respirator testing for United States Bureau of Mines approval. In general, [illegible] are less efficient against silica sprays and silica dusts than against lead [illegible] protection afforded against silica by many unapproved respirators is [illegible] high order.

2. *Unreliable Carbon Dioxide Absorbents*

Although the soda lime presently used in respirators to neutralize acid gases is not adversely affected by organic vapors, some alkaline absorbents used in the past as fills for gas-mask canisters and for cartridges used in absorbing carbon dioxide in oxygen-rebreathing apparatus are known to have become paralyzed or poisoned by the vapors of ethyl alcohol. This was verified by experimental work in which carbon dioxide, passed through the granular absorbent, was absorbed completely until ethyl alcohol vapor was also introduced, whereupon the carbon dioxide passed through unchecked. After the ethyl alcohol was removed by ventilation, the alkaline absorbent again reacted with carbon dioxide in a normal manner. The use of this and similar alkaline absorbents may have resulted from adverse experience with some of the earlier types of oxygen-rebreathing apparatus when worn by members of mine rescue teams after they had partaken of alcoholic beverages.

III. Selection of a Respirator

In the selection of a respirator careful consideration should be given to the chemical, physical, and toxicological properties of the contaminating material, possible secondary or by-products that may occur; whether the exposure will be immediately dangerous, or whether injuries might arise only after prolonged exposure; the nature and amount of work to be done by persons wearing the respirator; whether the exposure will be brief or prolonged; whether sufficient consideration has been given to other possible control measures. The person making the selection should know the principles, design, scope, use, limitations, advantages, and disadvantages of the respiratory protective equipment available (see also Figure 2).

Desirable qualifications of a respirator are: low resistance to inhalation and exhalation, smallest possible dead-air space, long service life, least interference with movement and vision, light construction, ruggedness, dependability, and low cost. The two factors that most influence fatigue are the resistance to breathing and exhalation and the size of the dead-air space. Resistance to breathing is tiresome to muscles that are not trained to the effort; especially is this true of exhalation, which is normally passive. Excessive resistance can cause serious irregularities in respiration in untrained persons. The dead-air space—space between the facepiece and the wearer's face—serves to enlarge the approximately 150 ml. normal space intervening between respiratory tissue of the lungs and the environmental atmosphere. The air in this space is partly depleted of oxygen and rich in carbon dioxide, and when the volume of the space is unnecessarily large disturbances of respiration may result.

TABLE 3

Typical Situations and Suitable Respiratory Equipment

	Respirator						
	Dust, mist, or fume	Chemical cartridge	Gas mask	Air-line	Hose mask	Abrasive-blasting	Oxygen-breathing apparatus
[illegible] necessitating protection							
[illegible] blasting							
[illegible] inside cabinet	–	–	–	–	–	++	–
[illegible] leaks, outside cabinet	++	–	–	–	–	–	–
[illegible]	++	–	–	±	–	–	–
[illegible] workers							
[illegible] grinding, buffing, polishing, sweeping, screening, shoveling, mining, tunneling, and stone cutting	++	–	–	+	–	–	–
[illegible] chemical plants or involving high concentrations of toxic gases	–	–	+	–	±	–	++
[illegible] dwellings, offices, or [illegible]	–	–	++	–	±	–	+
[illegible]	–	–	++	–	++	–	+
[illegible] fumes from soldering, brazing, welding, flame [illegible]	++	–	–	++	–	–	–
[illegible]	+	–	–	++	–	+	–
[illegible] and explosions	–	–	+	–	–	–	++
[illegible] spraying	+	+	–	++	–	–	–
[illegible] storage tanks (crude)	–	–	–	–	++	–	±
[illegible] plant							
[illegible] ammonia lines	–	–	–	–	++	–	+
[illegible] ammonia lines	–	–	++	–	+	–	–
[illegible] wells, silos, unventilated	–	–	–	–	++	–	+
[illegible] ships	–	–	++	–	+	–	–
[illegible] in ventilated areas							
[illegible] than 2 per cent	–	–	++	–	++	–	–
[illegible] than 2 per cent	–	–	–	–	++	–	+
[illegible] beer, wine, vinegar, etc.	–	–	–	–	++	–	+
[illegible] not suitable.	+ Some application.			++ Usually preferred.			

[illegible] essential that the provision of respirators be under competent supervision, and not only must the correct respirator be provided, but also it must be [illegible] sterilized, and maintained in good condition and the wearer must be [illegible] instructed in its purpose, use, and care.