DESIGN OF MODERN THEATERS IN BRAZIL

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1. INTRODUCTION

This paper examines the architecture and acoustics of four Brazilian theaters designed from the late 40s to the late 50s, Teatro Nacional Cláudio Santoro, Teatro Castro Alves, Teatro Guaíra and Teatro Cultura Artística They were designed as multipurpose spaces, with flytower, orchestra pit and rehearsal spaces. The first three are also home of symphony orchestras. Our comments refer to the sound of these halls for orchestral music (non-amplified). Other uses are not discussed.

The objective of this paper is discuss their architecture features and how they impact the listening experience in the theaters. We analyzed the plans and sections, finishing materials and then estimate what kind of listening experience could be expected. The findings were crossed with private communications with musicians, conductors and concert goers. Room acoustics measurements were carried-out, however objective data is not the focus of this paper. As basic reference the four halls are in the range of $1{,}30 \leq \text{T-30} \leq 1{,}60$ s and $1{,}20 \leq \text{EDT} \leq 1{,}50$ s, for unoccupied condition.

We included three contemporary designs as example of potential changes in the way the theaters have been designed in Brazil.

2. ARCHITECTURE OF MODERN THEATERS IN BRAZIL

For this paper we took four emblematic theaters designed from the late 40s to late 50s: Teatro Cláudio Santoro, Teatro Castro Alves, Teatro Guaíra and Teatro Cultura Artística. They are considered important references of modern Brazilian architecture. A common design feature of these theaters is the large auditorium in fan-shape approach. There are other interesting points:

- Only Cultura Artística took a short period of time between design and construction. The others took more than 20 years.
- Only Cultura Artística is private. The others are non-private (city or state).
- Claudio Santoro, Guaíra and Teatro Castro Alves are multipurpose theaters and also home of symphony orchestras. However, they were not designed as concert halls. The orchestras were created long after the halls' designs, and significant changes to the existing buildings are not practical or feasible.

Fan shaped, single parterre (or with large frontal balcony), wide hall, with a "multipurpose" program is a common architectural and program approach of the late 40s to 60s. The disappointing acoustical qualities of this architecture can be found elsewhere, and it is not a Brazilian privilege – while time to time is considered as a "local trademark".

In the table below can be seen approximate dimensions of the four theaters. More information can be obtained with the Author.

Hall	Design	Seats	Width			Length	Height	Volume	
			Prosc.	Center	Rear			Hall	V/N
Cláudio Santoro	1958	1307	44 m	55 m	72 m	36 m	8 m	11238	8,59
Castro Alves	1957	1554	23 m	33 m	42 m	42 m	10 m	13652	8,78
Guaíra	1948	2173	27 m	33 m	40 m	27 m	12 m	13053	6,00
Cultura Artística	1943	1156	22 m	40 m	45 m	24 m	8 m	6971	6,03

Prosc.: proscenium floor, side wall to side wall, close to pit edge.
Length: from the edge of orchestra pit to the rear wall
Height: in the middle of parterre

2.1 Teatro Nacional Cláudio Santoro (Brasília)

TNCS was designed by Oscar Niemeyer on 1958, and the construction started on 1960. TNCS has three different halls: Villa Lobos, Martins Pena and Alberto Nepomuceno. Sala Villa Lobos is the largest and was opened on 1981 for a multipurpose program and also as home of Orquestra Sinfônica do Teatro Cláudio Santoro that was created on 1980.

The building has a pyramid shape, and the external walls are covered by sculptures from the Brazilian artist Athos Bulcão. The stagebox is contained in the pyramid. The stage of Villa Lobos connects with Martins Pena.

The hall is fan-shaped and seats 1307, in a single parterre (no balconies). The hall is wide: 44 m close to the proscenium and 60 m in the center. Many others Niemeyer's theaters are very wide, maintaining the monumentally of his architecture. The foyer is connected to the auditorium, adding extra volume to the inner space without benefits for the acoustical climate: the square meters occupied by the foyer and seating area are almost the same. The volume of the foyer it is almost 50% of the auditorium volume. However the coupling of these spaces was not acoustically planned.

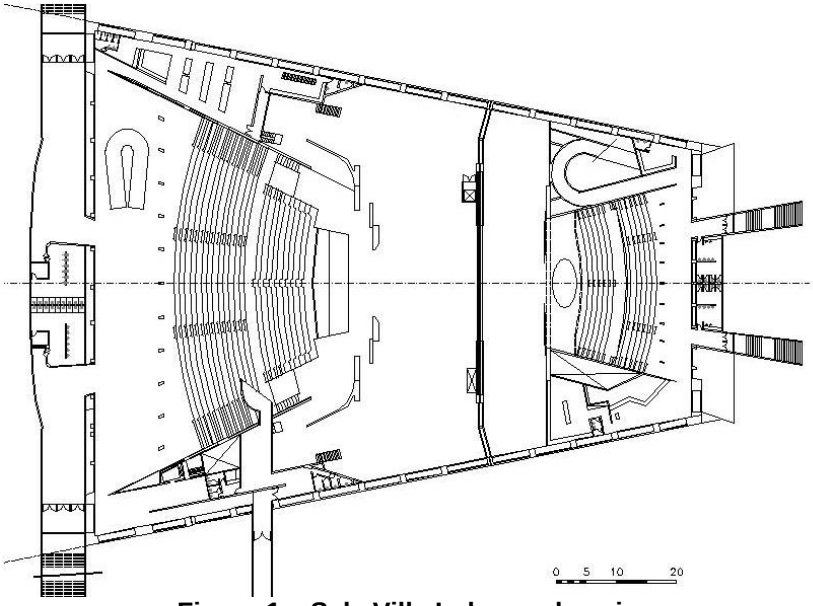


Figure 1 – Sala Villa Lobos - plan view

The orchestra is placed in the large proscenium floor, out of stagehouse. Wooden towers were recently installed close the orchestra, helping the sound projection. Even so it is far from a good result for orchestral music.

Talking to maestros in different occasions, they said the hall is too dry, and lacks intimacy and listener envelopment. This is what we expected analysing the architecture drawings, also confirmed by room acoustics measurement that we carried-out.

The noise generated by the air conditioning is too loud. This is quite common in other theaters of the same period: machinery rooms close to critical listening spaces, misunderstanding about the requirements of very low background noise, lack of coordination between acoustics and mechanical design, among other factors.

2.2 Teatro Castro Alves (Salvador)

Castro Alves was designed by Jose Bina Filho on 1957. Soon before the opening in 1958, a large fire destroyed the theater, remaining only the structures. It was then opened on 1967 and had different upgrades and renovations until been opened again in 1985. The hall is fan-shaped with a single parterre that seats 1554. The theater has a multipurpose program and is also the home of the Orquestra Sinfônica da Bahia that was created in 1982.

In the notes of the original design, concerns were described about acoustical parameters: "*was fixed the ideal reverberation time for our case*" that should be 1,7 s with fully occupied hall. According to these notes "*carpets and velours*" should be avoided inside the hall. Ceiling profile was studied for good sound reflection toward the seats. Also, it is described concerns regarding noise control for the air conditioning and plumbing systems. While the notes show interest in acoustics for orchestral music, the Author did not find any recommendations about how the hall should be shape, volumes relations to seats, or how the stagebox may impact the results. Perhaps, at that time this kind of concern was in the very early stages.

The profile of the existing ceiling is little different than drawn in the original drawings. Some overhead reflections can be expected to the musicians in the orchestra pit, and there is a tilted segment not previously proposed. The floor is entirely carpeted and the side walls are covered by wood panels over air space.

In the Author's listening experience the hall sounded dry, and at rear seats the orchestra sounded not involving. Noise from air conditioning and mechanical noise (structureborne transmissions) is loud for nowadays standards, but quieter than in Brasilia.

Castro Alves has a great reputation for dancing, amplified music and for drama presentations. Also plays an important part of cultural life in Salvador. Many actions to defend the civil rights on 60s to 70s took place in this theater.

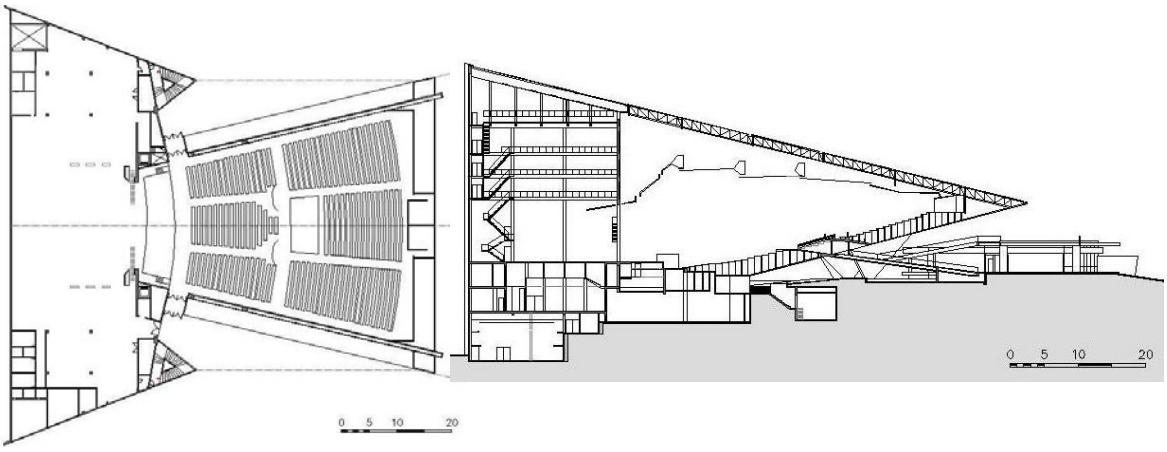


Figure 2 – Teatro Castro Alves

2.3 Teatro Guaíra (Curitiba)

The complex was designed on 1948 by Rubens Meister and has three different halls. The largest is called Bento Munhoz or "Guairão" and seats 2173, distributed in main parterre and two front

balconies. The building was partially opened on 1954 and finally “Guairão” was opened 20 later on 1974. The hall has a multipurpose program and is the home of Orquestra Sinfônica do Paraná that was created in 1985.

The design of the theater was challenging to Meister, who was concerned about the acoustical qualities of the hall. Once he said “*the auditorium is a violin, which mission is to amplify the sound in a natural way*”. He developed studies about sightlines and cinema design.

The width in the center of the hall is about 33 m, same as Castro Alves and narrower than Cultura Artística and Teatro Nacional. The ceiling shape is tilted to project the sound to the rear seats, in the same way it is found in many other theaters from the same period around the world.

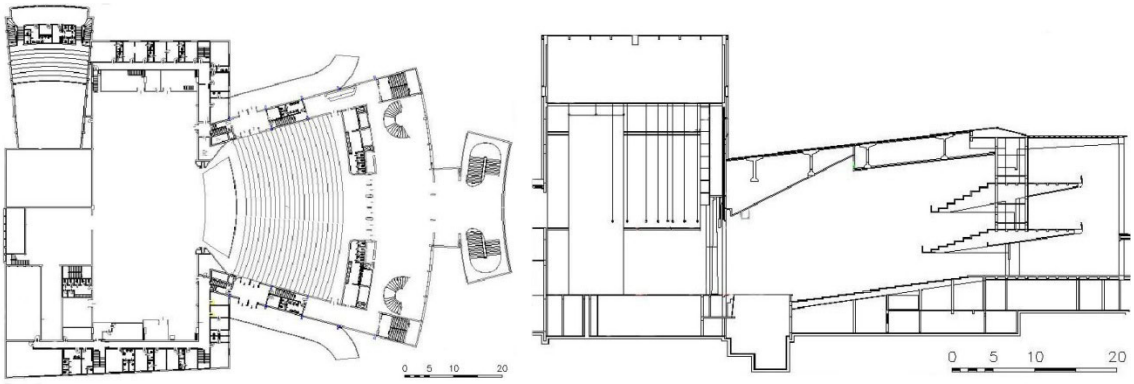


Figure 3 – Teatro Guaíra

Looking to the plan and section views, we expected to find lack of envelopment and difficulties of ensemble. No reflection from the ceiling covers the orchestra pit, unlike Castro Alves where “some” overhead reflection is found.

The balconies overhangs are deep, ranging from 7,8 m (2nd balcony) to 10,5 (1st). At the time we prepared this paper, Guaira had no concert shell and the orchestra was placed in the proscenium. It is reasonable to expect lack of lateral reflection for the players.

This was partially confirmed by musicians, and partially not. It is unanimous opinion that orchestra shall be placed in the proscenium, outside of the stagebox for better acoustical quality. One orchestra musician promptly reinforced “*there is no acoustical treatment in the walls*” in a clear reference how orchestra players reacts against absorbing materials.

The sound quality is not uniform in the parterre, where can be found several “dead” spots. According to different opinions the seats in the balconies have better acoustical quality compared to the parterre.

2.4 Teatro Cultura Artística (São Paulo)

Cultura Artística Society was founded in 1912, in an important period of local industrialization. Soon music took an important status in the Society who started to wish its own theater. On 1942 the project was commissioned to Rino Levi, who was enthusiastic with acoustics and had already designed several movie cinemas at that time. Construction started on 1947 and the hall was opened on 1950. A fast-track project compared to the previous examples. Rino Levi was

The Cultura Artistica had two halls: Esther Mesquita, with 1156 seats, and Rubens Sverner, with 339 seats. Sala Esther Mesquita will be discussed here. Unfortunately this hall was consumed by fire on August 17, 2008.The building was protected by landmark authorities, and it is a great loss for the city in all aspects: cultural, urban, architecture example, to say the less.

The fan shape design is explained as paraboloid to "*better diffusion of the sound*", according to literature about the theatre[1]. "Flaps" existing in the side walls were not shown in the original drawings, and probably were installed to "correct" wall's reflection. That same for panels hanged from the ceiling that is not shown in the figure 4.

The hall was wide: with 40 m at parterre center line (wall to wall). While in the previous theaters the floors are carpeted, at Cultura the floor was in wood. The seats were leather covered and no absorbing materials were installed in the side walls. Interesting observe the ceiling almost flat, in contrast with other designs of same period.

All reviews we found about the acoustics of Cultura Artística were favorable. The Author's listening response varies according to the seating position. In one cello recital, seated at side rows, the hall lacked spaciousness. Seating on the center line of the audience, it was much better.

It is important remember that for more than 40 years Cultura was the most prestigious modern theater in the city (perhaps in the country). The professional management of the hall was vital to maintain their long time reputation.

Out of question, was one of the most loved performance spaces in the Country. Villa Lobos, Guarniei, Rubinstein, Yo-Yo Ma, Antonio Menezes, Claudio Arau, Rostropovich, Nelson Freire, Stern, are few names that played there. All of this certainly contributed to keep a very positive reaction to Cultura Artística.

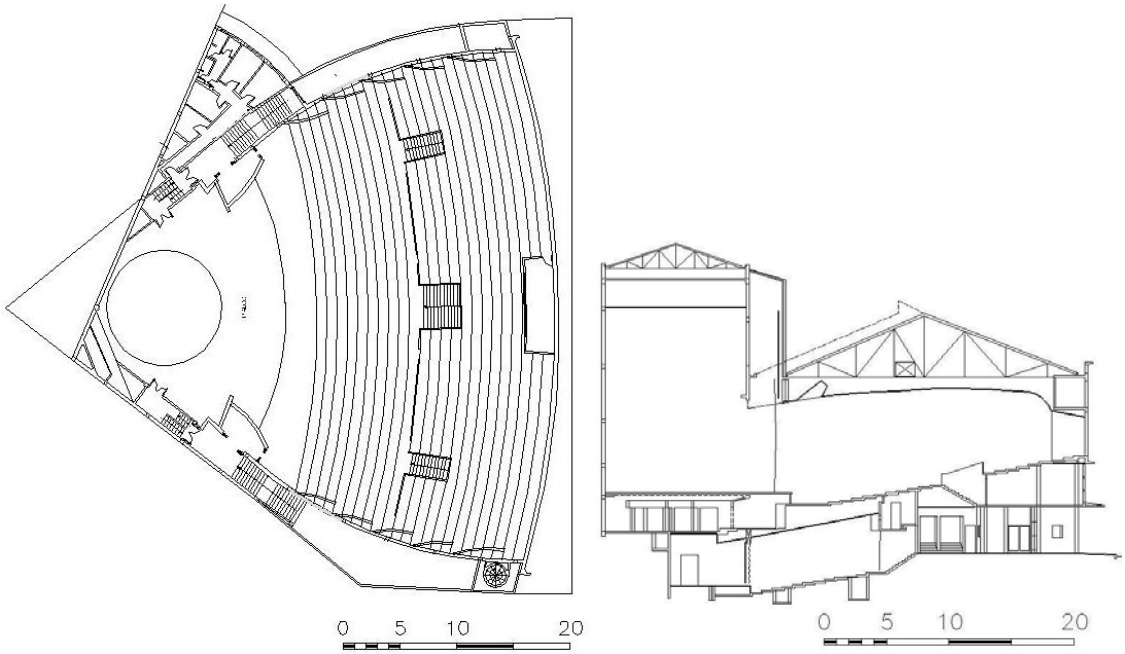


Figure 4 - Teatro Cultura Artística

3. CONTEMPORARY SPACES

About 1997 two new projects opened a different process of theater design in Brazil, Teatro Alfa and Sala São Paulo. In both situations, the acoustical and theatrical qualities, and performer needs were definitely considered as top priority.

After the opening of both halls (1998 and 1999), it was clear that themes like "*client support*" and "*space program*" makes a great difference for the results of performing arts spaces. Reviews were excellent and user's reaction even better.

The relationship of music and architecture is not a theoretical subject and it is not intangible matter. These relations are translated as shapes, volumes and geometries. The expression "*the hall is a musical instrument*" has a price to be paid: the design of the instrument. A flute is a flute is a flute. Or, it is not a flute.

The statement "*first comes the architecture design and the technical issues shall fit the architecture*" used time to time started to sound strange. Orchestras, dancing groups, opera companies, want a hall fully responding to their needs. And they know that auditorium size, shape, volume, impact their work.

3.1 Sala São Paulo (São Paulo)

Sala São Paulo is an adaptive conversion of a portion of the Julio Prestes railway terminal into a shoe-box concert hall of 1509 seats. Estação Julio Prestes dates from 1938 and the renovation project begun on 1997. The concert hall construction started on 1998 and it was opened on July 1999. Sala São Paulo was designed as the home of OSESP – Symphonic Orchestra of State of São Paulo. From the beginning topics like space program, rigging systems, acoustical priorities, shall comply to OSESP needs.

Here is a huge difference comparing Sala São Paulo to Teatro Nacional, Castro Alves and Guaíra as orchestra homes. Sala was designed focused in the orchestra needs, while the others theaters were not designed to serve as concert hall or an orchestra home.

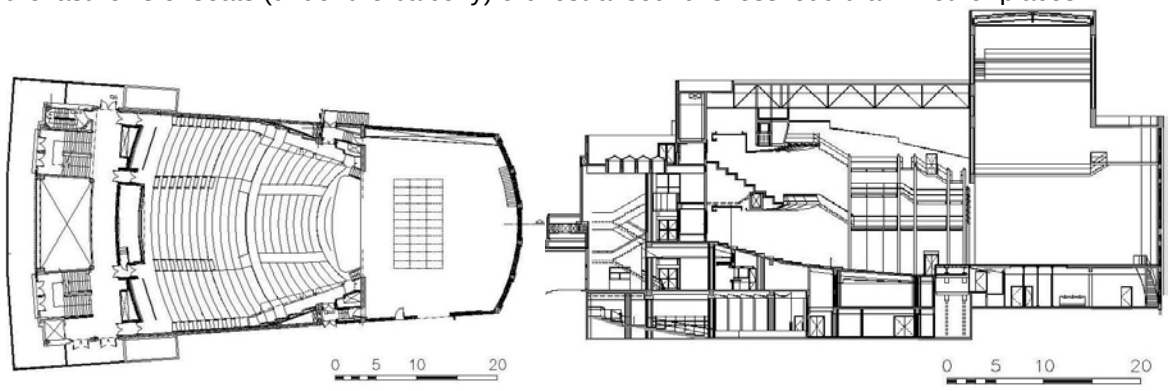
3.2 Teatro Alfa (São Paulo)

Teatro Alfa is a private theater with multipurpose program for 1300 seats. The design started on 1995/1996 and the hall opened on 1998. From project to commissioning phase, the quality of the acoustics, stage and support for the user were in the very top of priorities. This is a great difference compared to the projects where the architecture design dictates the entire project, from space program to sizes and shaping.

Due to site dimensions restrictions, the stagebox are smaller than the designers would like. For example, the wings are small. The hall is narrow with 16,5 m width at proscenium, and this is welcome by actors, players and conductors. They talked about felling themselves "surrounded" in the stage (and not lost in the space).

Soon after the opening, Alfa gained enormous reputation with dancing companies, actors and musicians. Ten years after the opening, is still considered one of the best theaters in the country.

The Author talked to several conductors, and they were unanimous about the good acoustical qualities. Some conductors are enthusiastic about the pit sound. Only few referred to the hall as "too dry". In Author's listening experience the hall is intimate and the sound is uniform in all seats. In the last rows of seats (under the balcony) orchestral sound is less loud than in other places.



Teatro Alfa

It is reasonable that conductors used to pure concert halls (with long reverberation times) feel Alfa dry and not loud enough.

