The restoration of La Fenice in Venice: the consultant’s viewpoint

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Abstract: The fire that destroyed the Teatro La Fenice in Venice has immediately triggered a discussion to determine whether it should be rebuilt as it was or whether it should be replaced by a modern building. Once the decision was made to restore the Fenice "com era", a complex programming, design and construction process followed. The theatre was renowned for its acoustics but a single set of objective acoustical data was available. This paper attempts to discuss how the various phases and parameters of this process may affect in fine the acoustics of the theatre but, more generally, stresses the importance of some critical components and the lack of knowledge of the acoustical features of opera houses.

HISTORICAL ACOUSTICS AND CONTEMPORARY TECHNOLOGY

Following the destruction by a fire of the very famous Teatro La Fenice in Venice, on January 29 1996, an extremely complex process was set in motion to attempt the reconstruction of this historical opera house as soon as possible. Even though this theatre had been renowned for its acoustics, the only set of measurements available correspond to a single condition: repairs were in progress, the iron curtain was up, the stage was empty and a relatively large number of seats had been removed.

The question of an adequate documentation of the acoustics of opera houses, concert halls and theatres, or in the absence of objective acoustical data an accurate inventory of the geometry and of construction components, is an important one. In spite of the efforts and the very thorough work of acousticians during the twentieth century in this area, the information available on a given theatre, once disaster has struck, is usually not sufficient to understand the sources of acoustical quality. In addition, very often, the owners and users of the buildings do not even possess complete archives that would describe accurately the geometry, the technology and the materials used in the original building.

Modifications and renovations are constantly needed in opera houses and in similar buildings because of wear and tear, because of technological advances or simply because of modifications in the regulations on public buildings; concerns about fire hazard or the need to create access for the disabled often trigger major modifications. This context may lead to some misunderstandings. For example, in several theatres or concert halls, the wooden floor of the stalls or the wooden elements of the pit or of the orchestra platform have been rebuilt in concrete to reduce fire hazard without realizing that acoustics would be changed drastically. This is sometimes not reflected in the existing documents.

In the case of La Fenice, in the midst of controversies on ownership, financial consequences, the identification of the authors of the fire or the image of Venice, the first major decision consisted in choosing to rebuild La Fenice as it was before the fire, in spite of the pressure of some famous architects who advocated the construction of a contemporary building, for example a high rise glass tower...

Once this threat was forgotten, it was discovered that even if the new theatre was to be apparently identical to the historical one, a number of unavoidable requirements would affect, one way or another, its acoustics. It would not make sense, for instance, to neglect an upgrade of the technology of the stage equipment for the sake of a perfect acoustical restoration. Similarly, an increase of the number of seats logically needed to allow access to a larger number of patrons and to improve profitability, or more realistically to reduce losses, would of course alter the response of the room. In addition, modern orchestra pit requirements must be taken into account within reason. It would probably be an error also to refuse the installation of a modern air conditioning system in the very particular environment of the Venice lagoon and canals. Most of all, in the case of any public space and in particular after a destructive fire that could have been a human tragedy, it is absolutely necessary to apply strict safety regulations and to introduce the most advanced fire detection and retardant techniques.

All this means that even if the new theatre is supposed to be "com era", "as it was", in practice some changes must be made. Such alterations could without doubt induce very significant or very subtle modifications of the acoustics of the theatre unless precautions are taken at the design stage and during construction. The practical question is: how can all these elements be introduced in the project without devaluing significantly its original acoustical characteristics.
WHAT ARE THE ESSENTIAL ACOUSTICAL REQUIREMENTS?

When a new opera house is being planned, a number of factors may affect the outcome: the geometry of the land, the nature of the building, the size of the hall and mostly the architecture and interior decoration. In that case, it is tempting to write very complete and complex specifications, using sophisticated acoustical parameters. Even if some of this data can actually be used in the design process and verified once the building is completed, as it is the case for example for the measurement of the noise levels of technical equipment and to an extent of reverberation time, it is not easy to produce a set of requirements that will guarantee acoustical quality. In the case of a building that has altogether vanished, the task is almost impossible if adequate documentation does not exist.

In the case of the supposedly "identical" restoration of a burnt-down opera house, most of the geometrical parameters are automatically set. No significant modification of the former geometry should be allowed in spite of the need to introduce modern techniques, greater comfort, better visibility or contemporary regulations. For example, requests by the musicians and by the music director for an enlarged pit, which would provide more comfort and would widen the repertoire, must be weighed carefully.

The major risks seem to come from the following requests: increase the capacity of the theatre, substitute modern to traditional materials, even if the safety arguments are legitimate, modernize the stage, increase the size and the flexibility of the orchestra pit.

Construction technology itself evolves constantly. In a bizarre environment such as that of La Fenice, it makes sense to implement the most advanced techniques and to draw benefits from advances in material science. Unfortunately, room acoustics has been so neglected by physics or engineering departments that some gaps remain.

THE GAPS BETWEEN SCIENCE AND ENGINEERING

In fact, a sad event like the destruction of an important opera house provides an opportunity to evaluate once more the state of the art. In this instance, art means architectural and engineering design and construction of a very complex object. It does not mean here the art of the science of acoustics.

The scientific work that has been accomplished in the twentieth century is quite remarkable and the birth of new tools has vastly enhanced our knowledge. The fact that anyone is able today to manipulate time-varying, frequency-varying, space-varying data and to derive non-trivial objective results has obviously changed the rules. Nevertheless a wide gap remains between the scientific output and the concerns of the acoustical designer who is overwhelmed by practical considerations and who must still rely, to a certain degree, on his own subjective evaluation.

SOME PRACTICAL TOPICS OF INTEREST

From the consultant’s point of view, it still seems necessary to improve the practical use of the very sophisticated and complex knowledge that exists today. In other words, how does the practitioner actually translate physics and psychoacoustics into engineering and how does he reduce his own subjective input into a project. One can name a few relevant topics:

- What are the essential physical features of an opera house? What are the parameters that actually contribute to the compatibility of opera and symphony?
- What acoustical features must a stage have? What are the most important acoustical features of an orchestra pit?
- What are the optimum size, depth, shape, materials, flexibility, ventilation system, etc.?
- How can diffusion phenomena be predicted in practice? What should the acoustics of the seats be, beyond absorption, when occupied or unoccupied?
- How can traditional and modern materials be compared from the viewpoint of acoustics? New vs.
- How can the prediction and measurement of objective parameters be improved? How can auralisation actually become a prediction tool?

The above comments obviously ignore on purpose the subjective aspects of the problem. But there is another mysterious topic, which deserves attention: how can the acoustical requirements be transmitted to the architects?

REFERENCES