

The new game plan for respirator testing

THE familiar U.S. Bureau of Mines approval on industrial respirators has been replaced by a joint National Institute for Occupational Safety and Health/U.S. Bureau of Mines label reflecting tough new testing and quality control standards administered by NIOSH.

NIOSH tests respirators at its Morgantown, W. Va. laboratory under the rules set down in 30 CFR Part 11 of Federal regulations.

Only those respirators tested under Part 11 will have formal approval after March 30, 1974. You can tell if you're getting a respirator approved under Part 11 by checking the label. First, it will have the joint NIOSH/Bureau of Mines seal. Second, it will list the schedule under which it was approved. Part 11 approval schedules are: Self-contained breathing units, 13F; Gas masks, 14G; Supplied-air respirators, 19C; Filter type dust, fume, and mist respirators, 21C; and Non-emergency gas respirators, 23C.

Patricia Gussey, chief of the NIOSH Respirator Section, and Samuel Terry, supervisory chemist, filled us in on the new test procedures:

- Self-contained breathing units now have a higher demand flow requirement; inhalation temperature in certain tests is higher; the manufacturer must now state the lowest temperature at which the equipment is reliable.

- Gas masks now require standard color coding on canisters and cartridges: the regulations recognize an "escape gas mask;" manufacturers may request approval for canisters or cartridges against specific gases not now included in standard test procedures.

- Supplied-air respirators may now be approved with a maximum hose length of 300 feet, up from 250 feet; noise levels measured inside the hood may not exceed 90 dBA.

- Dust, fume, and mist respirators must meet more stringent leakage and resistance requirements; there are specific provisions for testing single-use respirators (disposable dust masks), and powered respirators.

- Chemical cartridge respirators must meet more stringent resistance requirements; paint spray respirators used to protect against lacquer sprays and enamel mists face tougher tests.

In addition, manufacturers who submit respirators to NIOSH for certification must also submit quality control plans. NIOSH has the right to reject the plans, require changes, and to inspect the manufacturer's quality control test methods, equipment, and records. If the inspection reveals that quality control is slipshod, NIOSH and the U.S. Bureau of Mines may revoke their approval.

"As a further check on quality

control, NIOSH buys samples of approved respirators on the market and submits them to the same tests used for approval. In this way, we can determine if quality has deteriorated since approval was granted," Miss Gussey told us.

Test procedures

Respirators submitted to NIOSH for approval are put through "bench" (laboratory) and "man" tests (tests in actual use).

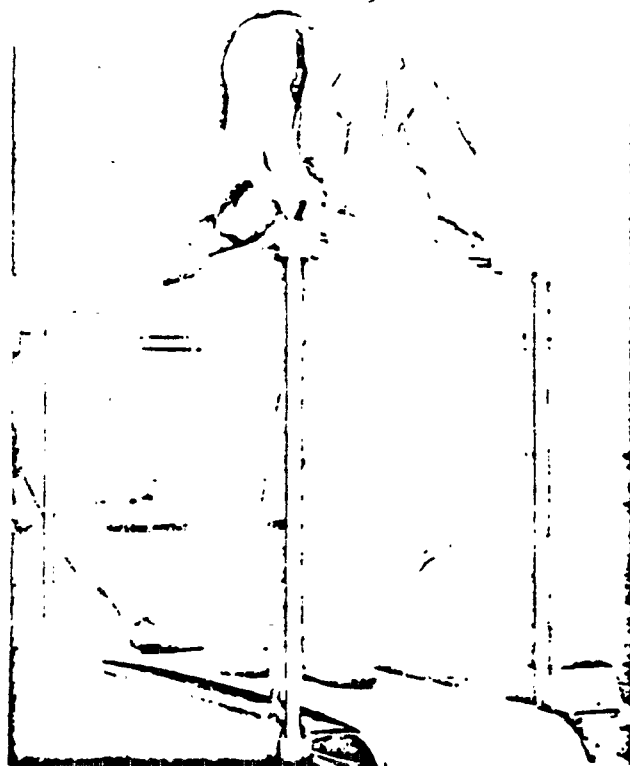
The man tests for self-contained units require hard physical work. A test subject dons the respirator, then takes a walk on a horizontal treadmill to get the feel of the equipment. Next, he takes a turn on a vertical treadmill, then crawls up, across, and down a wooden bridge-like affair.