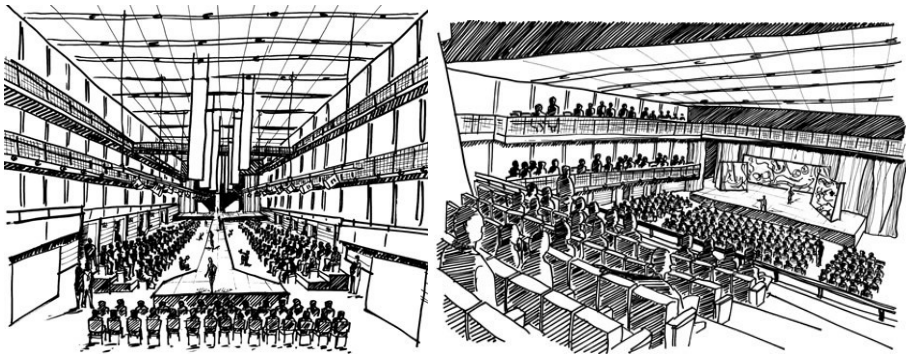
3.3 Teatro Bourbon (Porto Alegre)

Teatro Bourbon opened on 2007 is a “studio-theater” seating 1068 (in the main parterre and in mezzanine and side balconies). Theater designer Ismael Solé prepared the program for a flexible and intimate space, with a moveable seating platform and demountable stage and other features. The acoustical design started soon with the concept design. Sergio Monserrat was hired for the architecture design and developed the project based on the program guidelines.

Client established that theatrical design and acoustics should be priority. It was clear for team the limitations of term “multiple-purpose”, and how a bad acoustical experience could ruin the space reputation .Symphonic music, recitals and other acoustical programs were not included in the use program.

This design was challenging for acoustics: the theater would be built in an existing construction, side by side with a movie cinema and distant about 50 m from houses. Sizing limitations and excellent sound isolation were obvious issues in this case.

The entire floor is a floating slab of 12 cm thickness on neoprene pads – that was originally developed to Sala São Paulo. The envelope shell is built with floating gypsum ceiling and a heavy steel wall, called by the team as “ship shell”.



Different arrangements for Teatro Bourbon – architects drafts

The room acoustical design was carried-out to support amplified sound events, as brazilian popular music, jazz, blues, jazz symphonic, dancing, etc. Also a great care was taken to support speech in drama performances. Above 3,0 m of the floor, the side walls are covered with a kind of gridiron, and in the upper part of walls absorbing material was placed behind the grid. In the first 3,0 m the walls are lined with wood attached directly to the structures.

Talking to conductors they said the hall is “too dry” for orchestral music, confirming our expectations.

3.4 The New Kids

Two important new performing arts centers are in construction at the moment we prepared this paper.

Cidade da Música do Rio de Janeiro (Rio de Janeiro)

This is a large performing arts center designed by Christian de Portzamparc. The design started on end of 2002 including concert hall / opera house, recital hall, rehearsal rooms, in almost 94.000 m^2

of total construction area. The concert hall will be the home of OSB – Brazilian Symphony Orchestra. On August 2008, the construction was in the final steps.

This center was designed with acoustics and theater design in the very top of priorities. The design process was smooth due to previous experience of Portzamparc in designing this kind of space and involvement of the client (City of Rio) and OSB team.

Sede da OSPA (Porto Alegre)

On 2002 OSPA – Symphony Orchestra from Porto Alegre, hired Solé & Associados to design their home. This design was carried-out after exhaustive interview with OSPA conductors and players, visits to halls in Europe and in the US. The space program was then established, including hall size and shape, number of rehearsal room and dressing rooms and so on. OSPA supported all project phases, and sustained position that excellent acoustics was the design priority. On 2008 the project was finished and started the construction phase. The site faces to Guaiba River, an outstanding view.

4. FINAL

The multiuse fan shape auditoria had and still have a strong influence in the theater design in Brazil. Orchestra players don't like the sound of these spaces. Listening and performing arts rooms must be designed observing the users' needs. And these needs are translated as sizes, shapes, technical circulations, geometries, and so on. The inner volume of critical listening spaces is the room acoustics universe. For example, if an orchestra is delighted with the sound produced in surround halls, this should be considered and developed by the design team.

Orchestras also should clearly refuse to follow accepting spaces not properly design to their needs. As happen in many other type of professions and their buildings (hospitals, airports, soccer fields, etc). We are not talking about the boring conflict of architecture and acoustics in opposite sides. It is a matter to learn the lesson under the eyes and work together.

5. ACKNOWLEDGMENTS

Drawings from Cultura Artística sent by Milton Granado are gratefully acknowledged. Support and discussion with the maestros, musicians and staff of the theaters were also helpful.

6. REFERENCES

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