Respirator Fit Testing Practices in the U.S.

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ABSTRACT

The findings from a national survey of respirator programs were recently published by the National Institute for Occupational Safety and Health (NIOSH) and the Bureau of Labor Statistics (BLS). This current effort analyzes and interprets those published findings related to respirator fit testing in establishments with required respirator use (i.e., use on a non-voluntarily basis). This analysis indicates: (a) many of the establishments using tight-fitting respirators on a non-voluntarily basis seem not to understand fit testing requirements or were not familiar with the fit test terminology in the BLS/NIOSH questionnaire; (b) there is significant confusion between a user seal check and a fit test; (c) fit testing is not done in approximately half of the establishments where tight-fitting respirators are used; (d) qualitative fit tests are utilized far more often than quantitative fit tests; and (e) the irritant smoke test is reported to be the most popular fit test.

Keywords: respirator, survey, fit testing

INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) and the Bureau of Labor Statistics (BLS) recently published the results of a survey of respirator use and practices among U.S. private sector employers (BLS/NIOSH, 2003). The survey questionnaire, mailed to 40,002 private-sector establishments, contained 37 questions concerning respirator use. The cover letter accompanying the questionnaire asked that the survey questions be answered by the person most informed about the use of respirators in the establishment. Six of the 37 questions applied to both voluntary and required respirator use. The other 31 questions referred only to the required use of respirators. Three of those 31 questions specifically concerned respirator fit testing. This paper discusses the published results of those three questions concerning fit testing of respirators used on a required (non-voluntary) basis.

The results of these questions are presented in Tables 59 through 63, and 94 through 96 of the BLS/NIOSH publication. Because these tables from the BLS/NIOSH publication are not reproduced in this manuscript, the reader is encouraged to refer to that publication throughout the discussion in this manuscript. All references in this manuscript to Tables 59 through 63 and 94 through 96 refer to tables in the BLS/NIOSH publication.

Throughout this discussion, when statements are made about the appropriateness of certain fit testing practices, current NIOSH policy is used as the guide. NIOSH fit testing policy is identical to the requirement of the Occupational Safety and Health Administration (OSHA) standard 29 Code of Federal

Regulations 1910.134, except that NIOSH does not endorse the irritant smoke fit test (CFR, 2002; NIOSH, 1999).

RESULTS AND DISCUSSION

Question 30 in the BLS/NIOSH survey asked, "Is each employee who wears tight-fitting respirators fit tested?" Of the four possible answers – yes, no, not needed, don't know – only the "yes" would have been appropriate for a respirator program using tight-fitting respirators. The results from this question are tabulated in Tables 59, 60, and 94 of the BLS/NIOSH publication. For the reasons discussed below, these results indicate that most respirator programs are deficient in the area of fit testing.

Although fit testing is a critical component of any respirator program utilizing tight-fitting respirators, a significant fraction of the establishments do not report conducting fit testing for tight-fitting respirators used non-voluntarily. Of the establishments using tight-fitting respirators, Table 59 indicates that only 57.3% responded "yes," fit testing was conducted. However, the responses to question 31 (discussed below) indicate that the true percentage is likely even lower. This is particularly significant because tight-fitting respirators are by far the most common type of respirator; approximately 96% of the 281,776 establishments using respirators use tight-fitting respirators (BLS/NIOSH 2003), and fit testing is essential to ensure that respirator wearers are adequately protected.

Inspection of Tables 59 and 94 shows that, although the percentage of establishments with required respirator use that conduct fit testing varies from one industry sector to another, the largest variation occurs as a function of establishment size. Agriculture was the industry division with the lowest percentage of establishments conducting fit testing (45.3%), while the highest was in mining (78.8%). The larger the establishment, the more common was fit testing. The percentage ranged from 46.4%, for establishments with 1-10 workers, to 96.0%, for establishments with 1,000 or more workers.

