

Concert Hall in Taggenbrunn Castle

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Abstract

An old big and abandoned castle complex called Taggenbrunn, in the heart of Carinthia, was bought and revitalized. A new concert hall was projected and realized inside the big courtyard taking into account strong historical constraints and modern acoustic requirements. Here we present the main passages and results of a many years work with an international team from Austria and Germany.

1 Introduction

The demand for new performance spaces is in Europe big; in most cases they are temporary electroacoustic installations, fitting the desires of many festivals, mainly Summer ones in different countries.

Some new closed theatres and performance spaces are built every year from scratch too, but the challenge of a new modern concert hall in an historical castle is very rare.

Austrian entrepreneur Alfred Riedl, the Jacques Lemans watch industry founder, decided to realize his dream, as he knew the castle complex from his childhood and lived not far from it in St. Veit an der Glan in Carinthia. He contacted architect Stephan Kogler from SKAPE architects and exposed the idea: buy the castle complex, restore it in order to provide a setting for various events and realize a wine yard around it [4].

The bigger challenge was the projection, the approval under strict cultural heritage limitations and the realization of the completely new glass roofed music concert hall inside the original courtyard of the castle.

2 Renovations

The first recorded data of the castle dates back to the 9th century. During the subsequent 12 centuries many events contributed to the development of the castle and the last destruction took place during WW1, leaving the complex abandoned and semi destroyed surrounded by a wood forrest, as shown in figure 1.



Figure 1, Taggenbrunn castle before the restoration

After years of renovation work, an extraordinary project was realized, as shown in figure 2, which the Riedl family presented to the public in November 2019.



Figure 2, Taggenbrunn castle after the restoration

The historic Castle Taggenbrunn opened its gates, showcasing its impressive centerpiece: the newly constructed concert hall in the 2 layer glass-sheltered courtyard with a capacity up to 644 people, as shown in figures 3a and 3b.



Figure 3a, Schloss Taggenbrunn new concert hall view from the South side



Figure 3b, Schloss Taggenbrunn new concert hall view from the North side

3 Acoustic design

The reconstruction and expansion of Taggenbrunn castle into a unique concert and festival venue posed significant acoustic challenges. We will just focus on the concert hall ones.

The choice fell on the original inner courtyard; three dimensional shape of the space was almost defined because the floor and most of the walls were already existing and only part of the last had to be rebuilt.

Fortunately, the shape was sufficiently curved and irregular and practically no significant changes have been done to them.

This *de facto* situation perfectly combined with the acoustic statement of “no parallel surfaces”.

The next problem was the roofing of the hall. Because of weather constraints and to avoid noises coming from the nearby road (500 m away), it was decided to built some coverage. After many iterations between the proponent architect Stephan Kogler, the propriety, the Bundes Denkmal Amt - BDA (State Heritage and Conservation Department) and the main acoustic consultant prof. Karlheinz Müller from BBM G.m.b.H. exposing the different wishes, needs, requirements and limitations, an overall and very specific agreement among client, BDA, acoustic consultants and architects overcame the exposed problematics through close collaboration.

The final document stated that the floor would be only partially renovated, covered with stones and divided in 3 listeners sections for ca. 406 listeners in front of a podium, the walls just cleaned and rebuilt in the original shape and stone type and a glassed transparent coverage would be installed at a specific height following an imaginary line under some architectural elements in order to avoid rain showers on the listeners, as showed in figure 4a and 4b.



Figure 4a, Unrestored Taggenbrunn castle courtyard, yellow line indicates the future position of the transparent glass coverage



Figure 4b, Taggenbrunn castle courtyard transparent glass coverage

The only allowed modern innovations were 3 balconies positioned on the short North and South angles of the room (103 seats on the first floor and 135 on the second floor) as shown in figures 5a and 5b.



Figure 5a, Concert hall first floor new South balconies/tribunes



Figure 5b, Concert hall second floor new South and North balconies/tribunes

The design involved exploring several acoustic options for the open courtyard, leading to the decision to install a central 1,2 m high stage with 3 audience blocks on the ground floor, surrounded by seating areas and a central limited 2 row only gallery, as shown in figures 5b and 6.

