ACOUSTIC DESIGN AND TRIMMING OF THE ENCORE HALL IN JYVÄSKYLÄ, FINLAND

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1 INTRODUCTION

The Jyväskylä Symphony had long been performing in Jyväskylä Theater, which had an ACS system installed (in 1992). The orchestra have long been waiting for their own dedicated hall and several projects have been proposed over the years. However, as the theater was to be renovated, it was clear that at least a temporary solution had to be found.

It was decided that the orchestra would move to the hall of the exhibition center and that also that rehearsal facilities for the orchestra would be constructed in the center.

It was clear from the beginning that it would not be possible to achieve acceptable acoustic conditions for the orchestra in the hall, using traditional acoustic treatment, so a decision was made to change the acoustic of the hall to be optimal for an electro acoustic enhancement system.

In this paper we will describe the acoustic design of the renovation, the specifications for the electro acoustic enhancement system as well as describe the trimming/adjustment of the system

2 ACOUSTIC DESIGN

The acoustic design for the original hall was done by Raimo Parjo.

The Wilhelm Hall is actually 3 separate halls: a traditional, very wide auditorium and two smaller halls that can be rotated 180 degrees and used separately, see figure 1.

The original ceiling in the original halls were gypsum board, profiled to optimize natural speech intelligibility, and it worked very well for this purpose. For the future use of the hall, the ceiling proposed two major concerns: its shape was too projective (optimized for speech intelligibility) and it was quite heavy. This was a problem because there was no official information about the loadbearing capacity of the ceiling, so by removing the heavy gypsum board ceiling and replacing it with a more lightweight metal mesh ceiling, at least some load capacity was achieved.