Many establishments apparently did not understand fit testing requirements or were confused by the fit test terminology in the questionnaire. Table 60 shows that, of the 269,389 establishments indicating (in response to questions 17, 20, and 25) that they used a tight-fitting respirator, 12.8% indicated that they did not use tight-fitting respirators, and 3.5% indicated they did not know if tight-fitting respirators were used. Table 94 shows that this discrepancy decreases with increasing establishment size. For example, 17.4% of establishments with 1-10 workers (that had indicated in questions 17, 20, and 25 that they used tight-fitting respirators) indicated in question 29 that they did not use tight-fitting respirators. This percentage dropped to 0.4% for establishments with 1,000 or more workers.

Question 31 asked, "Who conducts the fit testing?" The respondents were asked to check all that apply from the following possible responses:

- In-house staff;
- Employees fit test themselves;
- Respirator manufacturer's sales/technical representative;
- Other outside party who provides a fit testing service; and
- Don't know.

The results are tabulated in Tables 60 and 95. Of the 269,389 establishments that report using respirator types that require fit testing, 31.8% report fit testing is conducted by in-house staff; 16.8% report employees fit test themselves; 10.3% report fit testing is conducted by the respirator manufacturer; and 14.5% report fit testing is conducted by an other outside party.

It is troubling that 16.8% of establishments report that employees fit test themselves; it is unlikely that individuals could perform a proper fit test on themselves. It seems most likely that there is confusion between a "fit test" and the "user seal check" that is not a fit test but is only part of the procedure conducted by the employee on himself/herself every time the respirator is donned. The user seal check was previously referred to as a "fit check," "negative-pressure fit check," or "positive-pressure fit check." Perhaps — because of that old terminology — some employers believe that the "user seal check" is a fit test.

It is estimated that fit testing is only done in approximately half of the establishments using tight-fitting respirators. Of the 269,389 establishments using respirators that require fit testing, only 154,410 report that they do fit testing. However, since 45,385 of these may not do an actual fit test (employees fit test themselves), the number of establishments properly fit testing their employees may be as low as 109,025 — 40% of those requiring fit testing. Figure 1 shows the high estimate (57.3%) and the low estimate (40%) of the percentage doing fit testing. The true percentage is somewhere between the two with 50% being our best estimate.

