Acoustic signature

The new home of the Stavanger Symphony Orchestra has been attuned for maximum volume while retaining a sense of intimacy

A new 1,500-seat concert hall in Stavanger, Norway, opened its doors to the public on 15 September 2012. Final commissioning and testing, including test concerts with a partial and full audience, confirmed the high quality and potential of the space. Part of a new complex, the concert hall is located directly on the shore of Stavanger harbour and fjord and also features a 900-seat multi-purpose hall (for theatre, opera, banquet and amplified concerts, including a configuration for up to 1,600 standing audience), a large foyer and restaurant, as well as rehearsal and practice rooms. The hall will be the new home of the Stavanger Symphony Orchestra.

Intimacy and acoustic volume

One of the main design goals for the concert hall was to create a highly intimate space combined with ample reverberation and a large acoustic volume, a design goal that's a direct response to the characteristic use by the Stavanger Symphony Orchestra (SSO) and other users. The SSO is a variable geometry orchestra. Under the direction of chief conductor Steven Sloane and international guest conductors, the orchestra performs the romantic and contemporary repertoire, focusing on major symphonic works such as Mahler and Bruckner symphonies or the tone poems by Richard Strauss, which can now be performed under appropriate acoustic conditions.

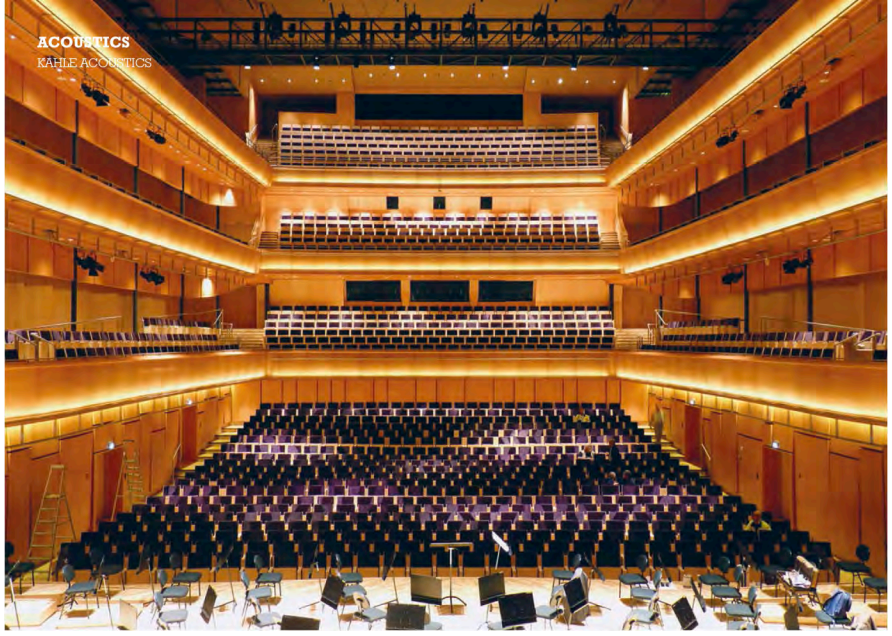
Furthermore, a subset of the orchestra performs under the direction of violinist Fabio Biondi, artistic director for the Baroque and Classical repertoire, using period instruments. In addition, a large annual chamber music festival is part of the programming of the hall. The possibility of a smaller seat count setting was also an important additional goal in the development of the design of the room.

The creation of an intimate room with an important acoustic volume was achieved by a combination of several design features, including a movable ceiling permitting volume change, reduced dimensions for the main floor parterre and 'floating balconies' hung from the side walls.

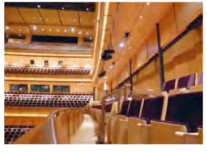
Variable volume

Divided into seven separate elements, the entire ceiling is movable in height, from the lowest setting with an average ceiling height of 17m above the stage to the highest setting with an average height of close to 22m above the stage. This corresponds to a variation in

Photo Kahle Acoustics



The view from the choir balcony shows the intimacy of the space (above)**; the floating side balconies with integrated acoustic reflectors enhance resonance volume and early reflections** (below)



acoustic volume from a minimum of approximately 17,000m³ (about 11m³/person) to a maximum of about 22,000m³ or close to 15m³ per audience member.

Reduced dimensions

To enhance the intimacy of the room and the proximity of audience members, the size of the parterre is smaller than that of other concert halls of similar size. It opens up at the first balcony level, creating the bigger acoustic volume required for the larger orchestral forces and the Romantic repertoire. The width of the main floor parterre is limited to less than 19m; the maximum width of the hall in the upper levels is close to 26m, and the distance from the stage edge to the first row of balcony seating is less than 20m. There are 20 rows of seating in the main floor parterre, six rows in the first balcony (and up to three rows for the side balconies), four rows in the second balcony and once again six rows in the third (and top) balcony level. The upper balconies are stepping back, limiting balcony overhangs to a maximum of two to three rows of seats. Using only the main floor parterre and the first rows of seating on the first balcony, an intimate chamber music hall for about 800 audience members has been created.

Floating balconies

The upper side balconies (second and third balconies) have been shifted inwards and are hung off the side walls, creating a gap of approximately 1.5m between the side balconies and the side walls. Acoustic reflectors (vertical 'downstands') are placed under the balcony soffits, maintaining the efficient 'cue-ball reflections' back to the main floor parterre from the undersides of the side balconies. The additional acoustic volume behind the side balconies creates an interesting architectural space as well as an acoustic resonance volume. Furthermore, scale model tests have confirmed that the lateral volumes improve projection of sound from the stage to the seats in the upper balconies, increasing the homogeneity of acoustics of the hall.

Architectural finishes

The architectural shape is a 'broken shoe-box' with curved surfaces and floating balconies inscribed inside the conceptual box. The use of different wood finishes creates a vibrant feel with an overarching uniformity. The floors are made of ash, while the balcony fronts, balcony undersides and wall finishes are maple in two different stains. All wood finishes are oiled in order to maintain the natural aspect of the wood and to keep the wood pores open for a warm acoustic response.

The acoustic reflectors above the stage are three-dimensional bubbles made from 20mm-thick Corian. The translucent white of the material creates abstract clouds above the musicians and first rows of audience seating.

Acoustic optimisation

The floating side balconies with integrated acoustic reflectors allow the acoustic signature – the definition and clarity of sound sources – of a small, intimate room to be maintained, along with the acoustic volume required for the large symphonic repertoire, plus an ample reverberation. Many other reflection surfaces were optimised in close collaboration between the architects Ratio Arkitekter and the acousticians. The angle of the curved balcony fronts is different for every level, sometimes even different between the areas around the stage (for increased on-stage communication) and around the audience area (for directed reflections towards specific audience zones). All wood finishes around the stage and the main floor parterre are curved for improved diffusion. The wood finishes of the rear walls (often vertically inclined) provide early reflections for audience members on the rear and side balconies, and an increased room response back to the musicians on stage.

The design brief required a maximum reverberation time of at least 2.1 seconds, corresponding to the taste of Scandinavian musicians and audiences for a long reverberation time and ample room response. This brief was met, and the acoustic result indicates that combining long reverberation time with great clarity and interesting architecture is possible through good collaboration between architect and acoustician when optimising the early reflection design. ■

www.kahle.be