

## **Effects of building mechanical system noise with fluctuations on human performance and perception**

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Modern mechanical systems in buildings can generate noise that fluctuates in level and/or time, and these fluctuations may annoy or distract human occupants. This study investigates the effects of noise with fluctuations, typical of building mechanical system noise, on human performance and perception. Thirty test subjects were exposed in a controlled test chamber to six different noise signals, each with a varying degree of level- or time-fluctuation, for one hour at a time. The subjects were asked to complete sequences of typing, math and verbal reasoning tasks, as well as a subjective questionnaire. Results show that the noise characteristics that are most likely to affect subjective ratings of annoyance and distraction are loudness, followed by the degree of fluctuations, roar or rumble. Statistical analysis did not find that performance scores were significantly affected by any noise attribute, though; trends in the data do indicate that (a) louder signals with significant low frequency fluctuations and (b) signals that vary on a larger time scale are still of concern. Correlations of the results with commonly used indoor-noise criteria, such as Noise Criteria (NC), Room Criteria (RC) and others, are also presented. [Work supported by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)]