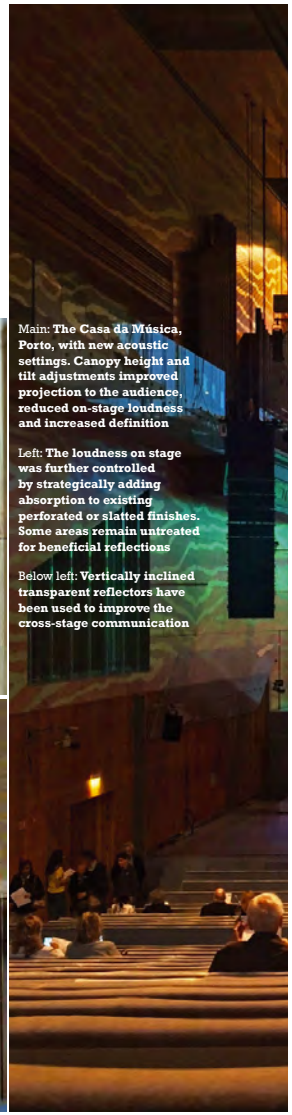
Tuning in

Venue acoustics can be vastly improved without the need for costly downtime and extensive disruption to artists and audiences

Downtime is an extremely expensive and disruptive issue for any performing arts organization. But what if a concert hall or theater needs acoustic improvements because artists are complaining about acoustic shortcomings? Besides the expense, any large renovation project will cause significant disruption to orchestras, opera or theater groups, as well as to audiences.

But what are the alternatives to a full-blown renovation? For acousticians, it is a remarkable experience to work with an orchestra during the final tuning prior to opening a new hall – when small changes to acoustics elements such as reflectors or curtains around the stage can produce striking differences in sound quality, giving the impression of listening to several different concert halls on the same day. Can the same be achieved in existing concert halls – and even in historic venues?

Recent projects illustrate that, in most cases, significant improvements can be made even while the venue is in operation, or during the short periods in between shows. Even in venues with considerable acoustical issues, problems are often specific to one part of the room and can be resolved by locally tuning surfaces. Another advantage of this approach is the opportunity to discuss the changes with performers and to listen after each step, adjusting the plans for the next phase of the project.



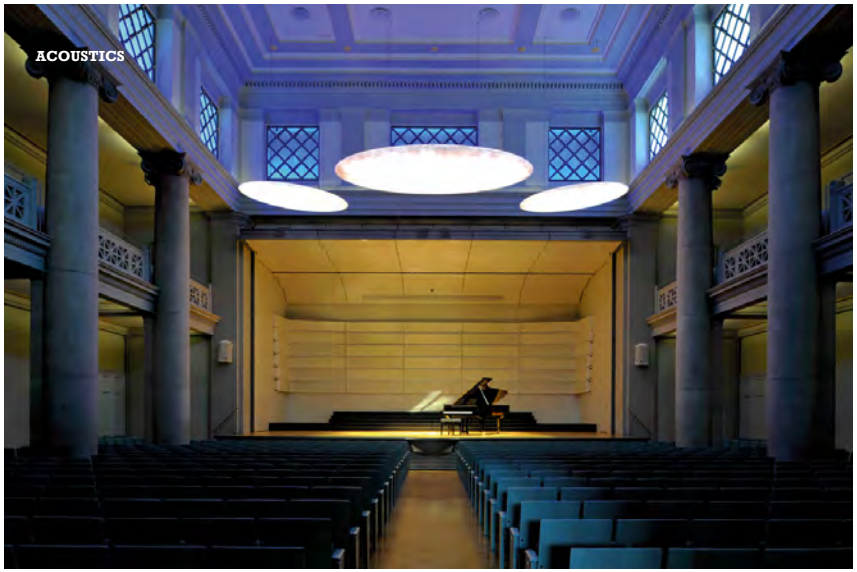
Main: **The Casa da Música, Porto, with new acoustic settings. Canopy height and tilt adjustments improved projection to the audience, reduced on-stage loudness and increased definition**