"These tests simulate the kind of hard work encountered in mining and rescuing. They also test the performance and reliability of the major parts of the respirator. The wearer must get an adequate demand flow at all times in all positions, and the equipment must survive rugged treatment," Terry said.

Part 11 sets up stiff tests for gas masks and facepieces. Manufacturers are required either to provide several facepieces to match various facial contours or to provide one facepiece that will fit several different types of facial structure.

NIOSH man tests facepieces on people with different facial features.

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Respirators must pass a rigorous "man test" (test in actual use) before they can receive NIOSH approval. Here the test subject, wearing a respirator, works up a sweat on a horizontal treadmill.

The test subject enters a test chamber with a concentration of 100 p.p.m. isoamyl acetate for a half-mask facepiece, 1,000 p.p.m. isoamyl acetate for a full-mask facepiece. For 6 minutes, he performs various exercises: nodding and turning, arm movement calisthenics, running in place, pumping a tire pump. Throughout the exercise he should not be able to smell bananas—the characteristic odor of isoamyl acetate. Bench tests measure the canister's ability to block out known concentrations of gases.

Manufacturers move

An OH field check reveals that, in general, respirator manufacturers welcome the new NIOSH test and quality control regulations.

One representative told us, "the quality control methods are really little different from what leading makers have done for years, and now all manufacturers will have to match them. I think in the long run the testing and quality control regulations may increase the cost of respirators somewhat, but, because they are so thoroughly tested and tightly controlled, American products will be in a better position in international markets."

Manufacturers haven't been sit-

NIOSH to expand product certification?

THOUGH, officially, NIOSH may now only certify respirators, coal mine dust personal sampler units, and detector tubes, it's clear that NIOSH will soon be branching out. In fact, tests are already in progress on a wide variety of personal protective devices.

Proposed regulations are being reviewed by NIOSH officials for certification of safety hats, safety eye-wear, safety shoes, faceshields, gloves, and sound level meters. NIOSH officials are also preparing similar regulations for the future to cover noise dosimeters, hearing protective devices, and direct reading gas and vapor meters.

Right now, all of the testing is be-

ing conducted according to American National Standards Institute (ANSI) standards for safety equipment. Significantly, however, for those pieces of equipment for which no ANSI standard exists, and in cases where NIOSH believes the current ANSI could be improved, NIOSH is researching other test methods.

Will the NIOSH tests eventually lead to NIOSH certification of safety equipment? Probably. But, it's important to remember that all NIOSH can do is certify that a piece of equipment has met certain minimum standards. It cannot require employers to use only certified equipment.

In that respect, its role will be roughly analogous to that of Underwriters' Laboratories. No one is under legal obligation to use UL-listed equipment exclusively, but the UL label does represent a standard of safety and quality.

Bob Schutz, head of the NIOSH Testing and Certification Laboratory, pointed out: "The actual authority to require use of such devices and instruments and to specify where they are to be used, rests with OSHA in its role as enforcer of Department of Labor Standards. Thus, it is important to remember that the role of NIOSH is one of advice and recommendation. The role of OSHA is enforcement."

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ing on their hands and waiting for government action. Research and development has been extensive.

For example, considerable research is in progress to reduce the weight of self-contained breathing units. By reducing the weight, manufacturers could offer units that provide protection for longer than 30 minutes, the current limit for NIOSH Bureau of Mines approval. Self-contained units that offer 45 minutes of protection are available, but because they exceed the 35-pound limit set in Part II, they cannot be considered for approval.

Aluminum cylinders, recently introduced by some manufacturers, cut the weight slightly. Their main value, however, is cleanliness—aluminum won't corrode—and ease of storage—aluminum cylinders can be made with flat bottoms. A method, now being tested by NASA, of reinforcing aluminum cylinders with glass fiber filaments, may help reduce weight significantly, but it won't be ready for the industrial market for some time.

Self-contained units are the big guns of respiratory protection. They come in a variety of sizes from short duration models for workers in areas where toxic atmospheres above the capacity of a gas mask could occur, to the 30- and 45-minute duration models. One new 30-minute unit features a specially designed regulator which provides optimum air flow for peak inhalation requirements without increasing inhalation effort.

