

practice controls over respirators (see NIOSH, Tr. 6/21; American Industrial Hygiene Section, Ex. 2-126, Docket H-160; American Conference of Government Industrial Hygienists, Ex. 2-32, Docket H-160).

Reliance on the use of respirators when engineering and work practice controls can feasibly achieve the PEL was also opposed by many unions, such as the United Auto Workers [Ex. 172A], International Brotherhood of Teamsters [Ex. 223], International Brotherhood of Electrical Workers [Ex. 313], the International Union of Electronic, Electrical, Technical, Salaried and Machine Workers [Ex. 90-135] and the Amalgamated Clothing and Textile Workers [Ex. 260A].

These general statements of policy preference were augmented by evidence and testimony concerning the reasons for preferring engineering and work practice controls. It is generally acknowledged that protection of the employee is most effectively attained by elimination or minimization of the hazard at its source, which work practices and engineering controls are both designed to do. Industrial hygiene doctrine also teaches that control methods which depend upon the vagaries of human behavior are inherently less reliable than well-maintained mechanical methods. The validity of these generalizations has been borne out by agency experience obtained throughout OSHA's existence and has been reiterated by a number of professional industrial hygienists for the asbestos rulemaking record [Exs. 171, 176A, 253].

Engineering controls in conjunction with appropriate work practices are usually the best method for effective and reliable control of employee exposures to asbestos. [Exs. 123A, 171, 176A]. Engineering controls act on the source of the emission and eliminate or reduce employee exposure without reliance on the employee to take self-protective action. These controls encompass product substitution, process or equipment redesign, process or equipment enclosure, exhaust or dilution ventilation, and employee isolation. Once implemented, engineering controls protect the employee permanently, subject only, in some cases, to periodic preventive maintenance. Work practices also act on the source of the emission, but rely upon employer and employee behavior, which in turn rely upon supervision, motivation, and education to make them effective. For this reason, work practices may not be as desirable as engineering controls, but because the two methods often must be employed

together [Ex. 238A, 240A] and because they are the only methods that eliminate or reduce the hazard at its source, they have been given equal status in the compliance priorities of OSHA health standards. For asbestos in particular, there exist time-tested inexpensive work practices which are widely regarded as necessary and effective in many cases. These include the wetting down with surfactants of friable asbestos before handling, prohibiting blowing of asbestos dust with air hoses, prohibiting dry sweeping of asbestos dust, banning certain high speed abrasive cutting tools and others. Therefore, for asbestos, proper work practices are essential in the control of asbestos dust and are properly given priority as a control technique.

In addition, this rulemaking record again documents OSHA's past findings that respirators are the least reliable means of control because of difficulties inherent in their design and use (see e.g. preamble to OSHA's Carcinogen Policy, 45 FR 5003 at 5224 et seq., the preamble to the inorganic arsenic standard, 43 FR 19584 at 19617 et seq., and the preamble to the acrylonitrile standard, 43 FR 45800, etc.). Because of these inherent difficulties, the effectiveness of respiratory protection varies from worker to worker and is subject to human error of many forms [AFL-CIO, Ex. 335, p. 12; Held, Tr. 7/2, pp. 10-11; Corn, Tr. 7/3, pp. 7-8; ORC, Tr. 6/22, p. 61].

One difficulty facing respirator users is getting an adequate fit. For negative pressure respirators facepiece to face seal is the most critical barrier against contamination. Simply, the effectiveness of any filter is nullified by a bad fit. Even if an employer offers sophisticated quantitative fit testing, that test indicates the fit of a respirator under laboratory, not working conditions. For example, changes in strap tension significantly may affect fit. Tightness may well be endurable in a testing situation, but unacceptable to the employee at work who may then loosen the straps. Poor maintenance, defects, or normal deterioration will similarly affect fit. Fit problems are intrinsic for many workers, even under laboratory conditions because of unusual facial structures, glasses, wrinkles, scars, bumps, facial hair and dentures (Held, Tr. 7/2, pp. 14-15, Ex. 171).

Even if fit is not a problem, conscientious wearing of a respirator is hindered by many factors. As pointed out by AIA/NA, worker discomfort, skin irritation or heat stress, body movements, difficulties in communicating and vision limitations,

leave only a nominal possibility that respirators will be properly worn at all times [Ex. 328, pp. 111-14-15; see also NIOSH, Ex. 117A, pp. 24-25; Held, Ex. 171, p. 7; Corn, Ex. 176A, p. 5; Dukes-Bobos and Smith, Ex. 315]. Because of the problems and limitations listed above, experts testify that workers rarely keep on a respirator for an entire eight-hour shift [Rosenthal, Tr. 7/11, p. 68]. However, even short periods where respirators are not properly used dramatically affect the degree of protection to a worker relying on respiratory devices.

OSHA recognizes that there are certain activities, often involving certain maintenance and repair operations, as well as in emergency situations, in which the reliance on engineering and work practice controls to control exposures to the permissible exposure limit may not always be feasible. Where the employer can show that engineering and work practice controls for such operations are not feasible, respirators may be used as a primary means of control. For small scale, short duration maintenance and repair activities, the infeasibility of most types of engineering controls will generally be assumed. This is so, in particular, when the maintenance operations involve having personnel located at places not normally occupied by workers or when personnel must perform duties to fix broken machinery. In these situations, OSHA does not require that the employer design and install special ventilation systems. However, where asbestos insulation is being removed from components of machinery, OSHA would expect work practices to be used. In such situations, however, the employer must institute whatever engineering and work practice controls can feasibly be used.

Commenters who endorsed OSHA's proposal to permit employers to reduce exposure below 2f/cc to the new PEL using any feasible combination of engineering controls, work practices or respiratory protection [Exs. 90-166, 90-168, 90-170, 90-182, 90-233, 263] emphasized that flexibility will result in better protection. For example, Texaco stated:

It has been our experience that control methods which are more cost-effective, but equally safeguarding, will be provided when the employer has the flexibility to select the means of controlling exposure. Therefore, we strongly support any feasible combination of engineering controls, work practices, and protective equipment to reduce exposure... [Ex. 90-170].

Similarly the Chemical Manufacturers Association commented: