

Cleaning and Foot Traffic Emissions Analysis

Asbury, G. Cleaning and Foot Traffic Emissions [Analysis](#). Test Number 0072198. Professional [Testing Laboratory](#), Inc., Dalton, GA. unpublished data. 16 pages. May, 2002.

Summary

A series of experiments were conducted to determine airborne particulate (ISO Fine Test Dust 12103-1, A2) emissions during a variety of normal activities as a function of [floor covering](#). Results were compared for hard and soft flooring surfaces. Surfaces were uniformly seeded with the standard test dust. Activities tested included: dust mopping a hard surface; vacuuming a standard carpet with a Carpet and Rug Institute (CRI) Green Label approved vacuum; vacuuming a standard carpet with a non-approved vacuum, walking on a hard surface and walking on a soft surface.

For the dust mopping experiment, the room was allowed to equilibrate (settle) for fourteen minutes. No airborne particles ($0.0 \text{ micrograms/meter}^3$) were detected. Dust mopping was begun at a walk rate average of 3.8 feet/second. At 30 seconds of dust mopping, the airborne particulate count rose to 46.2 micrograms. At 1 minute the airborne particulate counts increased to $353.9 \text{ micrograms/meter}^3$. The airborne particle counts rose steadily until at 11 minutes of mopping a peak concentration of $2032.9 \text{ micrograms/meter}^3$ was detected. The experiment was terminated at 12 minutes due to operator discomfort.

For the non-approved vacuum experiments, the room was allowed to equilibrate for 4 minutes. Airborne particle levels ranged between 0.4 and $0.8 \text{ micrograms/meter}^3$. The vacuum was energized in a stationary position over a dust seeded test carpet for 10 minutes. Airborne particle levels increased slowly from 1.0 to $6.3 \text{ micrograms/meter}^3$ over the 10 minute period. At this point, the vacuum was mobilized at a rate of 1.8 feet per second. Within ninety seconds, the airborne particle level rose to $463.3 \text{ micrograms/meter}^3$. The peak airborne level was reached 30 seconds later at $553.7 \text{ micrograms/meter}^3$. (Note: This is 15.6 times the peak level detected with the CRI approved Green Label vacuum tested. See below). Over the remaining 8 minutes of the experiment, the airborne particle levels declined to a final level of $156.1 \text{ micrograms/meter}^3$. The vacuum was deenergized and the particle level followed for 4 minutes. At the end of this period, the airborne particle level had fallen to a level of $136.0 \text{ micrograms/meter}^3$.

For the CRI Green label approved vacuum experiments, the room was again allowed to equilibrate for 4 minutes. Airborne particle levels ranged between 0.6 and $1.1 \text{ micrograms/meter}^3$. The vacuum was energized in a stationary position over a dust seeded test carpet for 10 minutes. Airborne particle levels increased slowly from 0.9 to $8.7 \text{ micrograms/meter}^3$. At this point the vacuum was mobilized at a rate of 1.8 feet per second. At 1 minute of operation a peak particle level of $35.4 \text{ micrograms/meter}^3$ was reached. Over the next 90 seconds, this level declined to $26.2 \text{ micrograms/meter}^3$. Over the rest of the 10 minute experiment, the airborne particle levels ranged between 25.9 and $21.9 \text{ micrograms/meter}^3$. The vacuum was deenergized and the particle level followed for 4 minutes. At the end of this period, the airborne particle level had fallen to a level of $18.9 \text{ micrograms/meter}^3$.

For the walking experiments, a similar protocol was followed. A standard hard surface or carpet was seeded with test dust. The test walker stood quietly for 4 minutes. In both hard and soft surface cases, the airborne particle levels were steady for the entire period at $0.0 \text{ micrograms/meter}^3$. On the hard surface floor, the test walker then began walking at a rate of 3.8 feet per second for 18 minutes. At 1 minute, the airborne level had risen to $15.1 \text{ micrograms/meter}^3$. At 2 minutes, the level was $91.3 \text{ micrograms/meter}^3$. The airborne particle levels rose steadily over course of the entire 18 minute walk. The peak concentration was $943.4 \text{ micrograms/meter}^3$ reached at 17 minutes. This level is 8.9 times the peak level seen on a carpeted surface.

For the carpet walking experiment, the airborne particle levels were steady for the entire 4 minute equilibration period at $0.0 \text{ micrograms/meter}^3$. When walking began, the particle levels increased to $7.8 \text{ micrograms/meter}^3$ at 30 seconds and $14.4 \text{ micrograms/meter}^3$ at 1 minute. The rise in particle levels was much more gradual. The peak level of $105.6 \text{ micrograms/meter}^3$ was reached at 10 minutes of walking. (Note: this peak level was not exceeded in three replicates of this experiment). The levels then began to decline, so that at the end of the 13 minute walk the airborne particle level was $81 \text{ micrograms/meter}^3$.