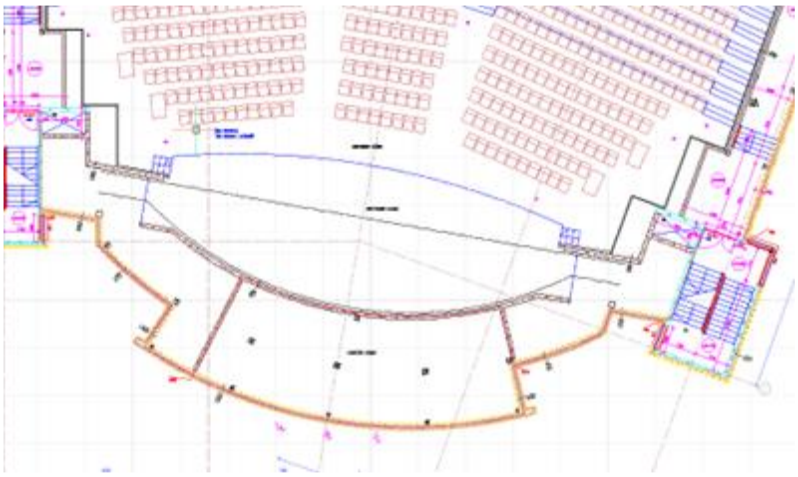

Figure 1: Original stage

Figure 2: Length section before renovation

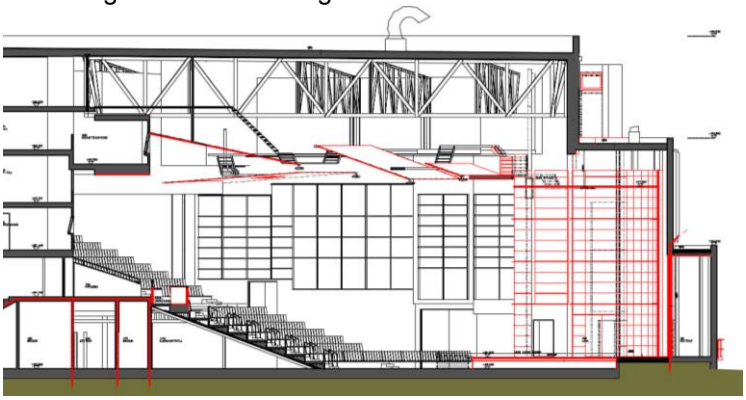

Figure 3: Section of the hall after renovation

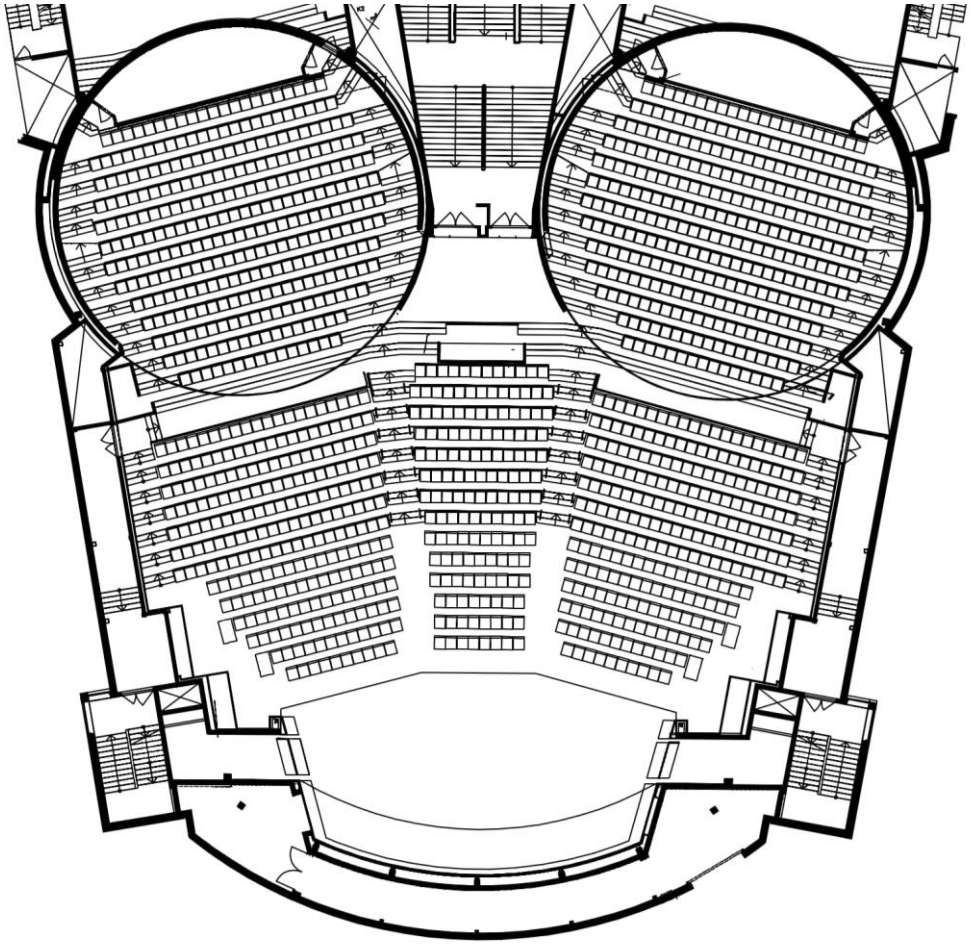

Figure 4: Plan of the hall after renovation

Also, it was clear that the original stage was neither sufficiently large nor appropriate for a symphony orchestra. All the stage walls were curtains, and there was very little storage space behind the stage.

The original stage was made from podiums and not sufficiently deep for a symphony orchestra. Furthermore, the orchestra's demand was for a stage with as good as possible natural acoustics, so fixed stage walls had to be designed.

The solution was to remove the backwall and extend the stage about 2 m back and to extend the back-stage area by extending the curved outer walls to the staircase and to make a loading ramp in front. Also, this meant that the rear part of the stage, see figure 3, is built on top of the old backstage concrete floor, where as the rest of the stage is a traditional wood on joist construction. Furthermore, there is an option to extend the stage by 1,5 m for large orchestras, see figure 6.

