Bristol Beacon Acoustics

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SOUND SPACE VISION

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The Dream

A Music Centre for Bristol to give new life, quality and relevance to the two performance spaces that have long been at the heart of Bristol's music community – now Beacon Hall and Lantern Hall; and to add a third "club" venue – the Weston Stage -- and music educational spaces to support and expand the support for the future of music in Bristol. In the 70+ years since the last major rebuilding of Colston Hall the musical landscape has changed, and several high-quality venues around the UK have raised the bar on quality of acoustics and flexibility to present a growing range of music. Transformation to the Bristol Beacon has retained those parts of the building that could be retained while bringing the acoustics and flexibility into the top tier.

Key Project Goals

- Achieve acoustical quality for orchestra and choruses on a par with the best halls in Britain and Europe, and 21st century excellence for pop, rock, jazz and other amplified music.
- Balance capacity with comfort, sightlines and flexible seating arrangement.
- Increase audience capacity for amplified music – more tickets available for contemporary concert formats.
- Retain historic character – community heritage, connection to Bristol's amazing music history
- Achieve modern standards of accessibility.

Starting Point

Acoustical performance is a function of scale (audience capacity), shape and materials. The basic scale and rectangular plan of the Beacon Hall were already good basis to achieve better, and indeed excellent, acoustics, especially for unamplified classical music. However, there were two fundamental acoustical problems with the 1951 interior:

- The original solid materials were hidden by thin panelling over voids limited the bass response and overall impact.
- The single balcony was so deep that it separated the room into 3 acoustical spaces – above and below the balcony and the central space. While the acoustics overall were not in the same league as the best newer concert halls, the sound was especially weak and lifeless for the hundreds of people under the balcony.

Fundamental Acoustical Design Goals

- Increase reverberance and immersion for classical music.
- Increase clarity for amplified sound, and integrate the room acoustics and audio system.
- Decrease the number of seats under a balcony overhang.
- Improve the acoustics onstage for orchestra and choir – reduce over-loudness, improve balance between orchestral sections, enhance communication between players. Unify the sound between stage and audience so the players have a good sense of their sound reaching the audience.
- Transform Lantern Hall from what has been principally a theatre environment to a music environment, and unblock the windows to connect with the surroundings, while insulating the interior from the urban noise.

Acoustical Design

Most aspects of auditorium architecture are interconnected in their effects on the overall acoustics. First of all, the single deep balcony created very weak, dry acoustics for hundreds of audience under the balcony; it limited the envelopment for the audience in the stalls; and produced a distracting echo from the rear wall to the brass. We recommended splitting the single large, deep balcony into two shallow balconies, improving the sound for all in and under each balcony, and opening up the room volume for the benefit of all. Now 2 horizontal side balconies work with the walls to produce sound that is more even throughout the hall and better for all.

We understand from long experience that this rectangular plan with high, horizontal ceiling and the 2 balconies would be the best form to meet the programming and quality intentions of the BMT. The overall scale of the room was to remain roughly the same, and we changed a few angles at the front and rear of the room to mitigate echoes and assist balance and projection of sound and to help the performers feel the space.

The choice of materials is a collaboration between acoustics and architecture. To increase the reverberance and bass clarity we replaced the thin panelling on upper side walls with new brick, which is well braced to the heavy, but uneven and distorted shell of the building. The patterning of the brick is an architectural development of our intention to incorporate some 3-dimensional relief in the brickwork to scatter high frequency sound waves. We worked with the architect's choice to reuse the historic chestnut panelling at stalls – already a good geometry for reflecting and scattering high frequency sound, and together with the contractor we developed thicker backing for less absorption of bass.

The balcony fronts have been changed from flat, vertical plaster planes to convex inverted triangles to provide appropriate lateral sound reflections to the stalls, softened, not too strident; but, with the side balcony soffits and profiled brick walls, strong enough to assist in the improvement of spaciousness and transparency. We explored options with the architect and evolved this approach of convex, angled timber shields, which was also carried through in the design of the timber overhead canopy.

The acoustic canopy has been redesigned to reinforce the string sound and cut back on the brass loudness, -- onstage and in the audience. The middle row pivots to allow deployment of the main loudspeaker clusters for amplified concerts. For classical music without the main loudspeaker clusters the canopy remains in its complete arc, and voice announcements in classical concerts can be conveyed through smaller discrete loudspeakers.

The quality of the concert experience starts with the quality of the performance; so we focus on giving the performers the best environment. The stage platform has been expanded to help the musicians hear each other better and reduce what was overloudness of brass and percussion onstage. A large platform extension elevator can accommodate the larger orchestras, and doubles as the means to store the stalls seating in the basement. We designed the geometry and materials of a new orchestra riser system to achieve the best possible musical communication onstage between players and good sight and sound lines for the audience. It is flexible in height and width to accommodate a variety of ensemble sizes with optimal spacing and acoustical relationships, more space for the players for onstage loudness control, and enabling a larger flat floor platform, which was not possible before. At upper levels around the stage amended wall angles and timber facets help to reduce the brass loudness.

Multi-layer fabric banners and curtains on a central control system can be deployed to reduce reverberance and increase clarity. We have also included the UK's first installation of inflatable bass absorbers, hidden above the canopy, to maximise the clarity of bass for amplified music. Together they can be set in various configurations to tune the acoustics for different events. Typically, they will all be extended for amplified pop and rock concerts and for comedy acts, and may be partially extended for recitals or to make up for the absence of stalls seats. These important tools give a range of acoustical flexibility so that each audience and performer can feel the acoustic was made for them.

More than the Sum of its Parts

The second performance space, now called the Lantern Hall, had a light touch in terms acoustics. As the tall shoebox shape was resonant on its own, we added an area of sound absorbing panels at the ceiling to allow sufficient clarity in small occupancy events. Simple, but effective sound absorbing curtains provide flexibility to tune the liveness for amplified and unamplified events. The original windows are now exposed again, but they now have a second layer of heavy glass to attenuate traffic noise entering the room and keeping loud music from bothering the nearest residents.

In order to allow maximum activity in the building and revenue to support the activity and quality, it was important that the Beacon Hall and Lantern Hall be able to operate simultaneously without disturbing one another. Before the transformation this was limited by the sound transfer between spaces. The Sound insulation between all three halls was improved with additional doors and vestibules.

The Education Centre and the new Weston Stage have been fit snugly into the two storeys below the Beacon Hall. The heavy brick structure of the arches achieves substantial separation between the halls. Sound absorbing finishes and electrical systems have been coordinated into very tight spaces.

We collaborated closely with the engineers and contractor on the mechanical and electrical systems to ensure there is no audible noise, so that the musical drama and subtlety can come across to the audience and the performers can work with a very wide range of dynamics. Noisy mechanical and electrical plant are located in a new pard of the building, structurally independent from the performance spaces. Acoustical guidance is deeply embedded in most aspects of this project.

All of this work was done in the service of the Bristol musical heritage and connection to the music of the future. One basic goal was to put the Bristol Beacon firmly among the best of the British and International concert halls in terms of acoustical quality. Along the way we have seen the variety of programming expand to encompass a wide variety of musical cultures and traditions, Paraorchestra, music education. Bristol has a strong tradition of artistic quality, and now have a venue to showcase regional, national and international performance.

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