

AT&T
Bell Laboratories

subject Disposable Respirators for
Use with Asbestos
Case: 48077-19

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from C. P. Lichtenwalner
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MEMORANDUM FOR FILE

For maintenance activities which may involve disturbance of materials containing asbestos, disposable respirators are often used as respiratory protective devices. Readers should be aware that there is some controversy over the use of these devices. Specifically you should note the NIOSH memorandum to the Regional Office Directors attached which states:

at the time . . . it may have been assumed appropriate to list asbestos as a fibrosis-producing particulate against which the single-use disposable respirator could be reasonably expected to provide adequate protection, NIOSH is no longer confident that such an assumption is reasonable because asbestos is also [a] potent carcinogen.

In an effort to determine the rationale behind this position I spoke to Nancy Bolinger at NIOSH in Morgantown. She stated that because asbestos is a carcinogen they would prefer not to see the use of any air purifying respirator. Thus they are advocating use of maximum possible protection. She further went on to say if a job requires mobility, the next choice after some form of supplied air respirator would be a full facepiece followed by 1/2 mask - following the standard respiratory protection factors tables to maintain highest feasible protection. Further, she stated there is difficulty assessing the fit of a disposable, claiming also that disposable respirators can easily be dislodged due to their light weight. As a final matter, she noted that most disposable respirators do not use type H (HEPA) filters which provide better filtration efficiency.

In my experience, albeit limited, a lightweight and close fitting respirator is usually less likely to be dislodged than a heavier model hanging off the end of a worker's face and chin, but it could also be true that an improperly worn heavy 1/2 or 1/4 mask respirator is so uncomfortable that a worker would have to reseat it in position. It may not be as uncomfortable wearing a dislodged or improperly fitted disposable respirator.

LLA 001700

Memorandum for File - 2

On the question of filtration efficiency, most of the work I have seen points out that the long fibrous nature should make it easier for a filter to trap asbestos than fine particulate. As pointed out by the NIOSH memorandum the tests for respirator approval use a fine particulate - not a fibrous challenge, however, one should expect better performance if fibers are used instead of fine particulate. Thus a type H filter may not be necessary for filtering asbestos fibers.

A recent study of the effectiveness of 5 different respirators filters (attached) was supplied by Ms. Bolinger. As expected the filters were much more effective in filtering chrysotile than the DEHS particulate. As table II shows, particulate penetration for the non-HEPA filters ranged from 2.7% to 31% but chrysotile penetration was usually less than 0.1%. It should be pointed out that this study tested the effectiveness of respirator filters only and did not include possible leakage around facial seal. The study did show a definite ranking of the filters ability to prevent chrysotile aerosol. Using the studies criteria of <0.1% penetration as + and anything greater than 0.1% penetration as - the ranking from the four penetration studies was as follows:

Filter Code	Manufacturer/ Model	Results from Table*			
		II	III	IV	V
A	Norton HEPA	+	+	+	+
B	3M 8710	+	+	-	+
D	Survivair 1030	+	+	-	+
E	MSA Combo II-F	-	+	-	-
C	A/O 1050	-	-	-	-

*Table II - Brief DEHS Pre-Test Exposure

Table III - Fresh from Package

Table IV - Extended DEHS Pre-Test Exposure

Table V - Pre-Test Storage at High Humidity

The 3M 8720 appeared to rate slightly higher than the Survivair 1030 because of a smaller penetration on Table IV.

A Dupont study of the protection factors of several varieties of respiratory protective devices was reported in 11/15/84 BNA Occupational Safety and Health Reporter. According to Mr. Allen Johnston of 3M, the report which will be presented to the AIHC and as a paper to the AIHJ will show the same workplace protection factors for the Dupont disposable respirators as the supplied air respirator. In particular the geometric mean protection factor for the 3M 9910 was 580 and the 95% lower limit was a protection factor of 55. He went on to claim that non-HEPA filters provided better protection than the HEPA equipped filters - hypothesizing that the higher pressure drop caused by a HEPA filter causes

LLA 001701

Memorandum for File - 3

a greater amount of air infiltration around the facial seal thereby reducing the protection factor. Non-HEPA filters provide more than adequate filtration to remove asbestos fibers and have a lower pressure drop (see tables II-V of Los Alamos report).

Based on the above information I see no reason to change our policy of recommending use of disposable respirators for maintenance activities which may involve disturbance of materials containing asbestos. It would, however, be prudent to caution against the use of the American Optical 1050 based on its poorer performance in the Los Alamos and Dupont studies.

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