In 1995, the National Institute for Occupational Safety and Health (NIOSH) published new certification tests for non-powered (negative-pressure) particulate filter respirators. The new certification regulation, 42 CFR 84, which contained these tests, eliminated the need for unique tests of particulate respirators used for various aerosols. At the same time, 42 CFR 84 established three series of filters, N, R & P with three levels of filter efficiency, 95, 99 and 99.97%. According to NIOSH, these new filters can be used without regard to aerosol size. The most critical filter selection issue is the presence of oil aerosols in workplace air.

In this workplace study, there was no difference in performance among a dust/mist respirator approved under 30 CFR 11 and two N95 particulate respirators approved under 42 CFR 84. While the new NIOSH standard imposed stricter filter performance requirements, its implementation did not result in a significant difference in protection provided by the new respirators.

In 1995, the National Institute for Occupational Safety and Health (NIOSH) published new certification tests for non-powered (negative-pressure) particulate filter respirators. The new certification regulation, 42 CFR 84, which contained these tests, eliminated the need for unique tests of particulate respirators used for various aerosols. At the same time, 42 CFR 84 established three series of filters, N, R & P with three levels of filter efficiency, 95, 99 and 99.97%. According to NIOSH, these new filters can be used without regard to aerosol size. The most critical filter selection issue is the presence of oil aerosols in workplace air.

While certain laboratory tests may show a difference between 30 CFR 11 and 42 CFR 84 compliant filters, there are no data to show if or how these changes affect respiratory protection in the workplace. Therefore, this study was undertaken to:

- measure the performance of three half-facepiece respirators by measuring workplace protection factors (WPFs);
- compare the workplace performances of a 30 CFR 11-approved half-facepiece dust/mist respirator and two 42 CFR 84-approved half-facepiece particulate respirators.

**Workplace protection factor**

The workplace protection factor (WPF) is a measure of the protection provided in the workplace, under the conditions of that workplace, by a properly selected, fit-tested, functioning respirator, when correctly worn and used.

(see Workplace performance on page 2)

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**A Note from the Editor**

In response to your requests, *JobHealth Highlights* will be converting to an electronic format with the second issue of 2000. For more information and to subscribe, please see the article on page 3 of this issue.

We appreciate your ongoing readership of *JobHealth Highlights* and look forward to continuing to serve you.
Mathematically, it is the ratio of Co to Ci, (WPF = Co/Ci) where:

- Co represents inhalation exposure with the respirator off (ambient sample)
- Ci represents inhalation exposure with the respirator on (in-facepiece sample)
- Co and Ci are determined simultaneously only while the respirator is worn and used during normal work activities.

Materials and methods

The respirators tested were the 3M 8710 Dust/Mist Respirator, the 3M 8210 N95 Particulate Respirator and the 3M 8511 N95 Particulate Respirator, which has an exhalation valve. Each of these respirators is NIOSH-approved. The 3M 8710 respirator was approved to 30 CFR 11 requirements, while the 3M 8210 and 3M 8511 respirators were approved to 42 CFR 84 requirements. The approval tests were conducted before July 10, 1998. After that date, respirator manufacturers could no longer sell 30 CFR 11 approved respirators and state they were NIOSH-approved.

The workplace chosen for the study was a lead battery plant. The facility used the dust/mist respirator in accordance with the administrative stay in the respirator selection table of the general industry lead standard, 1910.1025. OSHA placed this stay on the lead standard in 1979. The stay is still in effect and allows the use of non-HEPA (high efficiency particulate air) filters on respirators for concentrations up to 10 times the permissible exposure limit (PEL).

Twenty-one workers involved in plate stacking and assembly operations participated in the study. In addition, some workers were involved in burning operations. They were chosen because lead concentrations in their work areas were expected to be the highest. The workers were required to be clean-shaven.

