

Full-scale Modeling for the Lighting Design of a New Pavilion at the Venice Biennale

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Abstract

The research which is presented in this paper is related to a lighting topic and part of an architectural project for a pavilion at the Biennale of Venice, used for modern art exhibitions. The building is located along a Venetian canal: the roof form is curved in a way to allow daylight, reflected by the water, to penetrate in the lower part of the building, determining the atmosphere for the sculpture exhibition. In the upper part of the building, where the rooms have a barrel-shaped roof, we want to provide good diffuse lighting to emphasise the quality of the materials and colors of paintings. Starting point is a study of lighting techniques related to a temporary exhibition of modern art. Special attention will be paid to some considerations concerning the question of conservation, the integration of artificial lighting and daylighting, the modeling effects of light and its color performance as well as the effect of light. The study has been carried out testing (full-) scale models in the Lighting Laboratory at the University College of London.

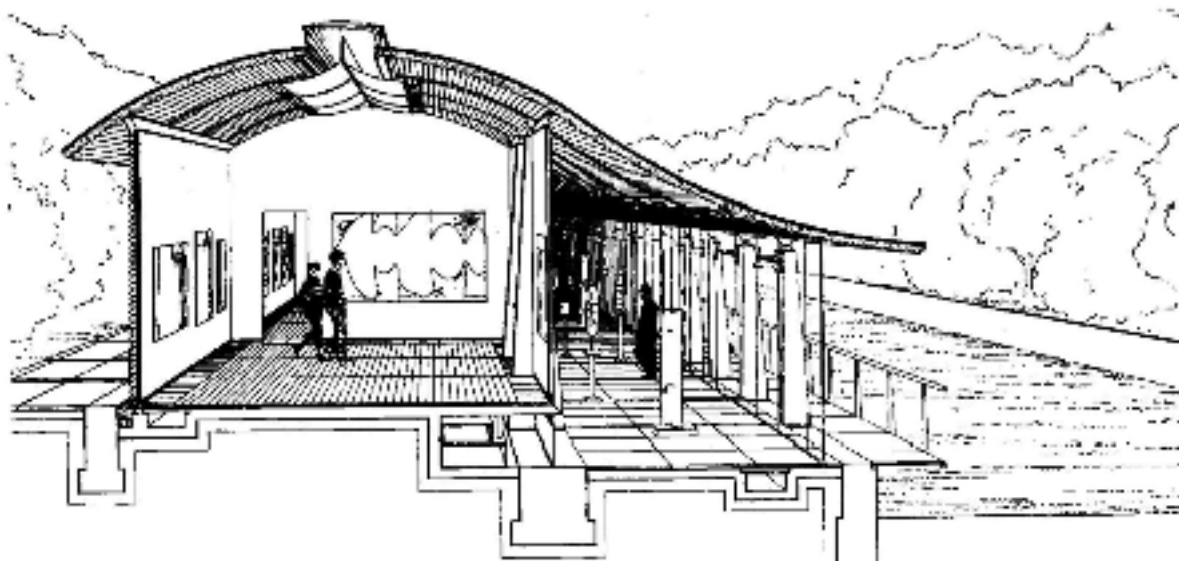


Fig. 1 Cross-Section of the Building.