The overhead reflectors are made from bended plywood.
The stage wall is constructed from gypsum boards with a veneered plywood board on top. The shelves are veneered plywood.

The original ceiling was removed and replaced with an acoustically transparent metal mesh. This increased the volume of the hall but as the area above the ceiling is mainly ventilation installations and thus very absorbent, the increase in volume did not increase the reverberation time in the hall.

It was also clear that the electro acoustic enhancement system had to work from the beginning and as the orchestra had experience with an old, not very well-working system in their old hall, it was decided not to take any chances with the new system. Therefore, the main requirement for the new system was:

- Reference installation in halls with a resident orchestra
- Well documented tuning
- Fast service/repair

For this reason, the Meyer Constalation system was chosen.

Figure 5: Hall after renovation

Figure 6: Enlarged stage

3 ACHIEVED ACOUSTIC CONDITIONS.

As the acoustics of the hall are based on the electro acoustic enhancement system, the hall has several different setups:

- Off
- PA
- Drama
- Musical Theatre
- Chamber Music
- Symphony
- Choir

Also, all settings are done of both occupied and unoccupied hall and with the rear pods connected to the hall or closed. However, it was decided that for concerts, the rear pods will always be connected to the hall, so all 1000 seats can be sold.

The reverberation time for the different setting is shown in figure 7. As can be expected, the variation is far above what one can achieve with traditional variable acoustics. The same can be seen in figure 8 for Early Decay Time.

