

RESPIRATOR CLEARANCE EXAMS INCLUDE SPIROMETRY

Personal respiratory protective devices (respirators) are required by OSHA or the employer for most employees exposed to potentially dangerous dusts and chemicals in their workplace. Routine medical surveillance, including spirometry, is a prudent final check on the effectiveness of this protection and is required by OSHA for several types of exposures.

Preplacement spirometry for persons whose jobs require respirators is valuable because an abnormal result may indicate one of the following: 1) the employee has an increased risk of further impairment of lung function or disability if exposed; 2) the employee has a preexisting lung disease not related to the planned work environment; or 3) the employee's lung function is severely impaired so that the small breathing load added by the resistance of the respirator would prevent effective job performance.

Previous research¹ and standards² have emphasized only the possible effects of the added work of breathing imposed by a respirator on employees with heart or lung disease. However, only severe airway obstruction measurably reduces work capability when full-face mask, demand-type respirators are worn during maximal exercise³.

In large corporations, less than 3% of all employees (usually smokers with COPD) have moderate to severe airway obstruction. About 15% of employees, however, have borderline to mild airway obstruction; thus, the first two reasons for preplacement spirometry are most important.

All respirator clearance exams should include a short questionnaire, a fit test, and spirometry. Employees may then be categorized as shown on the following table.

Category	FVC % pred	and	FEV1 % pred	Abnormality	Respirator use
I	~75	and	~75*	Insignificant	Unlimited
II	60-75	or	50-75	Mild	Limited
III	50-60	or	40-60	Moderate	Rare
IV	~50	or	~40	Severe	Never

*And no other abnormalities on other tests

Employees in categories II or III should not be placed in high-risk environments or use respirators for prolonged periods or for heavy exertion.

Employees in category IV are probably fully disabled because of lung disease and should not work in any job requiring a respirator for protection.

If the dust or chemical is very toxic, long periods of heavy exertion are expected, or a high-resistance respirator will be used, we also recommend chest x-ray, and ECG (if older than 40 years); and the measurement of changes in blood pressure, pulse rate, and breathing rate while the employee exercises with the respirator. If any of the results are abnormal, consider referral of the employee to a pulmonary specialist who can perform complete treadmill exercise testing.

After placement, surveillance should be repeated annually and on termination of employment. These serial comparisons will usually allow employees with decrements of lung function to be removed from the risk of further exposures before symptoms or disability occurs.

References

1. Harber P. Medical evaluation for respirator use. J Occup Med 26 496-502, 1984.
2. Standard Practices for Respiratory Protection. ANSI 88.2-1980 New York, American National Standards Institute, 1980.
3. Raven PB et al. Clinical pulmonary function and industrial respirator wear. Am Ind Hyg Assoc J 42:897-903, 1981.
4. Federal Register Vol 51, No 119, June 20, 1986