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Noise from Air Conditioners

by J.S. Bradley

Dr. J. S. Bradley is a senior research officer in the Acoustics Laboratory of the Institute for Research in Construction.

The installation of their air conditioner gave the young couple a reason to celebrate. Their dream home was finally finished and they looked forward to staying cool during the sweltering days of summer. They had no idea their cool comfort would turn up the heat next door.

The air conditioner was too noisy, a simmering neighbour complained to the city. However, an official investigation proved the air conditioner met all bylaws. The noise was within acceptable levels and the unit was located correctly 1.2 metres from the property line. The owners were relieved, but they still wonder why their neighbour had complained.

Recent findings by the Institute for Research in Construction (IRC) could hold some clues to explain the neighbour's irritation. Acoustics researchers at IRC have completed a comprehensive survey of the nature of the disturbance caused by air conditioner noise. The researchers found that annoyance was highest among neighbours who lived in quiet neighbourhoods and who did not own air conditioners themselves.

The study was conducted in residential areas of metropolitan Toronto. IRC researchers analyzed the responses of 550 people, interviewed in their homes, and compared adverse reactions to noise levels measured at several points near the subject's home and near the air conditioner. The researchers also measured the background noise levels over a 24-hour period to assess the general noise of the neighbourhood.

As would be expected, noisier air conditioners provoked more annoyance. However, it was not the absolute level of the air conditioner noise that led to the most complaints. Rather, it was the noise level relative to the ambient background noise that caused neighbours to complain about being disturbed. Specifically, when the air conditioner noise level was at least 5 decibels (dB) above the ambient background noise, complaints increased significantly.

The study also noted that people living in noisier neighbourhoods tolerated their neighbours' air conditioners better. As well, individuals who owned air conditioners were less disturbed by air conditioner noise than those who did not have an air conditioner. This finding could be due, in part, to a difficulty hearing the neighbour's air conditioner when one's own unit was operating. On average owners of air conditioners tolerated 7 dB more air conditioner noise than did individuals who did not own air conditioners.

In addition, the study revealed that the people interviewed would pay, on average, 12% more for a very quiet air conditioner.

The results of this IRC study will help communities rationally set acceptable limits for outdoor air conditioner noise. Many communities have tried to control noise; however, limits have often been somewhat arbitrarily derived. With this study, IRC scientists have attempted to quantify the effects of air conditioner noise and to explain why air conditioners sometimes cool down neighbourly feelings along with indoor temperatures.

IRC created the questionnaire and experimental design of the study and analyzed the data. The Ontario Ministry of the Environment (MOE) carried out the field measurements. MOE, the Heating, Refrigerating and Air Conditioning Institute of Canada, the City of North York, the City of Toronto, Toronto Hydro, the Ontario Home Builders Association, Ontario Hydro and the Ontario Ministry of Housing together funded the work.