THE NEW YORK STATE THEATER RENOVATION

E. Mommertz, Mueller-BBM, Planegg, Germany
G. Engel, Mueller-BBM, Planegg, Germany
Kh. Mueller, Mueller-BBM, Planegg, Germany

1 INTRODUCTION

Together with the Metropolitan Opera and the Avery Fisher Hall, the New York State Theater is one of the three large performance spaces of the Lincoln Center in New York. It is the home venue for the world-famous New York City Ballet (NYCB) as well as for the New York City Opera (NYCO).

In the early 1960s, the Theater was built by the architect Philip Johnson in collaboration with the famous choreographer George Balanchine whose influence was directly reflected in a very ballet-oriented acoustical design of the stage and proscenium. Over the years, numerous plans for improvement were prepared which resulted in an extensive redesign of the proscenium and in the installation of the so-called “eyebrow“ above the orchestra pit in the 1980s. In 1999, an electro-acoustic room enhancement system (ACS) was installed with the aim of compensating the little reverberation and the hall’s insufficient ambience. From the start, this system was subject to repudiation by numerous critics despite the fact that the system’s effect was hardly perceivable from most seats in the Theater. Finally, these acoustical deficiencies were among the reasons why the Opera became less and less popular in the past years.

Hiring Gerard Mortier as the new General Manager and Artistic Director of the NYCO was to become the great turning point at the beginning of 2007. With the wealth of experience he had gained as Director of the Salzburg Festival, the Ruhr Triennale and as Director General of the Paris Opera, in New York he succeeded very quickly in putting together an artistically ambitious program for his first season 2009. The aim was to make the City Opera step out of the shadows of its big sister, the Metropolitan Opera.

Mortier had realized very early on that the given acoustics as well as the orchestra pit size were not a good basis for the Theater’s planned revival. Thus, he initiated extensive renovation works.

This paper describes the acoustical design prepared by Mueller-BBM for the New York State Theater in close collaboration with the users, JCJ Architects, Schuler Shook Theatre Planners and the other parties involved in the planning process.

2 ROOM ACOUSTICS STATUS EVALUATION

The starting point for the acoustical design was an elaborate status evaluation. It became obvious very quickly that although the perception of the Theater as the Metropolitan Opera’s “little sister“ reflected the relative size, the actual dimensions still were huge. With more than 2,700 seats and a room volume of 19,000 m^3 up to the stage curtain, the auditorium’s dimensions in some cases double those of some famous European theaters.

What is also special: The New York City Opera and the world-famous New York City Ballet both use the venue for their performances. They alternate as independent users of the Theater approx. every two months. As a result, the acoustics has to reconcile their sometimes very contradictory interests and requirements. While there is general agreement on the desired brilliant and room-filling sound of the orchestra, their requirements are diametrically opposed when it comes to sound transmission from the stage to the auditorium. While the Opera relies on a preferably perfect sound distribution from the stage to all areas of the auditorium, for the Ballet this would result in reinforcing the noise caused by dancing and jumping on the stage floor. Again, this would considerably affect the impression of the City Ballet’s dancers moving noiselessly and weightlessly on stage.

For the purpose of evaluating the room acoustics as best as possible, various performances were attended, interviews with the users were held and elaborate room acoustics measurements were performed in the auditorium. In addition to the detailed measurements taken without an audience present, measurements were also carried out at the beginning of an opera performance in the fully occupied Theater with a 14-channel wireless microphone system. Thus, within a few minutes only, it was possible to collect important data regarding the auditorium's acoustics with and without the room enhancement system.

A detailed analysis of these measurements showed why the room enhancement system was hardly perceivable during performances in most parts of the stalls area. Despite the increase in the reverberation time measured from 1.3 s for medium frequencies to almost 2.0 s, the sound continued to be perceived as dry and dull due to the far too low reverberant sound level and the time structure of the reverberation. During the further planning, it became evident in the three-dimensional computer model of the auditorium that even an adjustment of the system would not help. When the system was installed, the positions available for loudspeakers and microphones in combination with the resulting levels and time factors hardly facilitated any natural sound effect on the entire stalls area.

