

### 36. Enhanced Particle Filtration in a Non-Problem Office Environment: Preliminary Findings from a Double-Blind Crossover Intervention Study

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**Background:** Previous evidence suggests unidentified indoor particulate contaminants may increase nonspecific symptoms and environmental dissatisfaction in office workers. The authors conducted a controlled, double-blind crossover study of enhanced particle filtration in an office building without known complaint history.

**Methods:** Standard filters in ventilation systems of two floors were replaced with highly efficient particle filters, on alternate floors weekly over four weeks. Weekly questionnaires assessed worker symptom severity, performance indicators, and environmental dissatisfaction. Temperature, humidity, ventilation rate, particle concentrations, and microbiological parameters were measured. ANOVA analysis models contained terms for week, location, person, and intervention. Potential covariates included temperature, relative humidity, and ventilation rate. Analyses were performed blinded to the intervention schedule.

**Results:** Baseline symptom prevalences ( $n_{\text{floor 1}}=160$ ,  $n_{\text{floor 2}}=305$ ) were average for U.S. buildings. Carbon dioxide concentrations and ventilation rates were typical for U.S. office buildings. Microbiological parameters measured were very low. Temperature and relative humidity were mostly within accepted comfort limits, but temperature was strongly associated with many outcomes. Enhanced filtration reduced concentrations of the smallest airborne particles (0.3–0.5 microns) 20-fold, but as expected did not reduce larger particles (>2 microns). With enhanced filtration, most symptoms improved very slightly (large p-values, 0.27–0.81); all performance indicators (confusion scale, fatigue scale, self-assessed productivity) showed small improvements (p-values=0.009, 0.13, and 0.11); two environmental dissatisfaction variables, excess warmth and stuffiness, improved slightly (p-values= 0.10, 0.006) but dryness worsened slightly (p-value=0.07).

**Discussion:** Enhanced filtration in this building produced very small improvements in most worker symptoms, performance indicators, and environmental dissatisfaction measures. Chance effects could be excluded only for the confusion scale and environmental stuffiness. Findings of only slight beneficial effects from removing small airborne particles in this building may not apply to buildings with

higher symptom or particulate contaminant levels, or lower ventilation rates. These findings also suggest occupant benefits from thermal control even within accepted comfort ranges.

7<sup>th</sup>

# Joint Science Symposium on Occupational Safety and Health

26-29 October 1998  
Hidden Valley, PA  
USA



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# 7<sup>th</sup> Joint Science Symposium on Occupational Safety and Health

26–29 October 1998  
Hidden Valley, Pennsylvania  
United States

*Arranged by*

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