

The design of daylight: the use of an artificial sky for the design of a library

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The degree dissertation intends to verify the conformity of the project for the Library of the New Faculty in Alessandria to the lighting needs of this building typology, analysing the most significant situations concerning the use of daylight. The study has been realised by an artificial sky, an instrument of physical simulation on scale model conceived by the Department of Energetics of the Faculty of Architecture of Turin and installed at the CERSIL, Environment Park, Turin. The main purpose is to show how a professional can make use of it to corroborate the designed options: this operation is not to be considered as a checking step but as a proper phase of the project.

Light is a fundamental element of everyday life. Although in past the progress has driven to prefer artificial light, nowadays we're rediscovering the benefits and the versatility of daylight. Lighting must consent to carry out a given visual task: with daylight this can be done efficiently and comfortably, thanks to the satisfaction of biological needs by virtue of the intrinsic properties of light and non-visual effects (influence on the physiological, mental and psychological condition). Besides, the use of a free and largely available source of energy such as sunlight brings about economic savings if compared to artificial light; it should be noted, however, that every wavelength (UV, IR and visible radiation) can damage certain materials.

The main goal of a lighting design is visual comfort (i.e. the satisfaction of the visual needs that a user expresses), which depends on the visual performance and on the pleasantness of the environment. The requirements of a room are related to the kind of activity that the user carries out: it is therefore necessary to define for each of them the features of illumination that permit the execution of such tasks in optimum conditions, also with reference to law requirements and recommendations.

The anthological review about the most relevant university libraries has been developed by themes:

- shape in plan, distribution of the levels, volume;
- covering materials and furniture (colour and surface finish);
- transparent elements (sidelighting, toplighting, corelighting);
- shading devices (systems oriented to the control of the quantity and quality of light);
- view outwards (reduction of visual strain and sense of alienation);
- integration of lighting fixtures with daylight technologies.

The library considered in this thesis is a one-storey, fan-shaped building, composed of three spaces: the entrance, the stacks area, the reading room (at a lower level). The openings consist of a zenithal skylight, a clerestory and a glazed façade (the last two oriented southwards) shielded by mobile louvres made of microperforated aluminium.

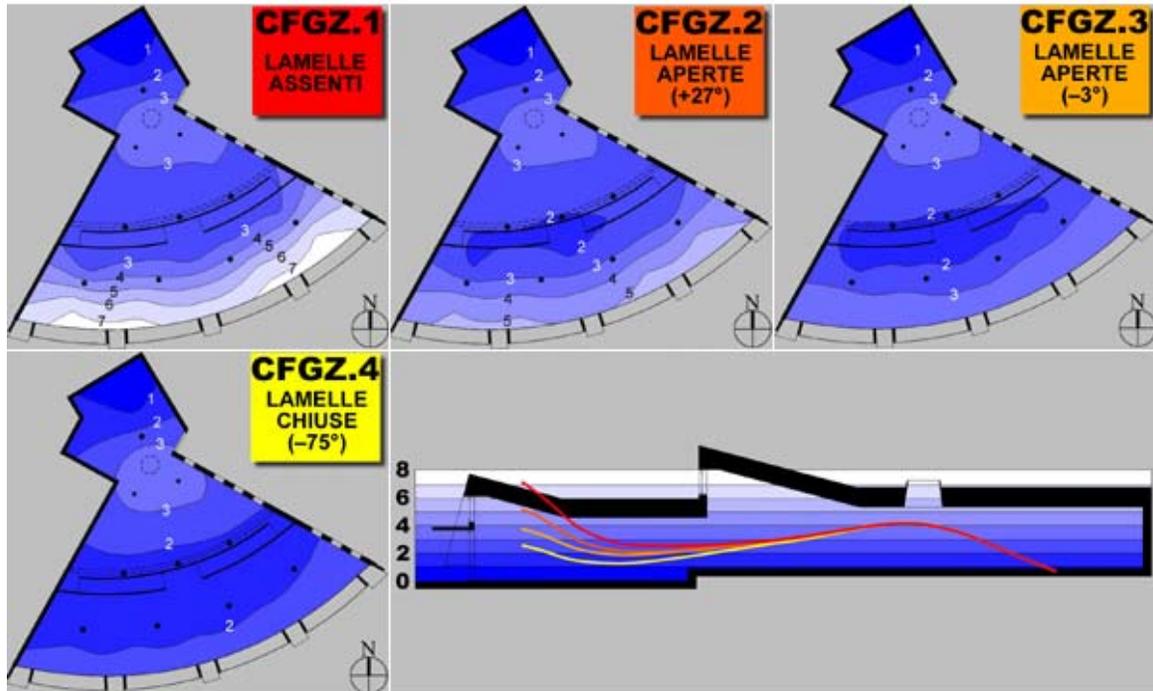
The use of the artificial sky requires the reproduction of the room by means of a scale