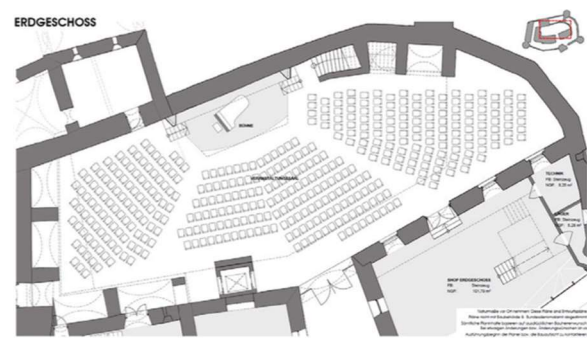


Abbildung 1. Grundriss EG gemäß [2].

Figure 6, Final stage and seating positions

The addition of a double layer glass roof created a hall with a sound volume of about 4.400 m³, ideal for a wide range of events, primarily focused on classical music performances, but also for festivals, readings, and exhibitions. Particular attention has been payed on the stage design: in order to maximize the direct sound and the first reflections from the back wall, a small acoustic chamber has been mounted on the same wall, as shown in figure 7. The upper reflecting area is 35° upper tilted, positioned at 6,85 m high sticking out for 0,7 m, allowing a good sound projection up to the farer seats. The lateral reflecting area is 22,5° left and right tilted up to 6,85 m high sticking out for 0,7 m, allowing a good sound projection for the nearer left and right seats (central seats already receive direct sound from the performers facing them).

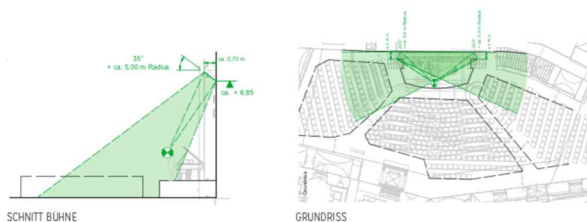


Figure 7, Final acoustic chamber and stage design

The installation of the tribunes provided favorable sightlines, as shown in figure 8 and direct sound conditions for the audience areas.

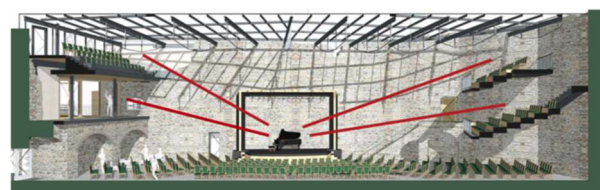


Figure 8, view from the tribunes/balconies

Because of security constraints a new big entrance had to be realized; its coverage is a wooden acoustic Profil 38/20 with 8mm space and 18% open surface.

An elevator was installed too and its concert hall inside wall has been covered with a wooden Profil 80/20 with 8mm space and 10% open surface.

The chairs, spaced about 0,85 m and about 0,5 m large, are sound neutral and can be easily removed; specific sound absorbing carpets have been positioned on the balconies/tribunes.

The acoustic challenges were solved through many virtual proposals, calculations and iterations. The final measurements, performed on 24th October 2019 by ing. Michael Wahl and ing. Petra Nies from Akustik Müller-BBM following the 2006 ISO 3382-1 version [5]. The room exciting signal was a Sine Sweep emitted by an omnidirectional spherical polar characteristic loudspeaker and captured by a measurement microphone with spherical polar characteristic. The measurements were performed at 18,3 C° temperature with a 54,6 % RH from 2 signal positions from the podium and 16 receiving positions on the floor, the 1st and 2nd floors.

The computation of the 32 measured impulse responses - IR resulted in a 1,80 s median RT₆₀ with 406 unoccupied seats for all the octave bands and a calculated 1,25 s median RT₆₀ with the fully occupied room for all the octave bands.

The very thick and irregular surface original and restored stone walls produced the desired high diffusion and excellent sound blending during music performances

These proper characteristics of the walls enhanced the low S/N and the good RT₆₀, as shown in figure 9.