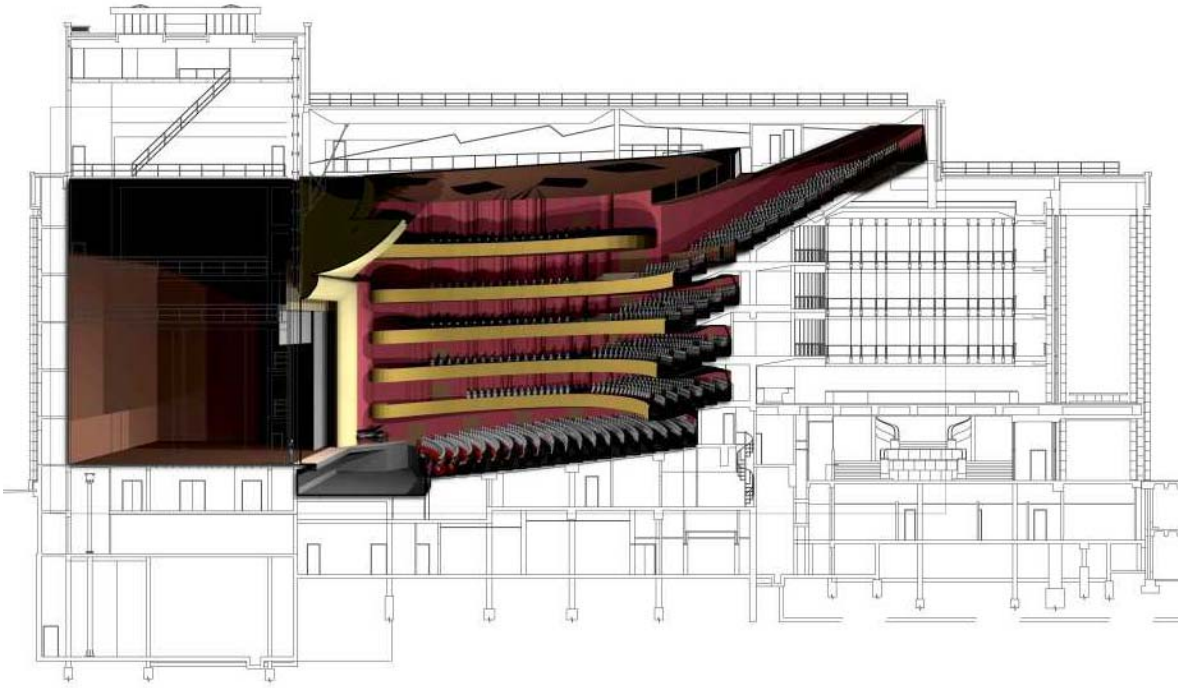

Figure 1 Acoustic computer model of the New York State Theater developed for room acoustical analyses

3 ROOM ACOUSTICS ADJUSTMENT MEASURES

From the agreement between Ballet and Opera, a number of measures resulted for the room acoustics redesign of the auditorium which support the common acoustic goals of them both and thus enable the Opera to take a step in the right direction.

3.1 Orchestra Pit

The most complex structural measure was the variable extension of the orchestra pit and the possibility of moving the pit to different levels. The formerly fixed orchestra pit with a depth of 2.2 m was to be turned into a multi-purpose pit with three platforms.

For performances of large operas with orchestra sizes of more than 80 musicians, the existing pit was too small. Therefore, in order to also be able to perform such works, the existing front wall in the orchestra pit was removed and the pit was extended by one row towards the auditorium. In this area, there now is another movable platform, the so-called “banana lift“ which in case of smaller orchestra sizes is placed at stalls level; for large orchestra sizes, it extends the orchestra pit towards the front. This system already supported by Mueller-BBM in terms of acoustics in the National Opera Helsinki and the Semperoper in Dresden maximizes the seating capacity and at the same time optimizes the contact between stage and orchestra pit.