The workers were instructed in proper donning, fitting and adjustment of the respirators. Prior to the study, each worker had passed the Bitrex qualiﬁcal ﬁt test with each respirator. The ﬁt test was conducted according to the protocol in the Occupational Safety and Health Administration (OSHA) Respiratory Protection Standard, 29 CFR 1910.134.

The sampling equipment used in the study included typical industrial hygiene equipment as well as specialized equipment developed for WPF testing.

A specially-designed nylon probe was used to collect in-facepiece samples. It was built to the specifications of a probe developed at the University of Minnesota by Dr. B.Y.H. Liu. However, it was longer than the original Liu probe and designed to project 1.0 cm into the respirator (from the inner surface of the respirator) and could be adjusted to varying depths. The probe was also designed to minimize particle entry losses.

The probe was placed opposite the mouth on the midline of the respirator. This placement was consistent with the recommendation made by Johnston, et al. When the respirator with the exhalation valve was evaluated, the probe was placed to the side, but still close to the mouth area. Because the depth of the probe was adjustable, it could be placed as close to the mouth area as possible without touching the mouth.

A sample cassette was ﬁtted directly to the probe for collection of the in-facepiece sample. A cassette heater was used to prevent moisture (from a worker’s exhaled breath) from condensing inside the sample cassette. The heater was based on a design by Myers and Weiss, and consisted of a bonnet, a battery pack, an LED used as an on/off indicator and a switch. The bonnet ﬁt over the cassette and contained a coiled heating element. A nickel/cadmium battery served as the power source.

The cassettes and sample tubing were attached to personal sampling pumps. Each worker wore two pumps. A water trap was placed between the in-facepiece cassette and sampling pump to protect the pump from condensed water.

The ambient sample (i.e., outside the respirator) was collected using the same type of cassette, which was placed in a worker’s breathing zone. A probe

Table 1  WPF results

<table>
<thead>
<tr>
<th>Respirator</th>
<th>3M 8710</th>
<th>3M 8210</th>
<th>3M 8511</th>
</tr>
</thead>
<tbody>
<tr>
<td>GM</td>
<td>730</td>
<td>955</td>
<td>673</td>
</tr>
<tr>
<td>GSD</td>
<td>3.24</td>
<td>4.75</td>
<td>2.31</td>
</tr>
<tr>
<td>5th Percentile</td>
<td>105</td>
<td>73</td>
<td>169</td>
</tr>
<tr>
<td>N</td>
<td>44</td>
<td>28</td>
<td>24</td>
</tr>
</tbody>
</table>

GM = Geometric mean
GSD = Geometric standard deviation
N = Number of samples
was attached to the outside sampling cassette so if any particle loss did occur due to the probe, the outside sample would be subjected to a similar loss.

Each worker was sampled for three days, wearing one respirator model on each day. The respirator models were randomly assigned to the workers and all three respirators were in use on each day.

Pump calibration was done in-line before and after taking each sample. The samples were collected at 2 Lpm. Sampling time ranged from 79 to 159 minutes. Up to three sample sets per day were collected for each worker.

Field blanks were collected and handled in the same manner as the samples, however, no air was drawn through them. Particle size sampling was conducted using 6-stage single-jet cascade impactors.

The ambient samples were analyzed for lead using inductively coupled plasma (ICP) spectroscopy. The in-facepiece and blank samples were analyzed by Proton Induced X-ray Emission (PIXE) Analysis. No detectable lead was found on any blank samples.

Workplace protection factors were calculated by dividing ambient concentrations by the corresponding in-facepiece concentrations. The geometric mean WPF, geometric standard deviation and fifth percentile WPF for each filter type were determined. The mean values were then tested using a one-way analysis of variance test (Tukey’s pairwise comparisons).

**Results**

One hundred forty-three (143) sample sets were collected to calculate workplace protection factors. Forty-seven (47) sample sets had inside sample mass values reported as non-detectable.

