The “Cité de la Musique” in Paris and its elliptical concert hall

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Abstract: Fifteen years have been necessary to program, design and build the Cité de la Musique, at La Villette in Paris. This music complex, completed in 1995, has two parts: the National Conservatory of Music and Dance, with some 250 music rooms and the concert hall wing. Its scope of activities is wider than usual and this has acoustical consequences: it ranges from the teaching of music, from “classical” to jazz, to training in professions related to music for example audiovisual techniques. Concerts of all types are being held. They include ethnic and folk music, blues, contemporary and classical music. Since the buildings have been in service for a few years, it may be of interest to start drawing lessons from this experience since some of its features are unique and in particular from the large concert hall.

AN ORIGINAL CONCERT HALL

The main concert hall has a nominal capacity of 1200 seats only but it has been designed in such a way that it can accommodate various orchestra and audience configurations: frontal, in the round, central, etc. It is being used for « classical » music as well as for « contemporary » music and even for jazz, ethnic music, popular music, and so on. This means of course that musicality is essential but also that acoustical reciprocity is a key element, together with clarity: acoustical conditions must be adequate for any pair of emitting and receiving points, in spite of the elliptical shape of the concert hall, because instruments may be distributed, for some works, at any point of the volume.

FIGURE 1: Three-dimensional view and longitudinal section of the elliptical concert hall

The outcome of the architectural competition led to an elliptical design, in spite of the concerns of acousticians. Even though this shape cannot be radically banned, it can lead to catastrophic results because of the strong focalizing effects. In some halls, even larger, where this shape has been retained, the results are excellent if proper design features are introduced; it is the case, for example, of the famous Palais des Beaux-Arts in Brussels. In the course of the detailed design phase, it was necessary to introduce a great deal of diffusing elements, vertical and horizontal, to compensate the unfavorable morphology. The introduction of such elements is delicate since it is difficult to optimize objectively their size and shape and since they tend to upset the pure architectural scheme. Also, even though this had not been anticipated in the original plans, a certain amount of variability was introduced in an attempt to broaden the use of the concert hall. The result is a very complex concert hall and its aesthetics is the object of a debate: the acoustical devices that had to be introduced have somehow spoiled the simplicity of the competition project.

The capacity of the concert hall, which is 39.5 m. long, 32.75 m. wide and 15 meters high, varies from 900 to 1200 seats depending on the orchestra and audience configurations. Its maximum volume is 11282 m³.
Large dimensions were required for the fixed vertical diffusing elements to break focalization. For the horizontal ceiling, variations of the Schroeder diffusing panels have been installed. Reverberation time, which varies from 1.3 to 2.1 seconds at mid-frequencies, gives only a very incomplete description of the acoustics of this concert hall. Some variability is obtained by opening some of the ceiling elements, some with a system of vertical curtains. Since exceptional situations can be expected, a grill has been installed above the ceiling so that all types of devices (loudspeakers, platforms, absorbing blankets, and screens) can hang in the volume at any point the producer may choose. Therefore one can expect that the acoustical features of this hall can be modulated almost as one chooses.

Since this is a relatively small volume, designed for a clear sound, one did not really expect that full symphony orchestras would be able to perform “vast” works such as, for example, Mahler’s symphonies. It turns out that this type of repertoire has been programmed successfully; even under these circumstances, music lives well and no saturation has been observed. It is due to the nature, size and geometry of the diffusing elements.

DESIGN TOOLS: DIFFUSION VS. ABSORPTION

The design tools, computer and scale model techniques that are available today to the practitioner allow him to take some risks and, as a consequence, to give more freedom to the architect. However, some of the models or algorithms remain too naive. The relationship between reverberation time and diffusion has not been established clearly enough so that engineers can balance properly an architectural scheme.

In the Cité de la Musique concert hall, a demonstration of this exists: most of the original elliptical shape has been broken, except for a ring close to the ceiling. For some configurations, this small element seems to disturb moderately but significantly the sound field. No acoustical investigation of the design had been able to predict this phenomenon.

CONCLUSIONS

This project has demonstrated that a critical shape can turn into an excellent concert hall. It has raised many questions: how can the aesthetics be preserved if so much diffusion is needed, what corrections should be made to acoustical parameters to take into account diffusion, is acoustical variability really needed for a large repertoire?

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REFERENCES

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