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Sound strength and reverberation time in small concert halls

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Many small concert halls are being built in music departments in schools and universities and these have to cater for a wide variety of musical ensembles ranging from orchestras to solo performers. Such diverse musical forces require different acoustic conditions in terms of reverberation and loudness and so variable acoustics are frequently provided. However, introducing absorption decreases reverberation and loudness and so a careful balance needs to be struck between controlling loudness and maintaining reverberation.

In the course of this study a series of measurements was carried out in six small concert halls in Cambridge, UK, which accommodate a range of sizes of musical ensembles from quartets to orchestras, in order to determine the range of reverberation times and sound strengths, including changes due to variable absorption.

The measured strength levels were compared to values derived from traditional and revised theory on strength calculations in order to assess the accuracy of the theories for small chamber music halls.

The measured values of strength levels were observed to be mostly lower than the predicted ones. In order to account for this difference (particularly in spaces with added absorption) a combination of Barron's revised theory and the Vorländer correction factor is proposed.