(see Workplace performance on page 4)
The outside lead concentrations ranged from 0.029-1.87 mg/m³. On average, the ambient short term samples were approximately 5-7 times the PEL. While some of the short term sample concentrations were high, it is important to remember these were not 8-hour time-weighted average (TWA) concentrations.

The inside lead concentrations ranged from non-detectable to 7.96 µg/m³. No worker was overexposed to lead as indicated by the in-facepiece concentration. All in-facepiece samples were less than the PEL of 50 µg/m³. All three respirators provided adequate protection, as indicated by the in-facepiece concentrations.

The mean WPF for the 3M 8710 dust/mist respirator was 730 with a fifth percentile of 105. The mean WPF for the 3M 8210 particulate respirator was 955, with a fifth percentile of 73. The mean WPF for the 3M 8511 particulate respirator was 673, with a fifth percentile of 169. There was no statistical difference among the geometric mean (GM) WPFs for the three respirators. All three fifth percentile WPFs were greater than 10.

A large portion of the data collected (about 30%) is not being used in the analysis presented in Table 1. While difficult to use statistically, the large number of inside samples that were non-detected indicates good respirator performance.

Waters has suggested that using 70% of the detection limit for censored data is most appropriate for parameter estimating, as long as the number of non-detectable samples is less than 30% of the data. We decided to examine these data by assuming 70% of the detection limit to be the amount of mass on the inside samples reported as non-detected. However, the 3M 8210 particulate respirator and 3M 8511 particulate respirator data sets exceed this limit. Forty percent (40%) of the 8210 respirator data had in-facepiece samples reported as non-detectable. Forty nine percent (49%) of the 8511 respirator data had in-facepiece samples reported as non-detectable. While we can discuss whether this is appropriate, it illustrates the effect of ignoring the non-detectable samples. The results are shown in Table 2.

Statistical tests indicate the differences among the geometric mean for the 8710 dust/mist respirator and the two particulate respirators are statistically significant. Examination of the fifth percentile, however, indicates the APF of 10 is appropriate for all respirator models.

Four of the five cascade impactor sample results indicated two particle size modes in the range of 7-12 µm and 2-5 µm. The fifth sample indicated a third mode of 0.6 µm. While fume was generated, 80% or greater of the mass of the lead aerosol was in the dust range.

The main variable in the study was respirator model, since many other variables were controlled by using the same workplace, workers, fit-test method, respirator facepiece, and sampling and analytical methods. The statistical

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<tr>
<th>Resperator</th>
<th>3M 8710</th>
<th>3M 8210</th>
<th>3M 8511</th>
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<tbody>
<tr>
<td>GM</td>
<td>804</td>
<td>2210</td>
<td>1968</td>
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<tr>
<td>GSD</td>
<td>3.30</td>
<td>5.46</td>
<td>3.82</td>
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<tr>
<td>5th Percentile</td>
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<td>223</td>
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<tr>
<td>N</td>
<td>49</td>
<td>47</td>
<td>47</td>
</tr>
</tbody>
</table>

GM = Geometric mean  
GSD = Geometric standard deviation  
N = Number of samples

Table 2: WPF results using non-detectable samples

Discussion

The main variable in the study was respirator model, since many other variables were controlled by using the same workplace, workers, fit-test method, respirator facepiece, and sampling and analytical methods. The statistical

Visit the 3M OH&ESD web site

Information on 3M OH&ESD products, as well as on current issues in respiratory protection, can be obtained by visiting our web site.

Our address is: http://www.3M.com/occsafety

Tech line

To reach 3M’s Technical Service staff with questions regarding our products, you can call 1-800-243-4630. If you wish to contact your local sales representative, you can leave a message by calling 1-800-896-4223.
tests indicate no significant differences among the challenge concentrations for each filter type.

The WPF results indicate no significant difference among the respirator models. All respirator models provided fifth percentiles considerably greater than 10, which is the assigned protection factor (APF) for this respirator specified in the OSHA lead standard(9) and in the American National Standard for Respiratory Protection, ANSI Z88.2-1992.(10)

Certain laboratory tests may indicate differences among the filters of these respirators. In this study, however, there was no difference in the workplace protection provided by these respirators. This is probably because filter efficiency is just one of the factors that contributes to respirator performance, and for half-facepiece respirators, not the most important factor.

