



ACOUSTICS  
KAHLE ACOUSTICS

October 2016 marked the opening night of Bochum's 950-seat concert hall, and a performance from the Bochumer Symphoniker conducted by Steven Sloane



ACOUSTICS

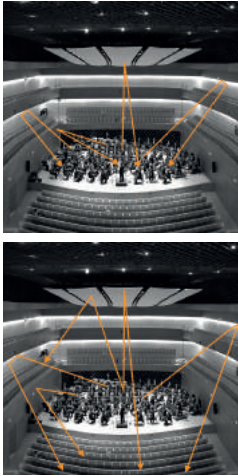
investment  
The Anneliese Brost Musikforum Bochum demonstrates that excellent acoustics can come at a moderate cost

**F**ounded in 1919, the Bochum Symphony Orchestra is in the top league of German orchestras, yet the ensemble had never had a home concert hall. Since its inception, the orchestra had performed on the stage of the local theater (the Schauspielhaus), in the Audimax lecture hall at the University of Bochum, and in the converted factories and warehouses of the Jahrhunderthalle in Bochum.

**Pushing forward**  
After decades of failed attempts to identify an appropriate site and secure funding, the appointment of music director Steven Sloane in 1994, and the resulting increase in audience numbers, generated the impetus to push forward for a purpose-built hall. In spite of the fact that the city was officially bankrupt, the Federal State of North Rhein Westphalia and the European Union promised sufficient backing for the project as long as stringent criteria were met –

facilities for the local music school had to be included, and the project had to have a maximum cost of €33.2m (US\$36.3m), of which €14.3m (US\$15.6m) would come from private donors. An architectural competition in 2011 sought designs for a 900-seat concert hall and a 300-seat multipurpose performance venue on the land surrounding the consecrated St Mary's church in the city center (which also dated from 1919). The winning design – from Bez + Kock of Stuttgart with acoustics from Müller BBM – went against the brief to place the multipurpose venue in the church and instead brought the church into the heart of the scheme as the foyer, flanked on both sides by the performance venues.

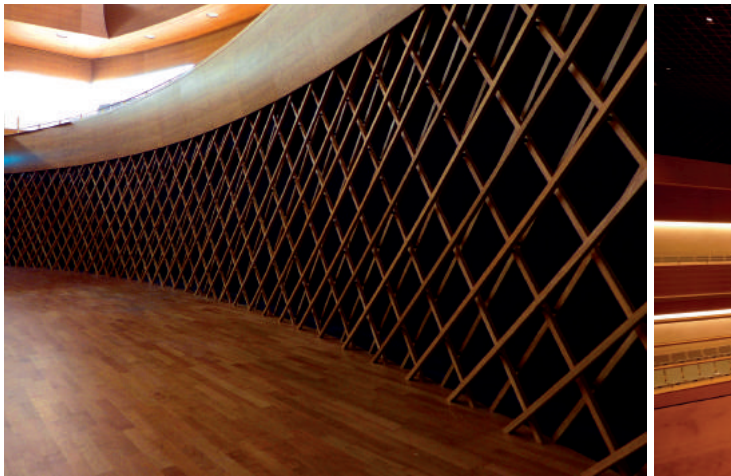
During the early discussions between the client, design team and client acoustician Kahle Acoustics, Sloane expressed a wish for a more intimate room, with the audience surrounding the musicians, rather than the strict, straight-lined shoebox that had been proposed in



Top left and above: **A visual illustration of the early acoustic reflections created to the orchestra (top) and the audience area (above)**

Above right: **The onstage wall is an open surface made out of wooden slats behind which a sound absorbing curtain can be installed to adjust orchestral balance**

Opposite page: **The venue's art deco-inspired canopy was acoustically optimized. Each element is curved in 3D to distribute the reflected sound evenly over the venue stage and audience stalls**



the competition submission. The architects responded with a more rounded seating layout and room shape incorporating concave-curved forms. This, however, created significant acoustic challenges. During these early meetings, the exchange of ideas between Kahle Acoustics and Müller BBM had been so successful that it was ultimately decided that the project should progress with both acousticians collaborating as equal design partners.

The curved forms in the plan were all based on two center points: one at the conductor's position governing the curves in front of the stage, the other in the middle of the parterre for the curves behind the stage – a shape that would theoretically lead to sound being significantly intensified at those two locations, resulting in echoes and uneven sound coverage. In order to maintain the architectural concept, Kahle Acoustics used Rhino/Grasshopper acoustic simulation programs, developed in-house, to adjust the geometry in real time. The potentially problematic focusing was converted into beneficial sound reflections by splitting the architectural curves into segments and by optimizing the curvature of each segment in section and plan, as well as by optimizing the vertical tilt. The shaping of the balcony fronts around the stage provides

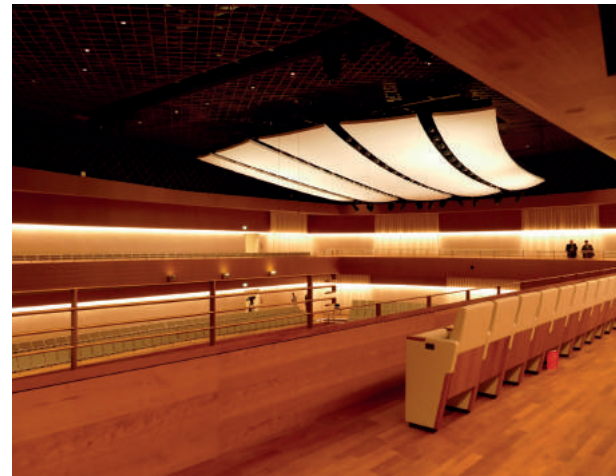
musical communication on stage and acoustic envelopment and clarity in the stalls. The cross-communication on stage works so well that even patrons in the first rows comment that they can hear the distant instruments very clearly, as well as an excellent balance of all the instruments.

**Making savings**

As one of many cost optimizations to bring the project in under €33.2m, it was decided that the canopy should not initially be motorized. Temporary winches were used to optimize the height and angle of the canopy during acoustic tests and listening sessions with the orchestra.

A further cost optimization was the inclusion of the roof structure and technical catwalks into the concert hall acoustic volume. In this way, the volume necessary for a symphony orchestra was obtained while saving a story in building height and associated costs. The issues of ugly exposed equipment and structure were mitigated through careful design and coordination: an acoustically transparent grid was developed to visually occlude the structure, and the technical equipment was carefully planned to minimize the incidental absorption in the top of the room, maximizing beneficial reverberation from above.

Even during a time of financial difficulty for the city of Bochum, commitment to supporting



and expanding cultural activities was considered to be an investment priority for the city and the state. Now named the Anneliese Brost Musikforum Bochum, the new performing arts center finally cost a total of €38m (US\$41.6m) – a relatively small overspend for a public project of this kind, and exceptionally good value for the delivery of a new concert hall venue of such exceptional quality.

The key to achieving such value for money was the simple idea that good acoustics and beautiful buildings do not require expensive finishes and high-tech equipment, but are the result of careful design, detailing and construction. When this is achieved, the result is a concert hall that the orchestra and local audiences can be proud of, and one that is flexible enough to adapt in the coming years and decades. In a city of 365,000 inhabitants, the Musikforum Bochum received more than 20,000 individual donations and more than 37,000 visitors during the opening weekend – one tenth of the population! ■

[www.kahle.be](http://www.kahle.be)