Self-generating units are also widely used. These have been Bureau of Mines-approved for up to one hour. Instead of cylinders, these respirators use a chemical canister which generates oxygen and removes exhaled carbon dioxide. An alarm warns the user to get into fresh air before his hour is up.

A new wrinkle in escape units is now used by the U.S. Navy to allow a ship's crew to escape from fire or smoke. The unit weighs 5.5 pounds and features a plastic hood and breathing air reservoir. It provides a continuous flow of air for five minutes.

Supplied air developments

Watch for a new continuous flow supplied air respirator that maintains a slight positive pressure in the vinyl

hood. Pressure helps to block out inward leakage as the hose line delivers cool, clean air. The manufacturer tells us noise levels in the hood will be well under the 80 dBA maximum permitted by Part II.

Supplied air respirators are available with a variety of headgear, including helmets specially designed for sandblasting, welding, and high temperatures.

OSHA permits air to be supplied to hose-line respirators either from cylinders or breathing air compressors. Compressors must be used

with air purifying sorbent beds and filters. If an oil-lubricated compressor is used, it should have high temperature alarm, carbon monoxide alarm, or both. If only a high temperature alarm is used, the air should be sampled frequently for carbon monoxide.

Purification systems should purify compressed air to the level approved for breathing by NFPA and Compressed Gas Association standards. One efficient system consists of a mechanical device that removes

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liquid water and oil and filters particles as small as 10 microns. It also blocks oil and water vapors, gases, and odors.

Protective respirators for dusts, fumes, and mists are subject to stringent testing and quality control under Part 11. The new regulations apply to standard type respirators; single-use respirators designed to protect against pneumoconiosis and fibrosis producing dusts and/or mists (aluminum, coal, flour, and free silica); and powered respirators.

Since the first approvals were granted about 2 years ago, the single-use or disposable respirator has been one of the hottest items on the market. Many industries have been waiting for just such a unit. Because OSHA standards require regular cleaning, disinfecting, and maintenance of respirators, disposables are in great demand in plants without cleaning and maintenance facilities and on construction sites.

Patricia Gussey of NIOSH believes the disposables are a good thing and much needed. "However," she cautions, "they are strictly for use around silicosis and fibrosis producing dusts, not for toxic materials. They should not, for example, be used around lead fumes or while spraying with lead-based paint."

Another item you'll be hearing more about is the powered respirator. It's already recognized in OSHA's asbestos standard for concentrations from 10 to 100 times the exposure limit. The NIOSH standards proposals for beryllium, coke-oven emissions, and lead also recognize powered respirators.

These devices are commonly battery-driven. They pull air into and through a filter and deliver purified air into the facepiece. Positive pressure, maintained in the facepiece at all times, helps repel contaminants that might otherwise leak in. One problem with powered respirators has been the weight of the powered unit. However, it appears NIOSH is near approval on a unit that weighs only 11½ pounds.

Improvements continue on standard-type respirators also. Several manufacturers now feature flexible aluminum facepieces so fit can be adjusted to insure a proper seal.

Many are also available with goggles and provide eye as well as respiratory protection.

Changes coming?

NIOSH is researching large samples of the working population in order to learn what facial contours and sizes are most common, and how facepieces might be altered to improve fit. This may result in a change in Part 11 requiring respirator manufacturers to supply three different facepieces. Workers, then,

would be measured and fit with the proper equipment.

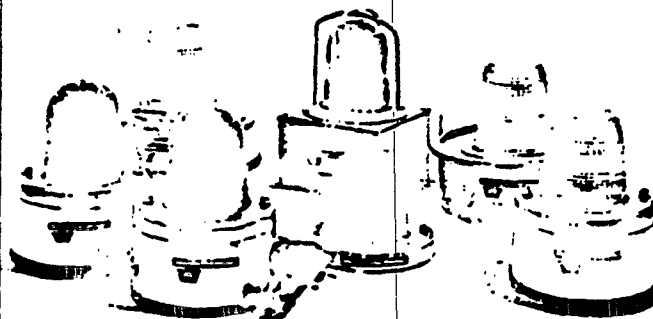
No single measurement technique has been selected, but apparently the one with the inside track measures the wearer from one corner of the mouth to the other and from the point of the chin to the bridge of the nose.

Another possible change coming eventually in Part 11: a more objective facepiece fit test than the present one which relies on the subject's ability to detect the odor of isoamyl acetate. ■

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