

# DESIGN OF RESPIRATORS FOR WILDLAND FIREFIGHTING

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Wildland firefighters are exposed to smoke levels exceeding short term occupational exposure limits for individual smoke components and sometimes exceeding immediately dangerous to life and health (IDLH) concentrations. They typically engage in heavy work levels while fighting fires during work shifts lasting up to 16 hours. However work levels are variable and high smoke levels are intermittent. In addition to the overall irritant index, smoke components of concern include respirable particulate matter, carbon monoxide, carbon dioxide, formaldehyde, acrolein, benzene, nitrogen dioxide and polycyclic aromatic hydrocarbons (PAHs). Cross-shift and cross-seasonal decrements in lung function have also been observed in wildland firefighters. Although some certified respirators may provide limited protection from smoke at outdoor fires none of them are designed for wildland firefighting. Most jurisdictions do not issue respirators to wildland firefighters. A notable exception is Western Australia where professional wildland firefighters use half-mask air purifying respirators with P/ OV/F filters. This paper proposes minimum design and performance criteria for air purifying respirators for wildland firefighting. The approach used begins by identifying the known levels of wildland firefighter exposures patterns of exposure and environmental conditions. The hazard ratio for each contaminant is calculated based on occupational exposure limits and known exposure levels. Occupational exposure limits are adjusted where necessary taking into account additive effects of smoke components and typical wildland firefighter work levels. A rationale for the minimum required protection factor and safety factor is provided. Appropriate test representative agent challenge concentrations are identified along with minimum breakthrough times and maximum breakthrough concentrations.