

Constructive singularities and energy efficiency of St. Petersburg historic circuses

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Abstract. The article is devoted to the design and construction of St. Petersburg circuses during the period since 1822 till nowadays. The article presents the characteristics of all eight historic buildings of St. Petersburg and their structural and architectural features. The article raises some issues of energy-optimal shape of a building on the example of St. Petersburg modern circus building. There are several historical drawings and photographs of the circus buildings. The article includes overview of normative regulation of circus buildings in Russia since the middle of the twentieth century and prospects for the future.

1. Introduction

Saint Petersburg has been the center of the most progressive ideas for the development of circus art since the late 1820-ies.

In 1822 the first special building for circus performances was built in St. Petersburg, as it is notified in "St. Petersburg Vedomosti" periodical [1]:

«On the 22-nd and the 23-d of May Rudolf Mex and his Company will introduce different circus ridings, horse racing, dancing on the ropes and a beautiful fireworks in a newly arranged building of Iosif Gabitfor gym exercises on Krestovsky Island. The beginning of the performance is at 7 o'clock».

In 1927 an entrepreneur J. Turnier achieved a permission for the construction of steady wooden circus building on the spot where the first view temporary buffoonery had been arranged, on 3, Fontanka street.

The building was designed by architect S. L. by Shustov and named as the Circus at Simeonovsky bridge. During the first year of operation the building was adapted with necessary changes for views not only for circus but also as a theatre. It was either a stage or an arena. In 1842 the building was shattered due to a dilapidation of the building. A new one was given a name "theater-circus" because circus performances happened along with Opera and drama performances.

In 1844 an entrepreneur and an artist of Italian descent A. Guerr arriving in St. Petersburg on tour coped to get a permission for the construction of wooden circus building opposite the Bolshoi theatre on Teatralnaya Square (figure 1). The design of the building was entrusted to an architect Albert Katarinovich Kavos (figure 2). The building was designed either for circus or for theatrical performances, because a new building had both circus arena and theatrical stage. The plan of the circus building was a rectangle with two side extensions of the stables.





Figure 1. Circus-theatre of the Imperial theatres Directorate (Guerr Circus)

Places for audience were around the arena, forming an open circle with a total capacity of 600 people. The building was used for circus performances only until 1855. In January 1859 it burned down. A new one built at the same place by A. Kavos was intended only for Opera performances.

In the mid-1870s near Alexandrinsky theatre on Zanevsky pr., 26 "Buff" theatre was built (figure 3). A. Lvov became as an architect as an engineer. And, as in the previous projects two circus buildings were designed so that they could be used for circus and theatrical performances. The fate of the building was difficult. The building was fired and several reworked. The feature of the theatre was a perfect acoustics. The sounds from the stage were heard from any point of the audience hall.

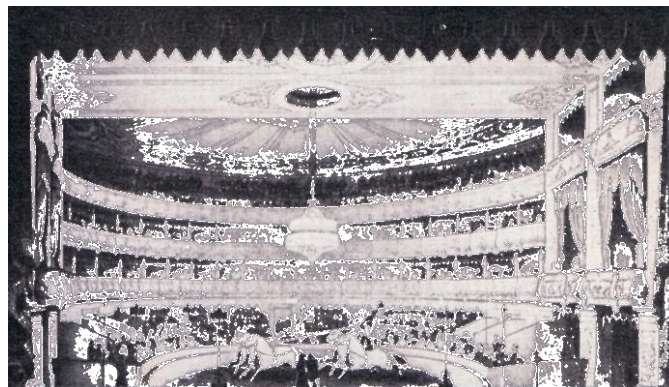


Figure 2. Circus-theatre of the Imperial theatres Directorate (Guerr Circus): inside the auditorium

In 1867 the head of Genne riders troupe received a permission to build a wooden circus on Mikhailovsky Manege square in Saint-Petersburg (at the intersection of Klenovaya and Karavannaya streets) [2]. The project was made by an architect P. P. Vasil Mazuev, an engineer was R. Berngardt. The building was to be built in just seven weeks. The foundation of it became a wooden frame chopped by hands. The walls rested on a wooden foundation (named as "chairs"), as the construction proceeded during the winter months, and there were not technical possibilities. The circus foundation stood on 12 main supporting wooden groundsels, dug into the ground by 1.8 m into depth. The building roof was made of wooden rafters with two metal hoops repaying the spacers.

The roof was insulated with an additional layer of boards 1 inch thick and the layer of felt in the form of insulation thickness of 4.5 cm (figure 4).

The roof was heated by an additional layer of wooden boards with a thickness of one inch and felt stratum is thick 4.5 sm. The inside part of the building (dressing rooms and other premises) was heated with Krelle system. It were ordinary temporary ovens. Lighting was made with gas. In case of fire water and fire hydrants were carried out. The construction of the building cost 37 000 rub. [3].