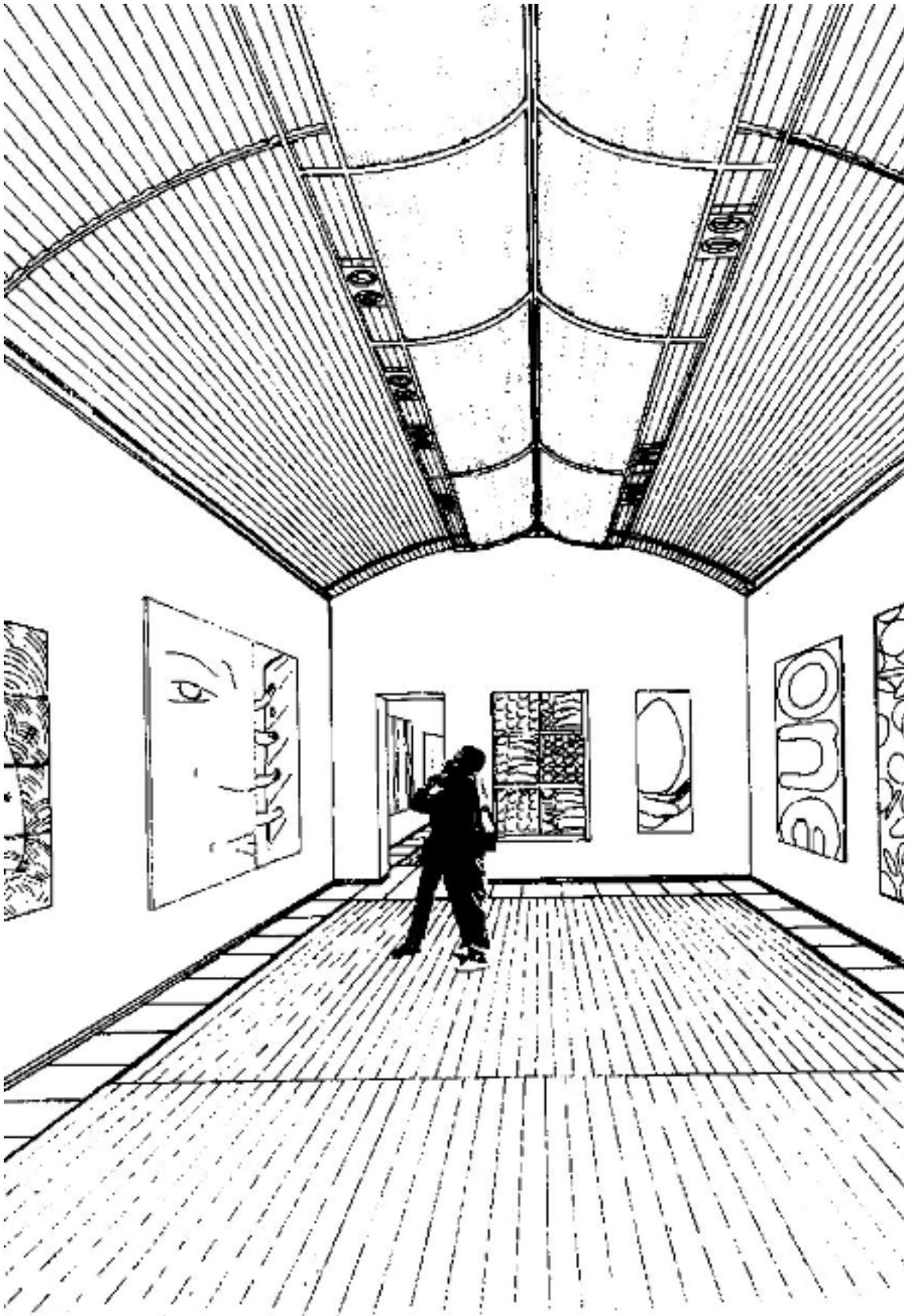


Fig. 2 Exhibition space.