In order to improve the acoustics in the pit and to facilitate a good balance among the orchestra members, the ceiling of the cantilever received a special acoustical treatment. Mobile, either absorbing or reflecting wall panels were installed. The main platform of the orchestra pit can be raised from a maximum depth of 2.55 m to stage level which is actually done during some performances in order to achieve special effects. This variability enables an optimum pit height and thus a suitable sound quality for the orchestra, always with respect to the orchestra size and nature of the work performed.

In the new movable platform, an air plenum is integrated in the podium that is moved as well. The perforation and depth of the underlying plenum had to be adjusted acoustically in order to counteract an increased bass absorption.

3.2 Orchestra Pit Balustrade

The mobile balustrade between orchestra pit and audience was designed in a way that it can be either sound transparent or sound reflecting. The latter is the standard configuration for Opera to support the balance between singers and orchestra and to improve the mutual contact between both. For Ballet use, the balustrade can be partly sound transparent, thus improving the brilliance of the orchestra sound.

3.3 Flooring

Initially it was planned to replace the existing thin carpet in the aisles of the auditorium by a thicker, more comfortable carpet. However, from the acoustical point of view it was suggested to replace the carpet by a sound-reflecting flooring. Measurements in the reverberation cabin (small reverberation room with $V = 6.35\ m^3$) and calculations showed that this replacement would result in a considerable improvement. However, it was a difficult task that required a lot of persuasion since for the American opera audience, a soft carpet is a clear evidence of comfort and quality. Notwithstanding, this measure contributed significantly to achieving a more brilliant sound in the auditorium.

3.4 Seating

Since the seating had already shown visible signs of wear and tear, it was replaced. The new seating was improved acoustically in such a way as to reduce the absorption when occupied. To this end, the surfaces not covered by the audience were designed with reflecting wooden materials. The upholstery cover was also analyzed in laboratory tests and then optimized. The new seating arrangement introducing two additional aisles at the orchestra level provided very important sound reflecting surfaces.

3.5 Sound Distribution

Due to the differing objectives pursued by Opera and Ballet, most discussions and design alternatives focused on determining the distribution of sound reflections in the proscenium and orchestra pit areas. The options discussed included major measures such as the “eyebrow“ above the orchestra pit being replaced by an acoustically favorable and adjustable reflector construction as well as solutions with minimum cost and effort. Finally, an option involving only a little more cost and effort than the minimum solution was executed. Thus, the unanimously unpopular partition walls at the front end of the balcony rings were removed and replaced by reflector elements installed in a more favorable way.

3.6 Room Enhancement System

Another major step in redesigning the Theater in terms of acoustics was the removal of the electro-acoustic room enhancement system. In this case, however, the system’s actual acoustical effect was of less importance since, as described above, this was quite limited in most cases anyway. However, the psychological effect on critics is significant. At last, they can again concentrate on the effect of music in the auditorium in an unbiased way instead of warily awaiting an electro-acoustic amplification which at least the electro-acoustic room enhancement system did not provide.

4 THE OUTCOME

The project ended in a very unexpected way. The beginning of the financial crisis ruined the plans shared by Mortier and the New York City Opera. The budget required and agreed for the new, modern and artistically innovative program was cut by 40 % which finally led to Gerard Mortier resigning from his position as director [2]. What remained was on the one hand the great uncertainty on the Opera’s future, on the other hand the already very advanced design for fundamental renovation and restoration works. Regardless of these challenges and thanks to a generous $100 million donation from David H. Koch, the renovation was completed in October 2009. With the new General Manager and Artistic Director, George Steel, the new opera season was ready to start in November 2009 in the renamed David H. Koch Theater.

To date, critics have been full of praise for the acoustical improvement achieved. With this respect also credits to our colleagues from JaffeHolden who had assumed responsibility for the acoustic works during the last 6 months of construction work.

5 REFERENCES

1. V. L. Jordan, ‘Acoustical Considerations Concerning the New York State Theater’, JASA, 13 (2) 98-103 (April 1965)
2. Meijias, J. ‘Das erste kulturelle Opfer der Krise‘, FAZ.NET (November 2008)