Left: **The loudness on stage was further controlled by strategically adding absorption to existing perforated or slatted finishes. Some areas remain untreated for beneficial reflections**

Below left: **Vertically inclined transparent reflectors have been used to improve the cross-stage communication**

Problem solving

Many concert halls suffer from unsatisfactory on-stage acoustics, with musicians unable to hear themselves or each other properly. This results in difficulties for ensemble performances and inadequate balance between the instruments. Musicians performing at both the Casa da Música in Porto, Portugal, and the Stadthaus Winterthur concert hall in Switzerland experienced such issues, and although the venues' architectures differ considerably – the former is considered a



Above: **Stadthaus Winterthur in Switzerland with the new stage shell. The ellipsoidal lights provide reflections back to the musicians and to audience in the stalls. Photo: Karl Fülscher for Architekturbüro Johann Frei**

Opposite page, left: **Acoustic reflectors in the Chapelle Corneille are attached to the backs of the last row of chairs. Four types of reflectors with different inclinations and angles provide a homogeneous distribution of sound**

Opposite page, right: **The view from the upper gallery in the Chapelle Corneille. The 21ft-diameter chandelier rotates to expose a mirrored side or a convex acoustic reflector creating clarity-enhancing reflections back toward the musicians and audience**

masterpiece of modern design; the latter is one of the most important examples of neoclassicism in Switzerland – the acoustical causes were very similar: excess loudness on stage and a lack of projection toward the audience.

In both projects, the addition of acoustical absorption close to the loudest instruments reduced sound levels. Acoustical projection and communication on stage were improved by tuning and/or installing sound reflecting surfaces. Expert feedback from artists was key to developing solutions that could be implemented with minimal disruption to the orchestra – for example, the new stage shell at Winterthur was installed in only two weeks.

Following a similar approach, changes were undertaken in the Stockholm Concert Hall, home to the Royal Stockholm Philharmonic Orchestra. In spite of several changes and renovations since its opening in 1926, the 1,800-seat concert hall had always struggled with problematic acoustic conditions. While the last renovation in 2000 improved some of these particular issues, the musicians continued to complain about difficulties hearing themselves and each other, while audience members observed a lack of reverberation and poor orchestral balance.

By adding a moderate amount of acoustical absorption at the rear part of the stage and by tilting the existing over-stage acoustic reflectors, the narrower front of the stage was acoustically balanced with the much wider rear section. For better cross-stage communication, vertically inclined Plexiglas panels were added to the balcony fronts around the stage, enabling tighter ensemble playing and better orchestral balance. The semi-transparent technical grid – installed during a previous renovation and suspended below the entire ceiling – was identified as the reason for the lack of reverberation. Rather than embarking on a time-consuming renovation scheme, with options including demolition and replacement of the technical access level, it was decided to first test an electroacoustic enhancement option to cancel the attenuation of sound passing through the grid. Installed over the course of three days, natural reverberant sound was picked up with microphones high in the hall and fed via the house mixing console to loudspeakers above the ceiling. The loudspeaker sound was diffused to subtly mix with the natural reverberation and create a smooth and natural enhancement of the reverberation that fully maintains the acoustical character of the hall. Now the acoustic and architectural ceiling heights correspond well. The improvement during the tests was so dramatic that the chief conductor, Sakari Oramo, decided to never conduct a rehearsal or concert without the system again. The temporary system has now been replaced with a permanent installation.

This page: Eric Pelhier for atelier d'architecture King Kong

Respecting history

Working on architecturally constrained projects can inspire solutions for adapting existing venues to new uses.

The Chapelle Corneille in Rouen, France, is a protected monument and while the project's aim was to create a concert hall for chamber music, orchestras and choral music, a prerequisite of the brief was to not obstruct the original vision of the chapel. All acoustic improvements are achieved with mobile elements that can be considered furniture and do not interfere with the architecture of the space, while at the same time creating a new sonic and architectural experience. ■

www.kahle.be