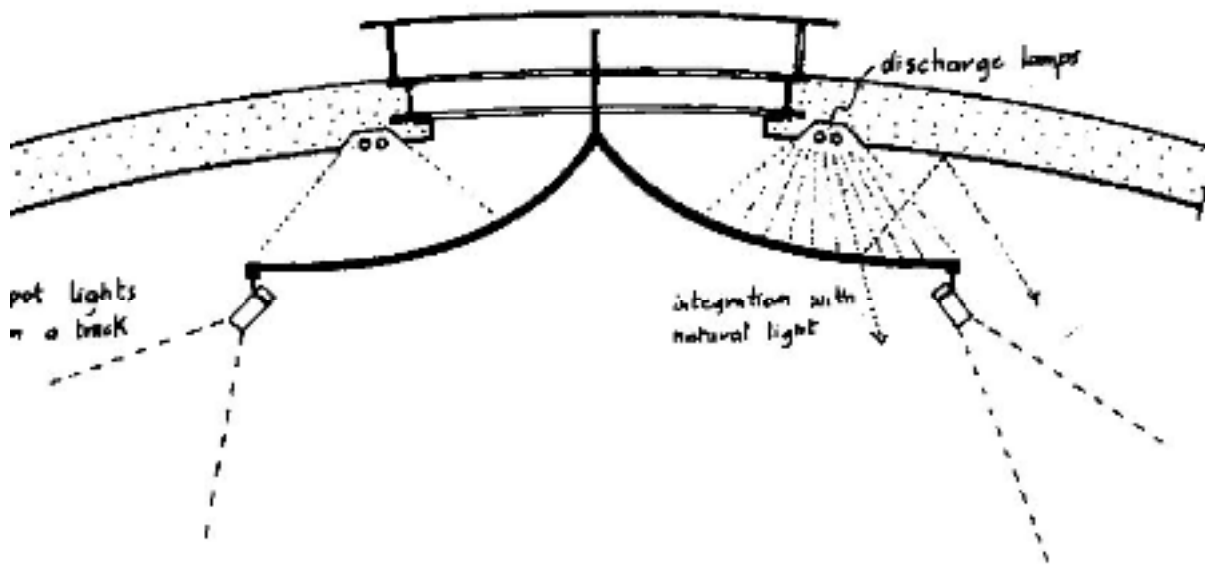
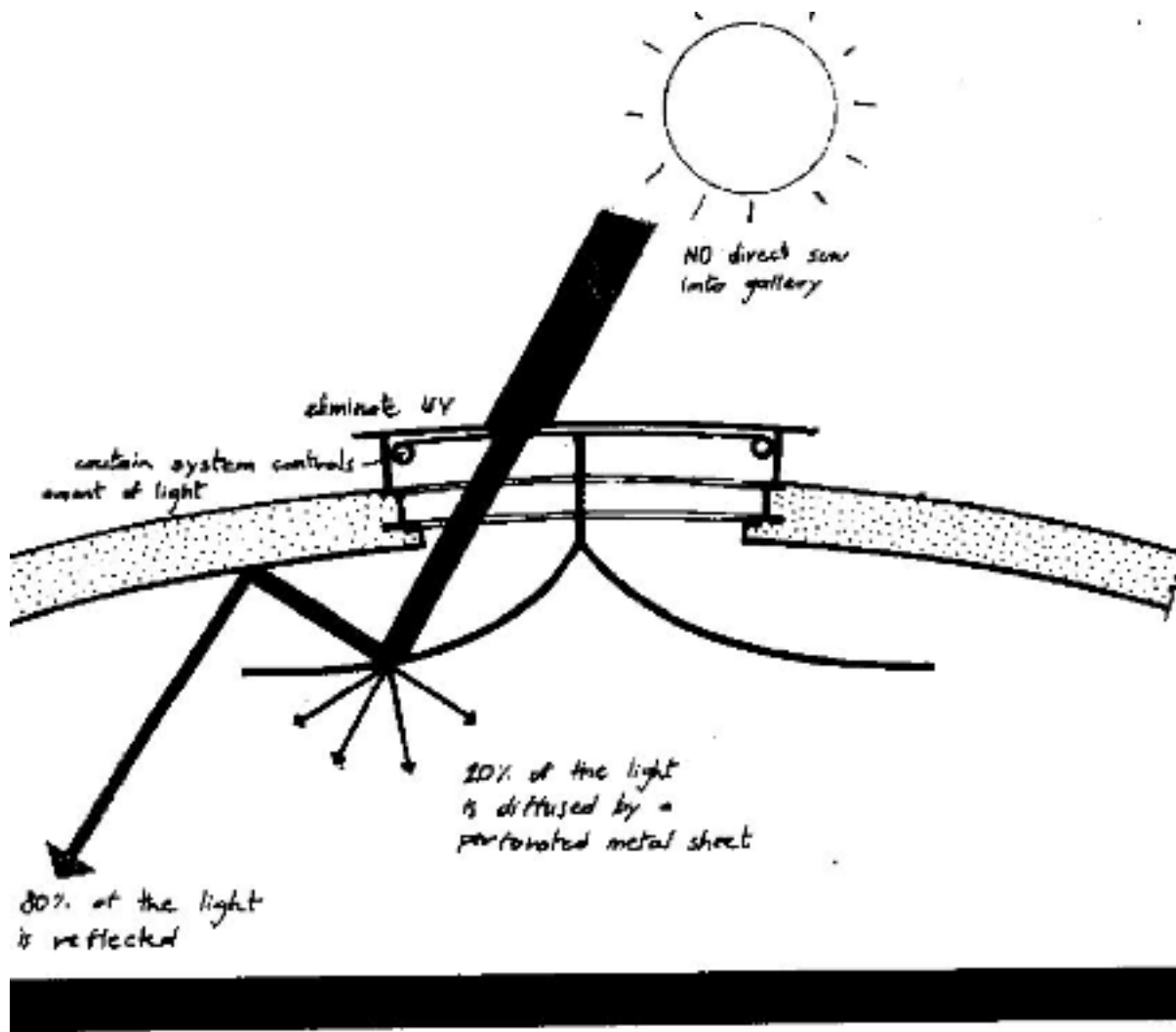