The particle size information from the workplace in this study is consistent with that reported for other lead battery plants.(11,12) Based on these WPF results, the OSHA administrative stay on the HEPA filter requirement for lead in general industry appears to be appropriate.

Conclusions

The following statements summarize our conclusions from this study:

- All respirator models provided a level of protection consistent with an APF of 10. There was no significant difference in the protection provided by the dust/mist respirator and the N95 particulate respirators tested, using the samples with detectable levels on the in-facepiece samples.
- All tested respirators reliably provided workplace protection factors of 10 when properly fitted, worn and used.
- In this study, the fifth percentile WPFs greatly exceeded 10, the maximum level for half-facepiece respirators.
- No WPFs were less than 51.
- No worker was overexposed to lead, as indicated by in-facepiece concentrations.
- Under actual workplace conditions, where respirators were tested for several hours, there was no difference in the protection provided to workers by the 30 CFR 11 approved-respirator and the 42 CFR 84-approved respirators.
- Using the fifth percentile as an indicator of performance, the APFs should not be different for these respirators.

References


“Bitrex” is a trademark of Macfarlan Smith, Ltd.
On October 7, 1999 the Nuclear Regulatory Commission (NRC) amended its regulations regarding the use of respiratory protection and other controls to help reduce worker exposure to radioactive material. These amendments were published in the Federal Register, 64 Fed. Reg. 54543. They are codified in 10 CFR 20. The NRC also revised Regulatory Guide 8.15.

This summary of the amendments to 10 CFR 20 has been prepared by 3M OH&ESD. It does not represent an official, legal, nor complete interpretation of the standard. If specific questions arise, the standard itself and Regulatory Guide 8.15 should be reviewed, rather than this summary. A copy of the amendments and Regulatory Guide 8.15 can be viewed or copied from the 3M web site: www.3M.com/occsafety.

Summary

According to the NRC, the amendments to 10 CFR 20:

- are consistent with recent (1998) revisions to the Occupational Safety and Health Administration’s (OSHA’s) respiratory protection rule(2); and
- make NRC requirements for radiological protection less prescriptive, while reducing unnecessary regulatory burden, without reducing worker protection.

The amendments provide greater assurance that recent technological advances in respiratory protection equipment and procedures are reflected in NRC regulations and clearly approved for use by licensees.

In addition to the amendments to 10 CFR 20, the NRC has revised Regulatory Guide 8.15. Regulatory guides provide descriptions of acceptable programs, are for guidance only and cannot be enforced unless a licensee commits to use specific regulatory guides in its license. Regulatory Guide 8.15 provides useful guidance for implementing an acceptable respiratory protection program.

Effective date

This final rule became effective February 4, 2000.

NRC vs. OSHA jurisdiction

In 1988, the NRC and OSHA signed a Memorandum of Understanding clarifying jurisdictional responsibilities at NRC-licensed facilities. The NRC regulates three areas:

- Radiation risk produced by radioactive materials;
- Chemical risk produced by radioactive materials; and
- Plant conditions that affect the safety of radioactive materials and thus present an increased radiation risk to workers.

If an NRC licensee is using respiratory protection to help protect workers against non-radiological hazards, OSHA requirements apply. The NRC states that, “This final rule would not require a licensee to maintain two distinct programs, and only minor differences exist between the OSHA requirements and this final rule.”

