

## Tuning the Concert Hall instrument

In the second part of our story behind the acoustic design of the new Concert Hall we explore the critical process of tuning and refining the space prior to opening performance. Much like the instruments themselves that will fill the beautiful new space with sound, the hall will undergo an important process of testing and tuning to ensure that it is able to perform to its optimum and provide an excellent sonic experience combined with the stunning visual intimacy of the Ngeringa Concert Hall design.

The commissioning and tuning process is a combination of objective acoustic measurements and subjective critical listening tests. These two sides of the process are complementary – measurements help the acousticians evaluate whether the hall is performing as per the design intent. However, numbers alone do not guarantee that good acoustics have been achieved – and so it is important that the measurements are supported by critical listening evaluations. For Ngeringa, the aspiration is that the hall will sound similar to the great European chamber music venues, and the gauge of the hall will primarily be the subjective experience of “how it sounds”.

Different acoustic treatments have been carefully incorporated into the design of the space, from the uniquely shaped and textured ceiling, the striking ‘keyboard walls’ and the rammed earth ‘wave wall’ feature. The ceiling itself has been subdivided into different depths of timber panelling, with each panel designed so the ceiling as a whole provides a well-blended and rich sound, distributing sound evenly across the audience area. Differences in the depth of the triangular panels enable the roof to scatter sound and mix it evenly across the audience area. Without these panels, the domed shape of the roof would focus sound unevenly (like an acoustic lens) onto only one area of the audience, which would be unwanted.

A number of measurements will be taken under different conditions to ‘refine’ and assess the space. For this the acousticians use specialised loudspeakers and microphones to emit test sounds in the unoccupied space and measure the room impulse responses – essentially the ‘room signature’ which captures the various sound reflections that arrive at listeners’ ears. Analysing the room impulse response allows us to determine numeric parameters (such as the reverberation time, early decay time, clarity index etc.) to compare the predicted results with the completed room values and to quantify how the room responds to sound.

Additional measurements of the background noise levels from heating and cooling systems and from lighting, as well as evaluating how the room sound changes under different combinations of seats being retracted and extended and curtains being deployed will help to gauge the flexibility of the Concert Hall for additional usages including recording, contemporary or amplified music, speech and functions/events.

Following this, the space will be evaluated as a ‘live environment’, and involves critical listening and subjective evaluation of the hall as both a musician and an audience member. For this testing, musicians would be engaged for a ‘voicing concert’ allowing subjective evaluation of the hall’s quality and to make sure the hall sounds at its best for the opening concert.