Fig. 3 Daylight control system and artificial light integration system.

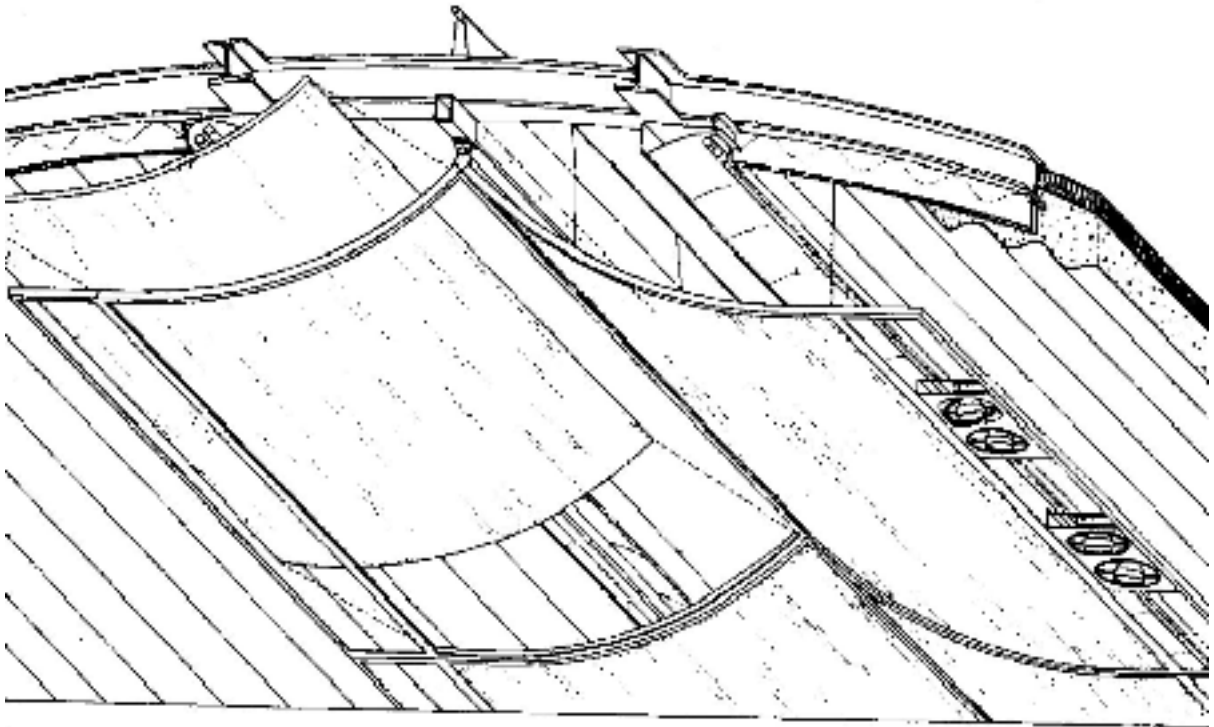


Fig. 4 Diffusing element construction detail.