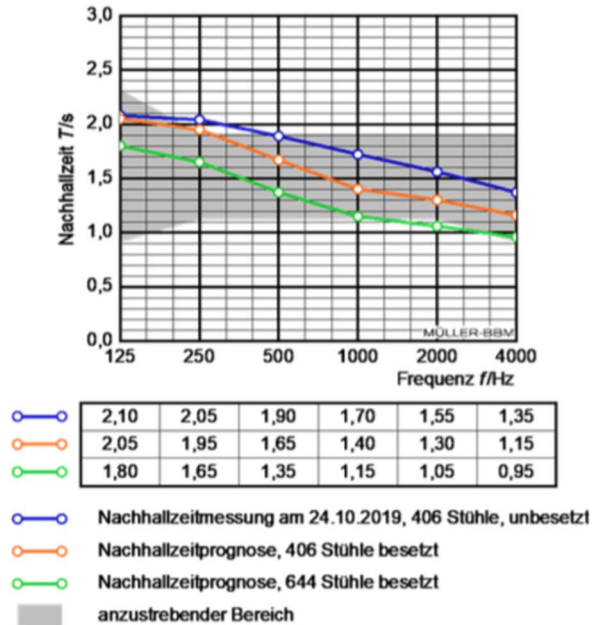


Figure 9, Taggenbrunn castle new concert hall measured and calculated octave bands RT₆₀

The combination of the exposed acoustic treatments, the ones on the new built balconies, a particular attention on the seats position, shape and material added on the original big stone vaults and stair with a 6,8 m³ volumen/person resulted in a well-balanced frequency dependent reverberation times decay from 150 Hz to 4k Hz. The room now offers a certain range of acoustic variability, enabling diverse performance scenarios [1].

Figure 10a shows the final rendering of the new concert hall, as it has been later realized and shown in figure 10b.

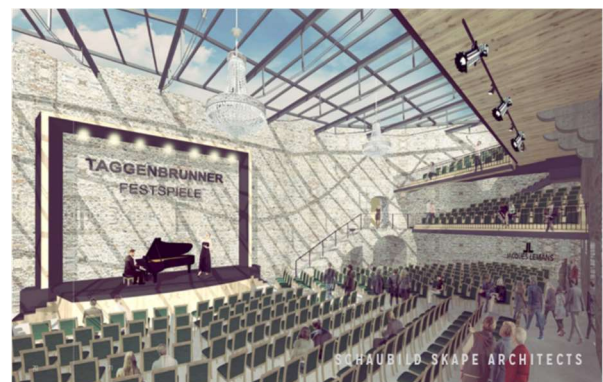


Figure 10a, Taggenbrunn castle new concert hall final rendering



Figure 10b, Taggenbrunn castle new concert hall open to public

References

- [1] skape architects (2023), *Architektur & Zeiträume, Burgruine Taggenbrunn, ein Juwel erwacht*, 2. Auflage, Eigenverlag, 2023;
- [2] ISO 3382-1: *Akustik - Messung von raumakustischen Parametern - Teil 1: Aufführungsräume*, 2009-06.

4 Conclusion

In this article we briefly described the history and the results of the Taggenbrunn castle project and focused on its impressive centerpiece: the newly constructed concert hall in the glass-sheltered courtyard with a capacity of over 640 people. This renovation and adaptation demonstrates that it is possible to revive also very old and huge buildings.

The castle, dating back to the 9th century, offers an impressive backdrop for opera stars, virtuoso ensembles and musical readings with very good S/N and RT₆₀, slowly descending from 2,10 s at 125 Hz to 1,35 s at 4 kHz, good sound blending and excellent diffuseness. In case of special needs temporary absorbing materials can be easily installed, allowing a certain acoustic flexibility for very different usage scenarios.

All modern acoustic and visual requirements have been achieved and the delicate historic structure has been skillfully combined with modern elements, creating the foundation for this visually and acoustically exceptional space, making Burg Taggenbrunn a unique realized cultural project in Carinthia and Europe.

Aknowledgements

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