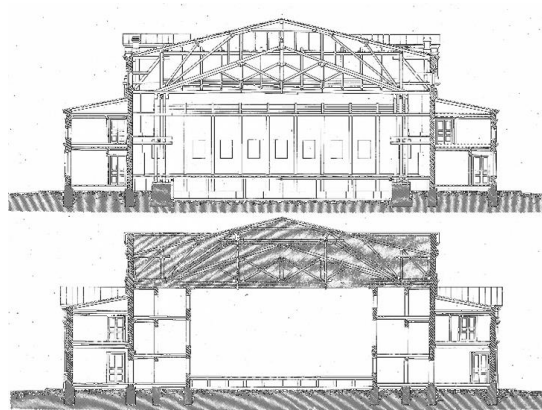


Figure 3. "Buff" Circus-theatre

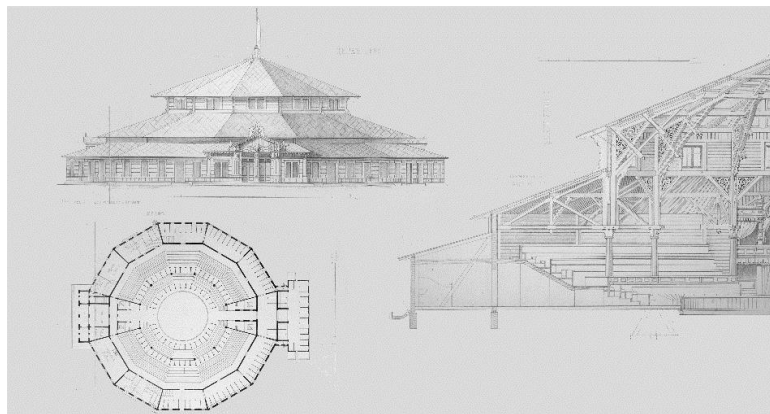


Figure 4. Circus Ginne, St. Petersburg, 1876

In 1872 Ginne left Petersburg, and turned over his control of the circus to his son-in-law, Gaetano Ciniselli whose name the history of St. Petersburg circus is still connected with.

One of the unusual and interesting circus buildings of St. Petersburg can be called Imperial circus (before its restructuring to become Mariinsky Theater) (figure 5, figure 6).

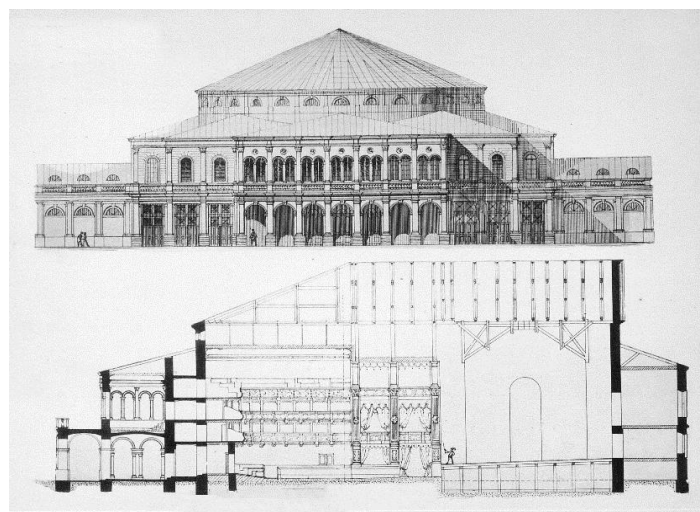


Figure 5. The building facade and section of Imperial Circus, St. Petersburg

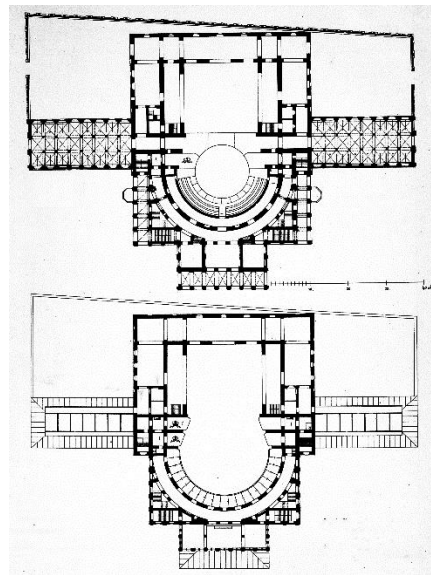


Figure 6. The building plans of Imperial Circus, St. Petersburg

2. Modern St. Petersburg Circus

The first stone stationary circus in St. Petersburg and in Russia became Bolshoi Saint Petersburg State Circus which was opened its doors on the 26d of December, 1877.

The initiator of its construction was a rider and a trainer of horses who had great fame in Europe, Gaetano Ciniselli.

Primarily a frame circus building was original so that to maintain the dome surface internal support columns was not used. It increased spatial freedom of the dome space and it was made for the first time in Russia. The supporting structure of the coating was ribbed metal construction system named after an engineer I. V. Swedler (figure 7). The unsupported dome covers a space with a diameter of 49.7 m.