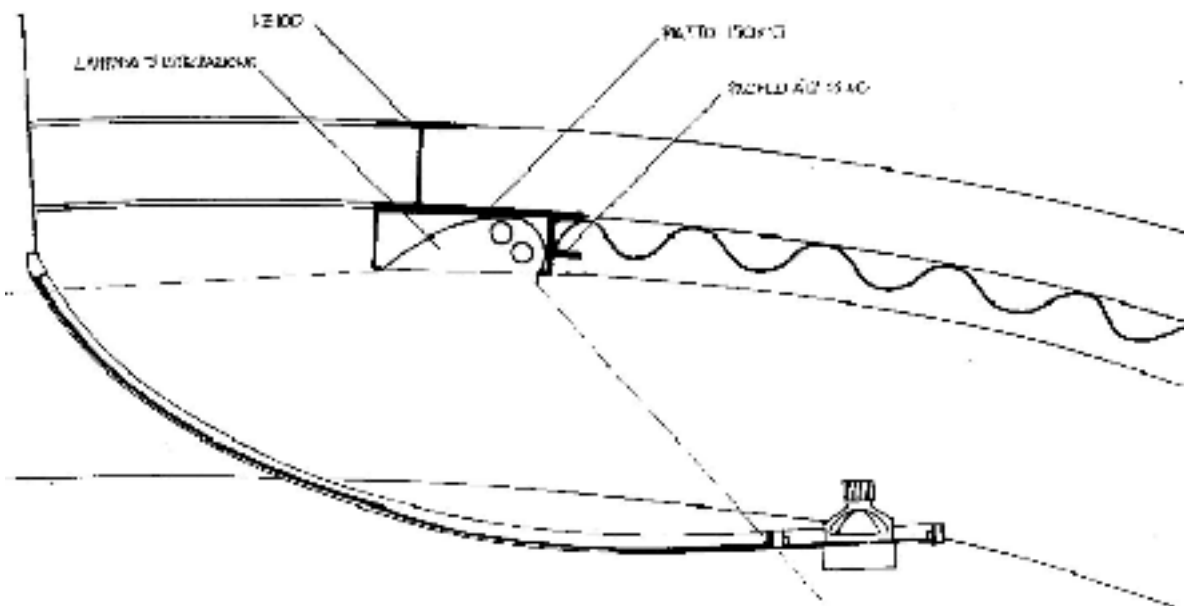


Fig. 5 Artificial integration light and spotlights.

Lighting Project

The project consists in the study of an element to diffuse and reflect the direct light from the sky, coming from a slot at the top of the barrel-shaped roof. Our work was based on the study of lighting techniques related to temporary exhibitions of modern art: we would like to pay attention to some considera-

tions concerning the question of conservation, the integration of artificial lighting and daylighting, the modeling effects of light and its color performance effect of light. The study has been carried out by testing scale and full-scale model in the lighting laboratories of the University College of London. The research explores the following details: the design of the element that acts as a diffuser and a reflector of light, contributing to the architectural value inside the building. This system for daylight control consists of an element to diffuse and reflect the direct light of the sky, coming from the slot at the top of the barrel-shaped roof:

- The design of the optical reflection system was developed testing on a scale model different solution: the choice of the final one was guided by the direct eye evaluation and the analysis of the data;
- Six samples of different papers were used to simulate the real material: the papers were tested to choose the right transparence and reflectance proportion to give a good performance on the daylight control system;
- Full-scale experiments were utilized to investigate the possibility of using perforated metal sheet for the real material of the reflecting and diffusing element;
- The study of artificial lighting with the task of integration of daylight: the idea of our design is an artificial light system that simulates daylight in the way light penetrates in the space and in the characteristic color of daylight during the different hours of the day. The design of the new daylight integration luminaries was carried out with full-scale experiments;
- The design of a spotlight system combined with the diffuser/reflector element: the idea is to show that a real integration in the design of daylight control system, artificial light system and architecture itself is desirable. The new spotlight system has been tested in a full-scale model of the painting room where it was possible to simulate the illuminance level of natural light and the different spotlights optical system.

Conclusion

The use of models in the design process helps not only to control the amount and the quality of the light, but also to control how the space and the materials change with the different light penetration.

References

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