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RESEARCH PROJECT TO PROPOSE AND VALIDATE A METHOD TO MEASURE THE SOUND POWER LEVELS GENERATED BY FANS IN FIELD CONDITIONS

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Executive Summary

This research project, funded by the CANADA MORTGAGE AND HOUSING CORPORATION is a first attempt to validate a method using intensimetry to measure the sound power levels generated by fans when they are connected to the ductwork of a ventilating system, and operating in real conditions. The goal of the study was to determine the accuracy and limitations of the proposed method. To achieve this, the results of the measurements made according to the proposed procedure were compared with those obtained in a reverberant room using the method described in the AMCA 300 standard.

All the measurements were conducted in the acoustical laboratories of the NATIONAL RESEARCH COUNCIL OF CANADA under the direction of Dr. Alfred Warnock and the author.

In summary, the proposed procedure consists:

a) in measuring the sound intensity inside and outside a section of duct located immediately after the fan discharge with a loudspeaker emitting pink noise at the position of the fan discharge. This is to perform a calibration of the field conditions and to take into account the sound transmission loss through the duct wall
b) in repeating the measurement outside the duct with the fan operating
c) in calculating the sound power levels using the data collected in a) and b)

The **conclusions** reached during this study are:

A. When the sound intensity measurements were made in the low background noise conditions of the large reverberant chamber, the results of 31 third-octave band sound intensity measurements over a total of 42 performed, were reliable.

   The SWL determined by the proposed procedure correlate fairly well with the SWL obtained using the reverberant chamber method described in the AMCA 300 procedure for the frequency range going from 50 Hz to 800 Hz with discrepancies inferior to 4 dB except for the 50 Hz band for which a discrepancy of 7 dB was noted.

   For the vast majority of ventilating systems, the 50 hz to 500 Hz frequency range governs the noise control design. The very limited tests results suggest that given a low background noise, the proposed method could be reliable in this range. This would have to be confirmed by further testing involving a large number of tests on different duct sizes.

B. It was hoped that the method proposed would be relatively simple to implement and that it could provide an economical way to measure the sound power levels of fans operating in a multitude of field conditions. It was also thought that the intensimetry technology would permit measurements in noisy environment as publicized in the literature of some manufacturers of these equipments.

   In reality however, the limitations imposed by intensimetry made the procedure difficult to use in an acoustical environment similar to that of a mechanical room, and unreliable due to the high number of non valid measurements.

   This suggests that in field conditions, reliable measurements could not be made in mechanical rooms where the ambient noise level is generally high. The measurements would therefore have to be made outside the mechanical room. Since in many instances the silencers and other noise control devices are installed inside the mechanical room or immediately before or after the

mechanical room wall of floor, it would not be possible to evaluate accurately the sound power levels of the fan without major modifications to the ventilating system. This defeats the purpose of the proposed method: to permit reasonably accurate field measurements of sound power levels generated at the discharge of ventilating equipments when they are installed and operational.

Progress must be made to allow for accurate intensity measurements in noisy environment before the proposed method be further developed for reliability.