The plaintiff lives on a 25-acre tract adjoining the cement company's property. The assertion is made that frequent dynamiting with heavy charges caused the formation of crevices in the earth about the plaintiff's premises, causing his three wells to dry up. In recent months, it is alleged, blasting operations have been carried on in an area from 300 to 500 yards from the home. Damages in the amount of \$21,500 are claimed.

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