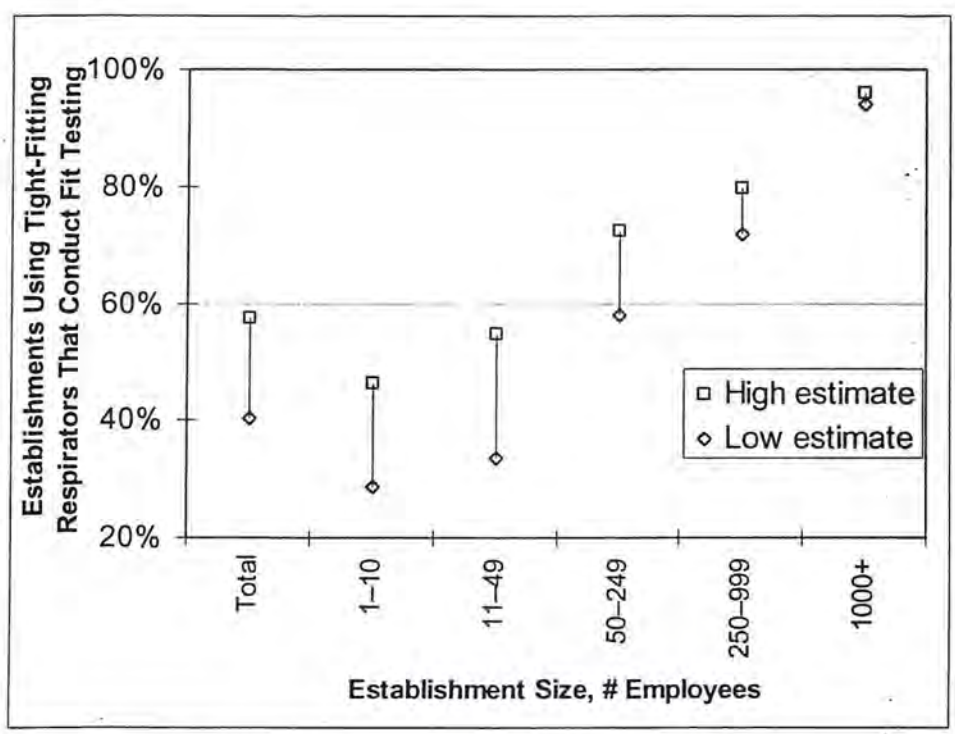

Figure 1. Percentage of establishments using tight-fitting respirators that conduct fit testing by establishment size. The "high estimate" is made by ignoring the fact that many establishments responded "employees fit test themselves," when asked who conducts fit testing. The "low estimate" is based on the assumption that such a response indicated that only a user seal check was conducted, rather than a proper fit test.

Figure 1 also shows that establishments with the largest number of employees were least likely to report that employees fit test themselves. While Table 95 shows that 16.8% of all establishments report that "employees fit test themselves," only 2.0% of establishments with 1,000 or more employees so report – an indication that the largest establishments better understand respirator terminology and are more

likely to conduct a proper fit testing program. Because the percentage of establishments reporting that employees fit test themselves decreases with increasing establishment size, our estimate of the extent of fit testing increases with increasing establishment size. Figure 1 shows this pattern.

Question 32 asked, "During the past 12 months, which of the following fit testing methods were used at your establishment?" The survey results are summarized below (Table I) with the most popular tests listed first.

Table I. Number and percentage of establishment by fit test method*

Fit Test Method	Number of Establishments	Percent of Establishments
Irritant smoke	35,776	23.2%
Don't know	28,692	18.6%
Saccharin	27,355	17.7%
Pressure (Controlled Negative Pressure)	25,448	16.5%
Bitrex	18,938	12.3%
Other	14,351	9.3%
Isoamyl acetate	11,632	7.5%
Unfamiliar with language/terms used	8,100	5.2%
Ambient aerosol (Portacount®)	7,453	4.8%
Generated aerosol	2,530	1.6%

* From Table 96 BLS/NIOSH Respirator Usage in Private Sector Firms, 2001

The high percentage (9.3%) of establishments responding that they used some "other" fit test method is unexpected because there are no other methods allowed by current OSHA regulations. The "other" response has no obvious explanation, but it may again indicate confusion between a "fit test" and a "fit check," or some other misunderstanding of basic respirator terminology.

Respirator use regulations require a written respirator program with a designated program administrator to oversee and administer it. Therefore, it is significant that 18.6% responded "don't know" what fit tests are used at the establishment.

The Controlled Negative Pressure (CNP) test is ranked third in popularity, but that is likely an overestimate, due to confusion between a fit test and what was previously called a "positive-pressure fit check" or a "negative-pressure fit check" that (as discussed above) is not a fit test. The CNP test is a quantitative test that serves a similar role as the ambient aerosol test, except that it can not be used with filtering-facepiece respirators – the most popular respirator type. Because the CNP test can not be used with filtering-facepiece respirators, it is likely that the CNP test usage is much less than half that of the Portacount® (Weed, 2004; Crutchfield, 2004; Coats, 2004). If that assumption is made and the CNP numbers are adjusted accordingly, the top four test methods are (in order of popularity): irritant smoke, saccharin, Bitrex, and isoamyl acetate. These four tests are all subjective, qualitative tests and are utilized by 93,701 establishments. The quantitative tests — Portacount®, generated aerosol, and CNP — are utilized in 13,710 establishments (with the CNP adjustment). Thus, qualitative fit tests are utilized far more often than quantitative fit tests, at a ratio of roughly 7 to 1.