Part 20, Subpart H

The NRC’s regulations for protection against radiation are found in Title 10 of the Code of Federal Regulations (CFR) Part 20. The respiratory protection regulations are located in several sections of Part 20, Subpart H, such as 20.1701, 20.1702, 20.703, etc. This contrasts with the structure of the OSHA standard, where the entire respiratory protection standard is located in one section, 1910.134, in Subpart I of OSHA’s General Industry standards, 29 CFR Part 1910. Awareness of this difference is important because, while the OSHA Respiratory Protection Standard is referred to with one number, several numbers are needed to refer to the NRC’s requirements. As a result, when discussing the NRC’s requirements in general terms, referral is made to Subpart H instead of specific section numbers. Definitions for respiratory protection terms are found in a separate section, 20.1003. They are located in Part 20, but not Subpart H.

Definitions

The NRC added several terms to the “Definitions” section that relate to respiratory protection. Prior to publication of these amendments, the only term the NRC used was “respiratory protective device.” In 20.1003, respiratory protective device means an apparatus, such as a respirator, used to reduce the individual’s intake of airborne radioactive materials.
Control methods

Sections 20.1701 and 20.1702 state the NRC’s hierarchy of controls. It is similar to OSHA’s, in that engineering controls are preferred. Only when it is not practical to apply process or engineering controls is respiratory protection allowed as a means to control worker exposure to radioactive material in the air.

Use of respirators (20.1703)

The majority of the requirements for use of respiratory protection are found in section 20.1703. The NRC considers a respiratory protective device to reduce the intake of airborne radioactive material unless the device is clearly and exclusively used for protection against nonradiological hazards. The requirements in this section apply whenever respiratory protection is used.

NIOSH-approved respirators

Generally, respirators approved by the National Institute for Occupational Safety and Health (NIOSH) are required to be used. An exception is made for respirators that have not been approved, are not listed in Appendix A or for which there are no test schedules. In these situations, the licensee can apply to the NRC for authorization to use this equipment.

Respiratory protection program

The NRC requires that a respiratory protection program be implemented. This program must include:

- Air sampling;
- Surveys and bioassays;
- Testing of respirators for operability, immediately prior to use;
- Written procedures
- Medical fitness determination by a physician; and
- Fit-testing.

Written procedures must be developed regarding:

- Monitoring, including air sampling and bioassays;
- Supervision and training of respirator users;
- Fit-testing;
- Respirator selection;
- Breathing air quality;
- Inventory and control;
- Storage, issuance, maintenance, repair, testing and quality assurance of respiratory protective equipment;
- Recordkeeping; and
- Limitations on periods of respirator use and relief from respirator use.

Program administration

Program administration is not addressed specifically by 10 CFR 20, although the NRC recognizes the importance of program administration. Regulatory Guide 8.15 states a program should be established that identifies the individuals who have supervisory and technical responsibilities in the respiratory protection program, including the respirator program administrator. The NRC will allow radiological and nonradiological respiratory protection programs to have different administrators. However, adequate communication and coordination must exist between the programs.

Respirator maintenance

10 CFR 20 requires that written procedures be developed for storage, issuance, maintenance, repair, testing and quality assurance of respiratory protective equipment. However, the requirements do not specify particular tasks. OSHA’s Respiratory Protection standard provides more detailed information. Still, guidance on respirator maintenance, storage, control, issuance and recordkeeping is provided in Regulatory Guide 8.15.

Medical evaluation

A physician selected by the licensee should determine which screening methods and tests are appropriate, set the acceptance criteria for those methods and tests, and periodically review the implementation of the program. While the physician is responsible for fitness determination, he or she need not administer each test personally. The physician may designate a certified, medically-trained individual who (in the judgement of the physician) has adequate experience, education, training and judgement to administer the screening program.

The fitness determination must be performed prior to the initial fit test for tight-fitting respirators and prior to the first field use of loose-fitting devices. A worker must be reevaluated every 12 months thereafter or at some frequency established by the licensee’s physician. Both NIOSH and ANSI Z88.6-1984 have suggested reevaluation intervals that a physician may use. Although the Z88.6-1984 document is no longer available from ANSI, the NIOSH recommendations are very similar.