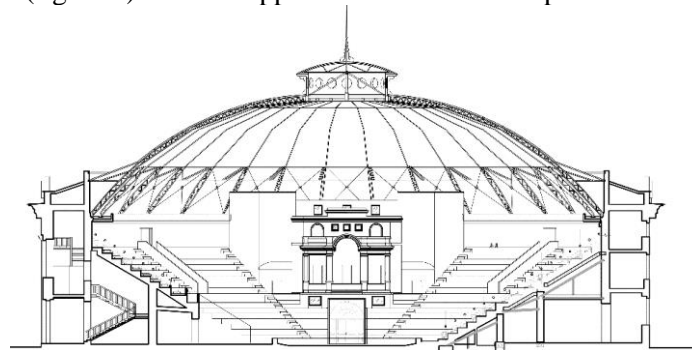


Figure 7. The building plan of Bolshoi St. Petersburg State Circus

Each strip-zone of a shell roof is divided into rectangular cells which vertical sides are created by trusses with variable depth (a distance between upper and lower chords). Within each cell of each strip-zone bracings with central hinges were established, thereby the flexural stiffness of the shell roof has been significantly improved.

The circus building cover form is energy effective from the point of energy management in the dome space and wind flow on its cover [4-6].

This Swedler system improvement is now widely used in constructions with span up to 200 m. The height of the shell roof from the arena is 23 meters. There is a roof light above the center of the arena with a height of 3 m, a historic spire with a height of 3 meters. A plan of the circus at the level of the arena is on figure 8.

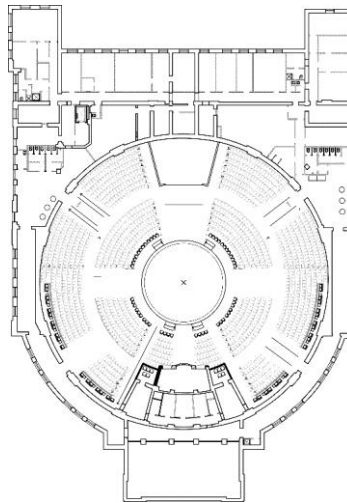


Figure 8. The building section of Bolshoi St. Petersburg State Circus

3. Results

Over a period of almost 200 years there were built eight buildings for circus performances in St. Petersburg. All the buildings of the circuses can be described in a comparative table with some information about materials, types of shells over arenas and fate of buildings (Table 1).

The most part of these buildings had only one purpose - circus buildings. But two of these construction objects were firstly circuses but in several years were rebuilt and reequipped to theatres. It was caused by the loss of interest in art during that shot period of time when the building gave great decrease in income from its using.

Table 1. Comparative characteristics of St. Petersburg circuses.

Building name, location, year of the construction	Author(s) of the project	The purpose of the building	Building material	Features and fate of buildings
Iosif Gabit Circus, 1822	no information	circus	wooden	the first special circus building in Russia
Jack Turner Imperial Theatre-Circus at Simeonovsky Bridge; 1827-1842 (at the place of present Fontanka, 3)	S.Y. Shustov	circus, theatre since 1828	wooden	demolished
Alessandro Guerra Olympic Circus, 1844	no information	circus	wooden	well-lit and warm building, demolished
J. Legear and P. Cuzan National Circus of Elysian fields, not far from Alexandrinsky Theatre, 1846	no information	circus	wooden	dismantled in 1867
Imperial Circus on Theatre Square at the place of A. Gverra Circus (before the restructuring it in Mariinsky Theatre, between 1847-1848)	A. K. Cavos	circus	wooden	Used until 1849
Ginne Circus; 1867, Mikhaylovskaya Street	Architect P.P. Mezhov, engineer R. Berngard	circus	wooden	no information
«Buff» Circus, 1870 dismantled	A. Lvov	circus, theatre «Buff»	wooden	dismantled
Cinizelli Circus	V. Krasilnikov, A. Agafonov, N. Kulreshov, engineer – V. Mirimanov	circus	stone	a special building for circus performances

4. Discussion

Circuses of England and France determined the shape of fixed capital circuses, in large part secured the architectural style and the basic rules of space-planning decisions of this type of buildings. Since the XVIII century the construction of special buildings for circus performances has begun in Russia, particularly in Petersburg and then - in Moscow. Now there are more than 40 stationary circuses in Russia. But only in the late XX century the first normative documents regulating the construction of such unique in its content and design features of buildings appeared. Until nowadays the document «RIS-Circus-77». Safety rules and industrial sanitation in circus companies" remains the only valid document in Russia. There are several documents as RES «Rules for electrical sets» and the latest document as the Order of Russian Government 02.04.2012 N434-p «About the conception of circus development in the Russian Federation for the period till 2020» where few words are pointed about deplorable condition of the buildings of the circus buildings.

5. Conclusions

The main direction of further creative development of the Russian circus system should be the establishment of qualitatively new circus program which will lead to the necessary modernization of the existing buildings and creating buildings for circus performances of a new generation. Performances with using of related types of art possibilities (theatre, cinema, stage, etc.) and modern technologies are complex shows based on circus numbers of different genres. The building must comply with the requirements of energy-optimal shape of shells of positive Gaussian curvature [7-9].

Buildings for them require special modern technical equipment and design features characteristic for the entertainment and theatre-circus performances with some ability to modify [10].

Acknowledgements

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