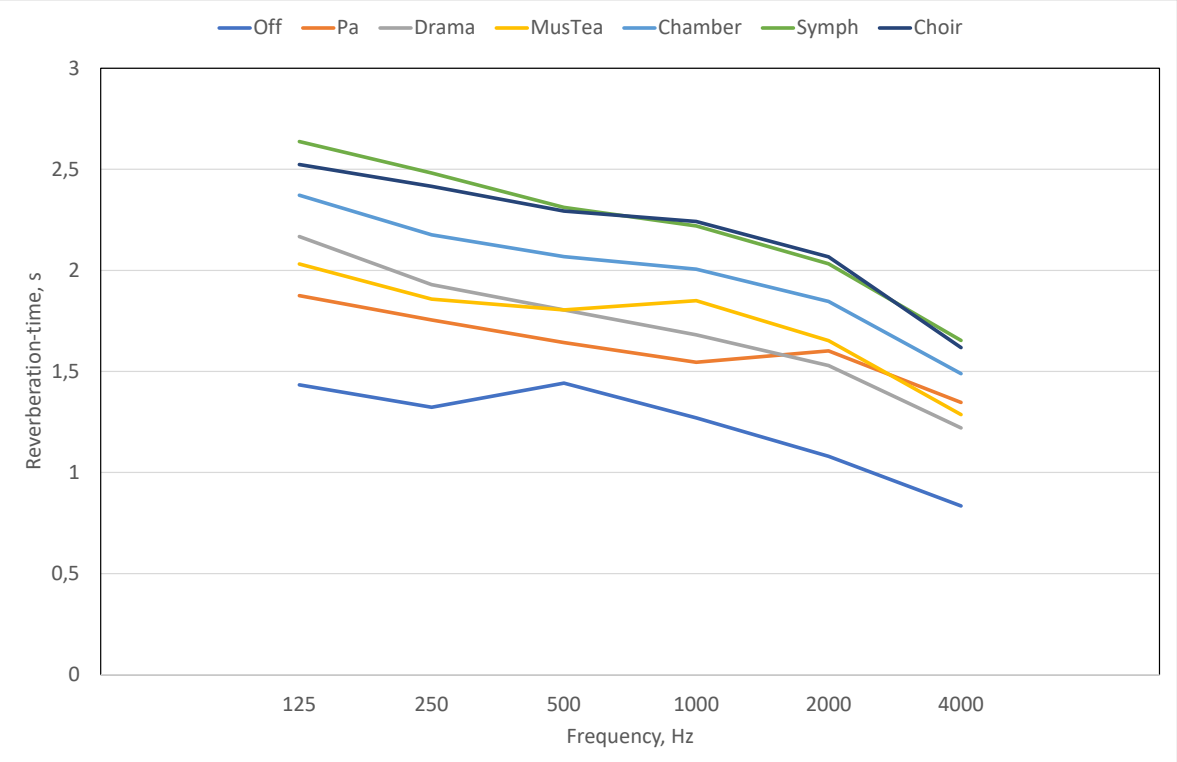

Figure 7: Reverberation time for the different setting

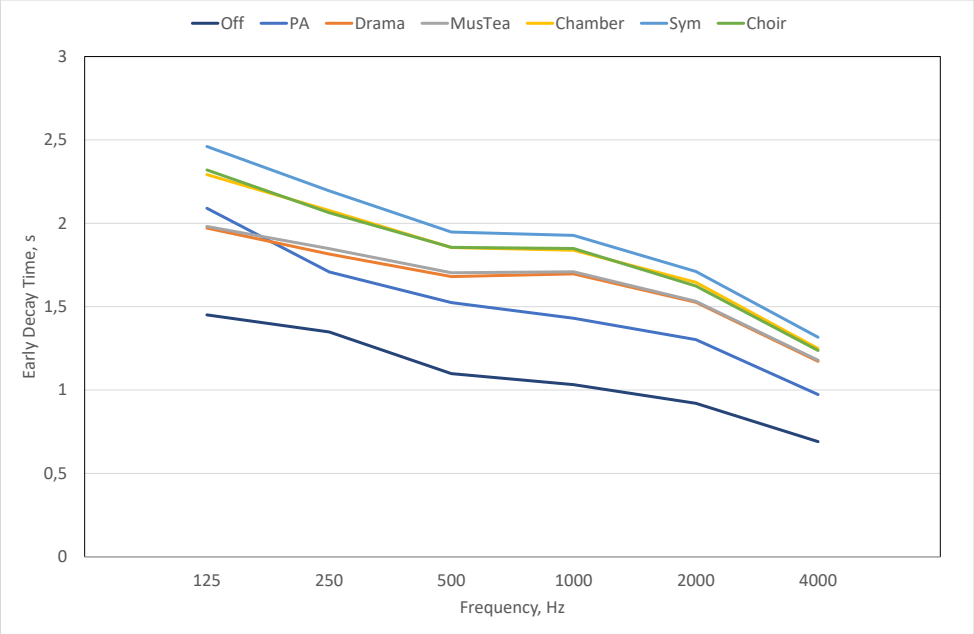

Figure 8: Early Decay time for the different setting

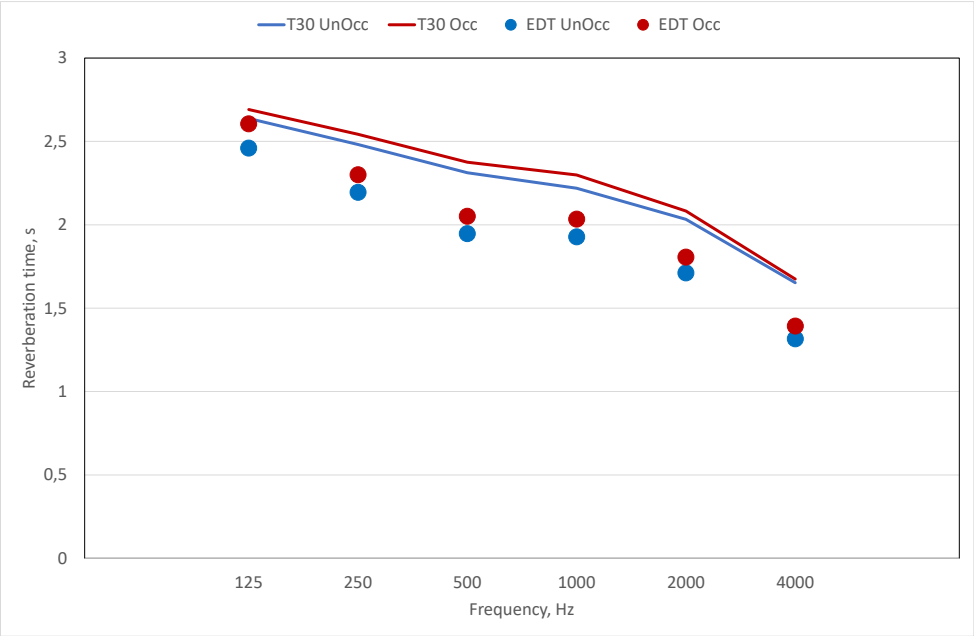

Figure 9: Comparison for Occupied and Unoccupied settings for Symphonic music, T30 and EDT

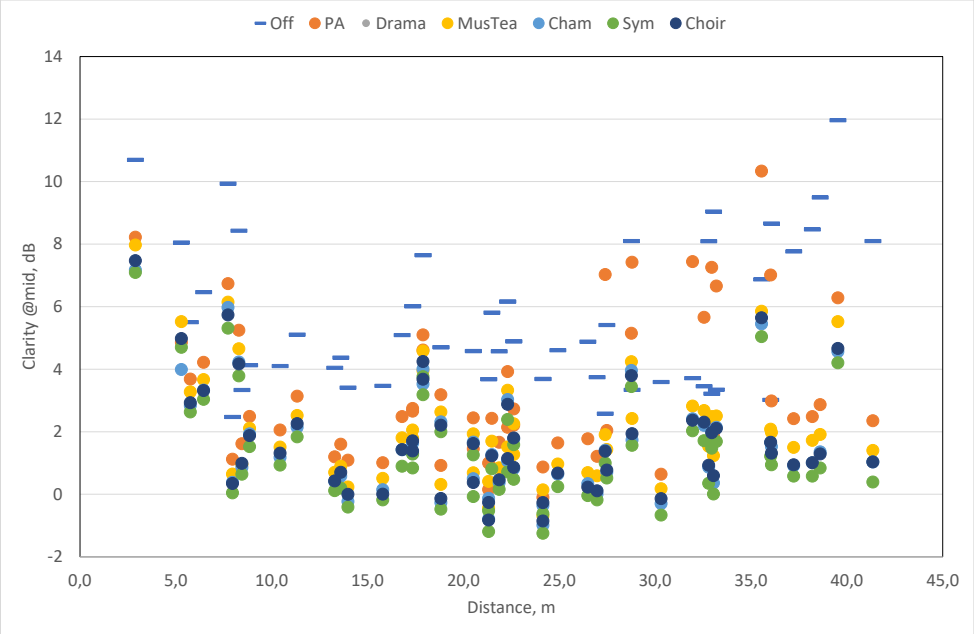

Figure 10: C80 @Midfequencies as a function of distance

As can be seen from figure 10, the C_{80} is greatly lowered with the system on, however it can also be seen that the change with distance is much smaller. In particular this is evident for receiver's 30+ m from the stage which is the receiver located in the rear pods.

4 CONCLUSION

The comments from most reviewers have been "Well, this is now a concert hall" which can be seen as a confirmation that the design has been successful. The conditions on the stage are still being optimized, both for the electronic enhancement system as well as for the "natural" reflectors. Also, some extra reflectors covering the entrances to the stage are planned.

But overall, the end-result proves that it is possible to convert a hall, which by traditional acoustic measures would be "impossible" for acoustic symphonic music, it to a venue where it is possible for the orchestra to play without having to fight the acoustic conditions.

5 REFERENCES

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3. H. Möller, J. Pätynen and S. Reina, Renovating the Encore hall using electro-acoustic enhancement systems, Presented at BNAM 2024, Helsinki, Finland
4. H. Möller and J. Pätynen, Practical spatial acoustic measurements in performance halls with a reduced virtual orchestra, June 2025Applied Acoustics 236(2):110740