Based on discussion with individuals familiar with the marketing and servicing of the generated aerosol test hardware, we believe that the estimated number of establishments using that test system may be too high because of the limited number of them in use (McDiarmid, 2004; Nowosel, 2004). Since

the generated aerosol test system requires a chamber (or a tent for one version), it is not easily moved from one establishment to another (as might be done by a vendor providing fit testing services). Thus, the number of establishments using the generated aerosol fit test system is limited by the number of test systems in use which is estimated to be dramatically fewer than 2,530. If the estimate of 2,530 is too high, it is most likely the result of misunderstanding of fit test requirements and terminology by some establishments. Also, because some Portacount® users increase ambient aerosol concentrations (by generating an aerosol with a candle or a TSI Model 8026 Particle Generator sold for that purpose), it is also possible that some Portacount® users may have mistakenly reported "generated aerosol."

The survey indicates that the irritant smoke test is the most popular fit test. That finding is unexpected because (1) the irritant smoke test can not be properly conducted on the most popular respirator type, the N95 filtering-facepiece respirator (disposable dust mask), (2) the ANSI Z88.10 (2001) standard has recommended that the test be phased out because of concerns with its validation, and (3) the irritant smoke test is the only OSHA accepted fit test that NIOSH does not recommend because of concern about the hazard associated with the test agent (NIOSH, 1999).

The sum of the entries in the right-hand column of Table I is 117%. This indicates that most establishments employ a single test method, rather than using a combination of different methods for different respirator types. Summation of the corresponding percentages in Table 96 of the BLS/NIOSH publication indicates that establishments with 1-10 workers rarely employ more than one fit test method, while it is not uncommon in larger establishments. That total of the percentages is 104% for establishments with 1-10 workers and 159% for establishments with 1,000 or more workers.

CONCLUSION AND RECOMMENDATIONS

Based on this analysis of the published BLS/NIOSH survey, it is concluded that: (a) fit testing is not done in approximately half of those establishments where tight-fitting respirators are used; (b) many of the establishments using tight-fitting respirators seem not to understand fit testing requirements or were not familiar with the fit test terminology in the BLS/NIOSH questionnaire; (c) there is significant confusion between a user seal check and a fit test; (d) in a ratio of about 7 to 1, qualitative fit tests are utilized far more often than quantitative fit tests; and (e) the irritant smoke test is reported to be the most frequently used fit test.

In an overview of results of the BLS/NIOSH survey, Doney et al. (2005) identified a significant number of indicators of inadequate respirator programs, including indicators of inadequate fit testing programs (43% of establishments either did not do required fit testing or did not know if fit testing was done). This analysis suggests additional indicators of inadequate fit test programs: 14,351 establishments report using a fit test method other than those listed when there really is no other method allowed by current OSHA regulations; 45,385 establishments report "employees fit test themselves" suggesting confusion between a user seal check and a proper fit test; and the unrealistically high number of establishments that report using the CNP method suggests unfamiliarity with fit test methods and a failure to understand the difference between a fit test and a user seal check.

The most fundamental finding of this analysis is that a large percentage of those establishments with required use of tight-fitting respirators do not conduct fit testing. Although our interpretation of the data in the BLS/NIOSH publication is clouded by the inconsistent pattern of some responses, it is clear that a significant number of workers using respirators do not have the advantage of a fit testing program and that intervention efforts are needed.

Efforts are needed to increase the awareness, understanding, and implementation of the essential elements of a respirator program in general, and fit testing, specifically. Such efforts could

originate from both the public and private sector. Federal and state agencies concerned with occupational safety and health clearly have a role to play. Manufacturers and distributors of respirators have an important role in educating their customers. Industrial trade groups may be able to assist their respirator-using members with respirator issues common to their industry. There is a particular need to direct these assistance efforts toward smaller establishments.

Mention of commercial product or trade name does not constitute endorsement by the Centers for Disease Control and Prevention or the National Institute for Occupational Safety and Health. The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the National Institute for Occupational Safety and Health.

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