(see NRC amends regulation on page 8)
The OSHA questionnaire is acceptable for medical screening, but the physician is responsible for establishing the precise screening method.

**Fit-testing**

All tight-fitting respirators must be fit-tested. Fit-testing must be performed before the first respirator use and annually thereafter. Qualitative fit-testing (QLFT) or quantitative fit-testing (QNFT) must be performed in the negative pressure mode, regardless of the respirator mode of operation that will be used in the field. The minimum acceptable fit factor for negative pressure respirators is 10 times the Assigned Protection Factor (APF). For positive pressure respirators, the minimum acceptable fit factor is 500. This requirement differs from the OSHA requirement. To OSHA, either QLFT or QNFT is acceptable and a positive pressure respirator can be used up to its assigned protection factor. Present QLFT methods are designed to ensure a fit factor of 100. Therefore, QLFT is only appropriate for devices with an APF of 10 or respirators with an APF greater than 10 where the licensee only takes credit for a protection factor of 10. In order to take credit for an APF greater than 10 for those devices listed in Appendix A to Subpart H, quantitative fit-testing must be performed. Fit-testing performed in accordance with the OSHA protocols will comply with the NRC’s requirements.

**User seal checks**

Each respirator wearer must perform at least one type of user seal check each time a face-sealing respirator is used. Acceptable user seal checks include the positive-pressure check and the negative-pressure check. The respirator manufacturer’s recommended procedures for performing a user seal check may be used instead of the positive- or negative-pressure check procedures, provided the employer demonstrates the manufacturer’s procedures are effective. The user seal checks recommended by 3M for disposable half-facepiece respirators have been demonstrated to be effective. The NRC also outlines user seal checks using irritant and odorous test agents.

**Respirator relief**

The NRC standard requires the licensee to advise each respirator user that they may leave the area at any time for relief from respirator use. Conditions that may require relief from use include equipment malfunction, physical or psychological distress, procedural or communication failure and significant deterioration of operating conditions.

**Limitation considerations**

Licensees are required to consider limitations of the respirator type and mode of use. The licensees must provide for vision correction, adequate communication, low temperature work environments and the concurrent use of other safety or radiological protection equipment when necessary.

**Breathing air quality**

Atmosphere-supplying respirators must be supplied with respirable air of Grade D quality or better, as defined by the Compressed Gas Association publication, G7.1. Moisture content in breathing air cylinders is not specified in 10 CFR 20, but Regulatory Guide 8.15 states that the NRC mandates compliance with the OSHA requirement (i.e., a dewpoint ≤ -50°F). They suggest, if practical, compliance with the moisture requirement of Grade L (i.e., a dewpoint ≤ -65°F).

**Face-to-facepiece seal integrity**

The presence of any item in the face-to-facepiece seal area of a tight-fitting respirator is prohibited by 10 CFR 20.1703(h). This includes facial hair, hair from the head, cosmetics, spectacle temple bars, and protective clothing and equipment that project into the seal area. Regulatory Guide 8.15 states the worker must be clean shaven, but that a respirator wearer should not be required to shave more than once during a 12-hour period.

**Appendix A of Subpart H**

Appendix A lists respirator types and their assigned protection factors established by the NRC. The APFs listed are taken from ANSI Z88.2-1992. Several footnotes are attached to this table. They explain the use of the table where the NRC differs with the APFs or respirator classifications of ANSI Z88.2-1992. The more significant differences involve quarter-facepiece respirators, half-facepiece respirators, disposable filtering facepiece respirators and the effect of filter selection on APF.

**Quarter-facepiece respirators**

Quarter-facepiece respirators seal over the bridge of the nose, around the cheeks and between the point of the chin and the lower lip. They are not listed in Appendix A

(see NRC amends regulation on page 9)
NRC amends regulation
(continued from page 8)

of 10 CFR 20 and may not be used in an NRC-regulated respiratory protection program. 3M OH&ESD does not manufacture or sell quarter-facepiece respirators.