model, targeted to the specific exigences of the simulation. Opaque and transparent surfaces have been reproduced with their own optical characteristics, while for the louvres (realised with technical fabrics) four geometric configurations have been considered, three different tilt angles (of which one represents closed louvre boards) and the absence of the shading device.



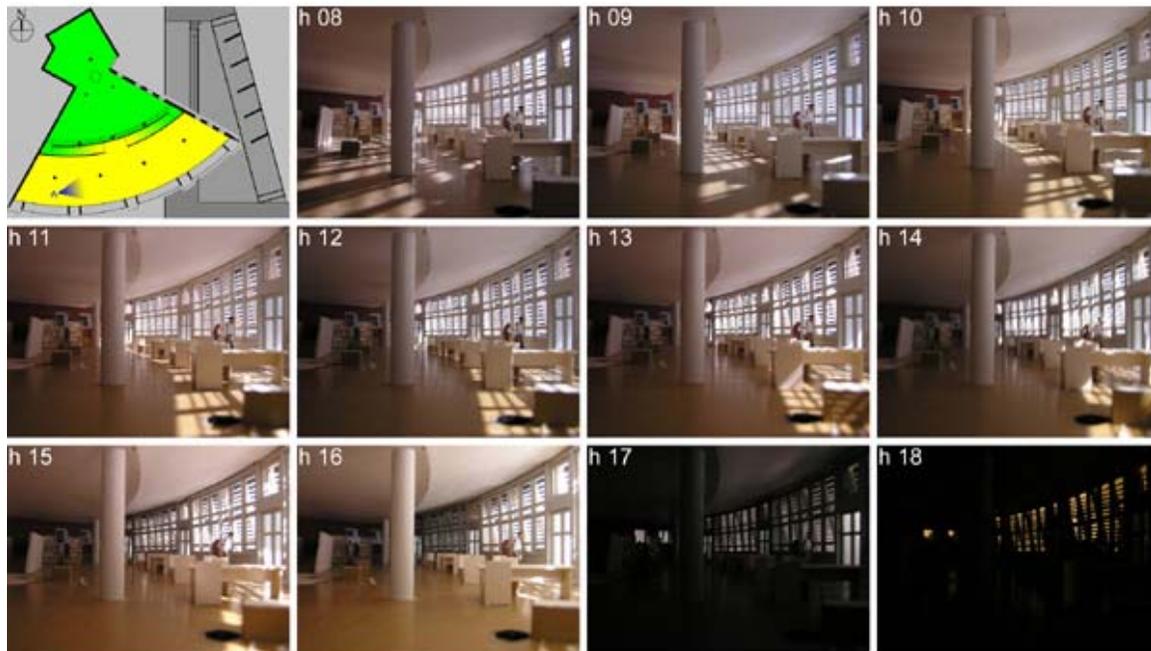
The artificial sky allows to make quantitative assessments: the data acquired by luxmetric probes are elaborated in order to represent illuminance levels through isovalue curves in plan or section and annual trends.

Valutazioni quantitative (cielo): isoFLD in pianta e andam. in sezione



The artificial sun supplies with qualitative data in the form of photographs showing the shade dynamics and the presence of glare or other aspects of the lighting scene.

Valutazioni qualitative (sole): punto di ripresa A, 21 marzo, cfgz. 2



The work has provided a validation of the project; the adequacy of the designed solutions can be easily verified, as well as those aspects that can hardly be pointed out during the project emerge with immediacy thanks to the use of the artificial sky: this remarks are useful because they let to intervene early on the project.

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