Acoustical Design of Queensland Conservatorium of Music

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Abstract: The auditorium of Queensland Conservatorium of Music was planned for both classical music concerts and lyric performances and has 643 seats. The retractable orchestra shell and acoustical banners on audience side walls are introduced to meet theatrical and acoustical requirements. The reverberation time changes from 2.0 second to 1.6 second with retracting the orchestra shell, and varies by 0.3 second with acoustic banners.

INTRODUCTION

The Queensland Conservatorium of Music (QCOM) belongs to the Griffith University, Brisbane, Australia. The new building for the QCOM was built at the site of 1988’s Expo in Southbank, in 1996. The new building has the auditorium with 643 seats for classical music concerts and lyric performances, lesson rooms, studios and the workshop for the Lyric Opera of Queensland (LOQ). The architect is Bligh Voller Nield Pty Ltd. (BVN). We have joined this project at the request of the architect since 1993. This paper reports the room acoustical design and properties of the auditorium.

ROOM ACOUSTICAL DESIGN OF AUDITORIUM

The auditorium is used not for the concert and rehearsal by QCOM, but also for the opera and musical production by LOQ. The orchestra shell, stage risers and acoustical banners are installed to fulfill the requirements both as a concert hall and a lyric theater. Fig.1 and 2 show a plan and a section of the auditorium respectively.

Orchestra shell: One-body shell slides forward to the proscenium on rail, and forms "shoe-box" style concert space (concert mode) with 643 seats. Merits of this type of the shell are as follows; theatrical equipment such as batons and lights can be freely installed in the fly-tower, openings between the shell and the proscenium arch can be minimized, and panels of the shell can be made of heavy materials. For a lyric performance, the orchestra shell is retracted backward, the stage curtains are on stage, and the proscenium opening is narrowed with suspended panel and rotating side panels (lyric mode).

Stage riser: The floor of 100 m² just in front of the proscenium is risen up to the stage level and used as a frontal part of a stage at the concert mode. It is also sunk under the audience floor level and used as a orchestra pit at the lyric mode.
Dimensions: The auditorium has dimensions of 15-20 m in width, 16 m in height and 36 m in length at the concert mode. The total air volume for the concert mode is approximately 9,000 m³.

Interior finishing: The Orchestra shell, side walls and ceiling are finished reflective with various size of corrugation for sound diffusion, as shown in Fig.2. Acoustic banners of 200 m², glass-wool panel covered with cloth, are settled down on side walls for tuning the acoustics. Seven small doors (4 m² per a door) are arranged on the orchestra shell for acoustical fine tuning in the stage space. Absorptive materials are exposed when the doors are opened.

REVERBERATION TIME

The measured reverberation times of the unoccupied auditorium are shown in Fig. 3. The reverberation time decreases from 2.0 second to 1.6 second at 500 Hz with retracting the orchestra shell and setting the stage curtains on stage, and varies by 0.3 second at 500 Hz with acoustic banners for both concert and lyric modes.

AUDITION OF ACTUAL MUSIC AND PERFORMANCE

The audition of actual music and performance played by teachers and students of QCOM was held under the unoccupied condition. It’s primary purpose was to demonstrate the acoustical adaptability and compatibility of the auditorium to the people concerned. The formations listed Table 1 were prepared for the audition of the concert mode.

<table>
<thead>
<tr>
<th>Formation</th>
<th>Players' Preference</th>
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<tbody>
<tr>
<td>Piano Solo</td>
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<tr>
<td>Vocal Solo</td>
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<tr>
<td>Violin Solo</td>
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<tr>
<td>Strings Ensemble</td>
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<tr>
<td>Full Orchestra</td>
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<tr>
<td>Clarinet Solo/Quartet</td>
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<tr>
<td>Trumpet Solo</td>
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<td>Brass Quintet</td>
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<td>Jazz Ensemble</td>
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<td>Marimba Ensemble</td>
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<td>Wind Symphony</td>
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Note 1: Banners / Doors Note 2: All banners 50% down

Players preferred the condition of the banners retracted for the string ensemble, the full orchestra and the lyric mode. On the other hand, players preferred that of the banners lowered for the wind ensemble and symphony, percussion and jazz except for the solo trumpet. Many players more than we expected, preferred on the stage where the small doors on the shell were opened, that is partially absorptive. But these setting preferences may vary during players' long-term experiences in the auditorium. The orchestra shell, banners and small doors on the shell are confirmed to have sufficient variability to meet players' expectations through this trial.

ACKNOWLEDGEMENTS

We express our thanks to QCOM and BVN for providing us the chance to join this project.