**Half-facepiece respirators**

ANSI Z88.2-1992 considers all filtering facepiece respirators to be half-facepiece respirators. The NRC uses two entries, one for filtering facepiece disposable respirators and another for half-facepiece air-purifying respirators. An APF is not assigned to disposable filtering facepiece respirators. The NRC definition (explanation) of a half-facepiece air-purifying respirator includes [3M emphasis] a filtering facepiece respirator if it has two characteristics. In order to be considered a half-facepiece respirator it must:

1. Have seal-enhancing rubber or elastomeric material applied to the entire face-to-facepiece seal area; and
2. Have an adjustable four-point (minimum) suspension strap system [NRC emphasis].
   (As in the 3M 8212, 8233, 8293 respirators.)

Most of these devices have exhalation valves, but an exhalation valve is not an essential design component. Devices that meet these criteria are considered half-facepiece respirators by the NRC and have an APF of 10. They are acceptable for use in an NRC-regulated program, as long all program requirements (e.g. medical screening, fit-testing, training, etc.) are fulfilled.

**Other filtering facepiece respirators**

Other NIOSH-certified filtering facepiece respirators that do not fit the NRC’s description are referred to as single-use disposable respirators or dust masks in Regulatory Guide 8.15. Voluntary use of these devices is acceptable to the NRC when no hazard exists and no APF is required. These devices do not have an APF listed in Appendix A. They are permitted for use in a radiological respiratory protection program, but no credit may be taken for their use unless [3M emphasis] certain criteria are met. The NRC’s requirements for respirators used voluntarily are different than OSHA’s requirements. As long as no APF is used, licensees are relieved of the requirement to medically screen and fit-test the wearers of these devices. A user seal check should be performed in accordance with the manufacturer’s instructions and all other applicable program requirements listed in 10 CFR 20.1703 apply. According to the NRC, the devices must be NIOSH-certified and wearers trained in their proper use and limitations. The information in OSHA's Appendix D to 29 CFR 1910.134 constitutes acceptable training for users of these devices.

In Appendix A to Part 20, voluntary use appears to be viewed as the primary purpose for these respirators and no APF is listed. It seems that the NRC considers the use of these devices for protection to be secondary. This is supported by the placement of the conditions for use with an APF of 10 in the footnotes to Appendix A.

If the licensee wants to use an APF for these devices, the rule permits the use of an APF of 10 if the licensee can demonstrate a fit factor of at least 100 by using a validated or evaluated qualitative or quantitative fit test. If an APF is used for these devices, the requirement for medically-screening the user is reinstated. Acceptable protocols for qualitative fit-testing can be found in Sections B1-B5 of Appendix A to OSHA 29 CFR 1910.134. In other words, these respirators may be used like any other half-facepiece respirators, as long as they are treated like all other half-facepiece respirators.

**Respirator filters**

The decision whether N-, R-, or P-type filters should be used is left to the licensee. P100 filters are not required to be used on half-facepiece respirators, but the NRC has made the APF for air-purifying respirators dependent upon the filter efficiency chosen. The ANSI Z88.2-1992 APFs for negative pressure respirators are not dependent upon the filter that is used. The APF takes into account filter leakage and face seal leakage (see JobHealth Highlights Vol. 16, No. 4; 1998).

For negative-pressure air-purifying respirators with an APF < 100, filters of at least 95% efficiency are required to be used (e.g. N95). For negative-pressure air-purifying respirators with an APF = 100, filters of at least 99% efficiency must be used. A negative-pressure full facepiece respirator with N95 filters has an APF of less than 100, according to the NRC. For

(see NRC amends regulation on page 10)
positive-pressure air-purifying respirators with an APF $> 100$, filters of at least 99.97% efficiency are required to be used. Currently, powered air-purifying respirators are only certified with high efficiency particulate air (HEPA) filters so this should not be an issue.

Readers are encouraged to review 10 CFR 20, Subpart H and Regulatory Guide 8.15 for more detailed information.

