

COMPARISON OF NANOPARTICLE FILTRATION PERFORMANCE OF NIOSH-APPROVED AND CE MARKED FILTERING FACEPIECE RESPIRATORS

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The National Institute for Occupational Safety and Health (NIOSH) and European Norm (EN) employ different test protocols and have different performance requirements for filtering facepiece respirators (FFR). NIOSH requires a minimum of 95% and 99.97% efficiencies for N95 and P100 FFR respectively while EN requires 94% and 99% efficiencies for FFP2 and FFP3 respirators respectively. To better understand their relative filtration performance N95 P100 FFP2 and FFP3 FFRs were tested using three methods: a polydisperse aerosol test (PAT TSI 8130) and two monodisperse aerosol tests (MAT). One MAT procedure utilized an in-house test system employing 4-30 nm silver nanoparticles while the other (TSI 3160) used 20-400 nm NaCl particles. Two models for each FFR type were selected and five samples from each model were tested against charge neutralized aerosol particles at 85 L/min flow rate. Aerosol penetrations were within NIOSH and EN expected levels for N95 and P100 and FFP2 and FFP3 models respectively as measured by PAT and MAT procedures. Monodisperse particle (4-400 nm) penetration pattern was consistent with single fiber theory for all four models tested. Consistent with other types of electret filters removal of electrostatic charges on the respirator fiber media by isopropanol treatment shifted the most penetrating particle size from 40-60 nm to 250-300 nm for all four models. The NIOSH-approved N95 and P100 and CE marked FFP2 and FFP3 respirators studied here should provide expected levels of filtration performance against a wide range of particles sizes (including nanoparticles) consistent with their performance requirements.