



# Waste Management Symposium 2007

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## Respiratory Protection: Standards & Advances

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# Protection Factors – A Brief History

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- 1987 NIOSH RDL downgrades APF for Hoods/Helmets
- 1992 ANSI releases Z88.2-1992 APF's
- 1993 OSHA reduces APF's in Lead Environments
- 1996 ORC Study conducted
- 2002 Variances recognized by OSHA for ORC study
- 2006 August 24, OSHA completes the revision of the reserve section of Respiratory Protection Standard
- 2006 November 22, New Regulations became effective

# Summary of New Regulation

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- Can be found in Federal Register/Vol. 71, No. 164/Thursday, August 24, 2006/Rules and Regulations
- With new ruling, OSHA has removed nearly all the confusion that has characterized the past many years
- However, for employers who utilize Powered Air Purifying Respirators (PAPR) and/or Supplied Air Respirators (SAR), there remains potential for confusion



# Protection Factors

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Why the potential for confusion?

OSHA has placed the burden for analyzing and interpreting the performance of specific respirator models in these two classes on the shoulders of employers.

Type of respirator <sup>1,2</sup>	Half mask	Full face-piece	Helmet/hood	Loose-fitting facepiece
1. Air-Purifying Respirator .....	<sup>3</sup> 10	50	.....	.....
2. Powered Air-Purifying Respirator (PAPR) .....	50	1,000	<sup>4</sup> 25/1,000	25
3. Supplied-Air Respirator (SAR) or Airline Respirator				
• Demand mode .....	10	50	.....	.....
• Continuous flow mode .....	50	1,000	<sup>4</sup> 25/1,000	25
• Pressure-demand or other positive-pressure mode .....	50	1,000	.....	.....
4. Self-Contained Breathing Apparatus (SCBA)				
• Demand mode .....	10	50	50	.....
• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit) .....	.....	10,000	10,000	.....

**Notes:**

<sup>1</sup> Employers may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when required respirator use is independent of concentration.

<sup>2</sup> The assigned protection factors in Table 1 are only effective when the employer implements a continuing, effective respirator program as required by this section (29 CFR 1910.134), including training, fit testing, maintenance, and use requirements.

<sup>3</sup> This APF category includes filtering facepieces, and half masks with elastomeric facepieces.

<sup>4</sup> The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a WPF or SWPF study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting facepiece respirators, and receive an APF of 25.

<sup>5</sup> These APFs do not apply to respirators used solely for escape. For escape respirators used in association with specific substances covered by 29 CFR 1910 subpart Z, employers must refer to the appropriate substance-specific standards in that subpart. Escape respirators for other IDLH atmospheres are specified by 29 CFR 1910.134 (d)(2)(ii).

# Assigned Protection Factors

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- Footnote 4 in essence states that to use an APF of 1000, the respirator manufacturer shall provide evidence to the employer that the respirator demonstrates performance at a level of protection equal to or greater than 1000.

# How Does One Get This Evidence?

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- OSHA intentionally did not specify a method or method's by which evidence of a respirators performance is to be determined or measured.
- Why?
- There is no universally accepted testing protocols pertaining to measuring respiratory efficacy.

# Guidance

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However...

- OSHA does provide guidance by stating, "This level of performance can best be demonstrated by performing a Workplace Protection Factor (WPF) or Simulated Workplace Protection Factor (SWPF) study or equivalent testing."



# APF Study Benchmarks

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- Referring to page 50168, OSHA believes the study conducted by the Organization Resources Counselors Worldwide, published in 2001, known as the ORC-LLNL Study, could be used to make judgments as to whether the tested respirators are “worthy” of an APF rating of 1000.

# APF Study Controls & Safety Factors

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- The ORC evaluation was a SWPF study
- OSHA also suggests that a WPF could be used as well.
- SWPF studies are better suited for the purpose of rating the performance of respirators because they have a much higher degree of “control” and typically take place in a laboratory setting.
- 5<sup>th</sup> Percentile:  
WPF = safety factor of 10  
SWPF = safety factor of 25

# Questions to Ask

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- How was the data gathered?
  - Independent, qualified third party?
  - Test Equipment Capability?
  - Challenge concentrations?
  - Sampling Size?
  - User Work Exercises?
  - Respirator Configuration?

# Questions to Ask

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- What was the treatment of the data?
  - 5<sup>th</sup> Percentile Geometric Mean
  - Safety Factor of 25
  - To achieve an Assigned Protection Factor of 1,000 based upon an SWPF study, the 5th percentile of the measured protection factors must be equal to or greater than 25,000.

# Conclusions

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- The fact that some PAPR and SAR with hoods or helmets do rate an APF of 1000 while others do not indicates clearly that when it comes to respiratory performance, design matters!
- Unfortunately, NIOSH testing and certification procedures for these classes of respirators do not distinguish between high and low performing products at the present time.
- It is up to the manufacturers of the better designed and better performing respirators to demonstrate their higher level of efficacy.
- It is up to respirator users to become educated on the differences in protection factors and design performance.



# Respiratory Protection Advances

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- Protection Factors
- Alarms
- PAPR Battery & Charger Technology
- Full Suits
- Cartridge Changeout Schedules
- Hybrid Respirators

# Questions?

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