**References**


3M to present technical data, new products at AIHCE 2000

During the 2000 American Industrial Hygiene Conference and Exposition (AIHCE) to be held in May in Orlando, Florida, 3M OH&ESD will be presenting technical data and exhibiting innovative, new products for respiratory protection. We hope you will stop by Booth #2609 to visit with us.

Technical sessions

Data on many aspects of respiratory protection will be presented during the conference. Several papers of particular interest to JobHealth Highlights readers are listed below.

New 3M products to be exhibited

3M continues to offer innovative new products for respiratory protection. Several of them are described here and will be on display at AIHCE Booth #2609.

9200 Series Respirators
Two new lightweight, easy-to-use particulate respirators offer a breakthrough in comfort and convenience. The 3M 9210 and 9211 respirators feature a soft cover web on the inner panels to improve comfort against the skin. These respirators are collapse-resistant for improved worker acceptance and are easy to carry and store before use.

6000 Drop Down Series Facepiece
A new 3M 6000 Series Drop Down Series half-facepiece incorporates a unique drop-down head harness system so that workers leaving a contaminated area can more easily communicate without totally removing the respirator.

8515 Welding Respirator
This new lightweight, comfortable particulate respirator is designed for use during welding, soldering, brazing and grinding operations. The 3M 8515 welding respirator has flame-resistant filter material, a one-way valve for easy exhalation and cooler comfort, and an adjustable noseclip to help provide a custom fit and secure seal.

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<td>Wednesday, May 22, 1:00 p.m.-4:30 p.m.</td>
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<td>4:00 p.m.</td>
<td>The Workplace Performance of a Loose-Fitting Facepiece Powered Air-Purifying Respirator with High Efficiency Filters (223)</td>
<td>D. Collia, P. Giles, S. Edwards, C. Freeman, U.S. DOL/OSHA, Washington, DC; C. Colton, J. Bidwell, 3M Company/Occupational Health and Environmental Safety Division, St. Paul, MN</td>
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<tr>
<td>Respiratory Protection II</td>
<td>Thursday, May 23, 8:00 a.m.-11:00 a.m.</td>
<td>Papers 275-282</td>
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3M OH&ESD offers respiratory protection training courses

Are you interested in learning the latest available information on establishing a cartridge change schedule? Do you want hands-on experience in analyzing breathing air quality? Are you an experienced respirator program administrator who just needs to know “what’s new” in respiratory protection regulations and technology? 3M has a unique program to respond to these and many more professional development requirements.

Two training courses are offered to provide individuals involved with a respirator program the information they need to operate their programs effectively. The courses are unique among those offered by respirator manufacturers in that they are based on the technical and regulatory aspects of a sound respirator program rather than specific products. In fact, a large equipment display from a number of respirator manufacturers is used to supplement the classroom and workshop presentations.

Respiratory Protection is a comprehensive 4½-day course intended for anyone involved with managing all or part of a respiratory protection program. All respirator types and each element of a respirator program are thoroughly discussed. Workshop sessions are used extensively to reinforce the course material.

Current Topics in Respiratory Protection is a two-day course designed to provide the latest in technical and regulatory information to experienced program managers.

The schedule of course locations and dates for 2000 is listed below. To find out more about these courses, do one of the following:

- Contact your 3M Sales Representative;
- Phone 1-800-659-0151, ext. 275;
- Visit our web site at www.3M.com/occsafety;
- Dial the 3M Fax On Demand system at 1-800-646-1655.

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<th>Course</th>
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<tr>
<td>Respiratory Protection</td>
<td>Minneapolis, MN</td>
<td>July 10-14</td>
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<td>Seattle, WA</td>
<td>September 11-15</td>
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<td>Phoenix, AZ</td>
<td>October 23-27</td>
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<tr>
<td>Current Topics in Respiratory Protection</td>
<td>Minneapolis, MN</td>
<td>July 17-18</td>
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