

The project of the natural lighting with the use of models in the Artificial Skies: analysis of the performance of control systems applied in mansard roofing

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OBJECTIVE OF THIS THESIS → TO PROJECT THE NATURAL LIGHTING IN THE CONFINED ENVIRONMENT

The articulation of this thesis is → 3 ambit of study

- **1 Technological solutions of front systems** studied with the elaboration of **69 Technicalles Cards** around the **control systems**: Transparent Component (Conventional or Innovative), Screening Component (Inside, Outside, Inside/Outside, and Inside the glass) and Conduction of the lighting Component (Shed or Sun-duct).(fig. 1)

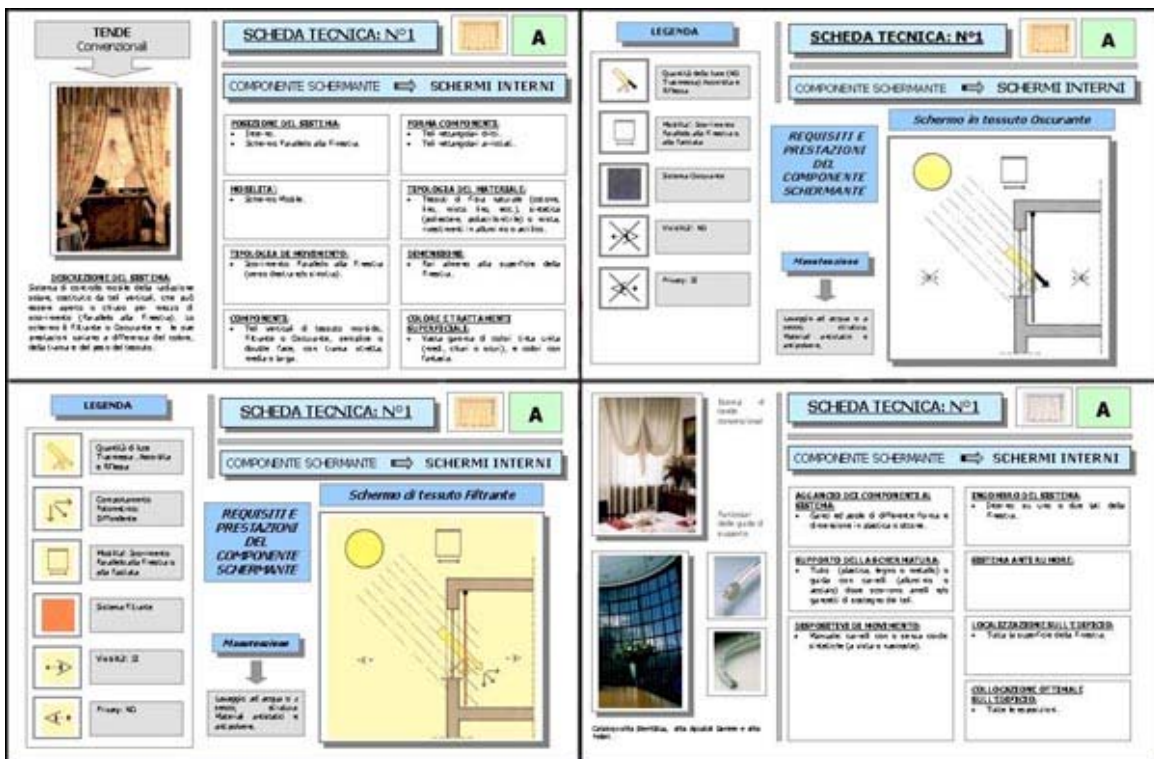


fig. 1: Example of the Technical Card: Screening Component

- **2 Instruments used for the project for the valuation of natural lighting** through the use of models in the Artificial Sky. They have been used to study the characteristics and the potentiality for the use of models in the Artificial Sky with reference to the **Portioned Dome Artificial Sky built by the Department of Energy Politecnico di Torino, at the Lighting Research and Experimentation Centre (CE.R.S.I.L) at Environment Park (Science and Technology Park for Environment) in Turin.**

(fig. 2)

Potentiality:

- Possibility to reproduce real situations, complexes geometries too.
- Possibility to reproduce many distributions of the luminance of the sky: →Standards Skies, and Sperimental Skies.
- Possibility to reproduce all the relative sun-earth positions.
- Quantitative analysis of the natural lighting in the interior environment.
- Perceptive/qualitative analysis of the natural lighting in the interior environment.
- Possibility to analysis on an urban scale, in the confined environment and with the individual components.

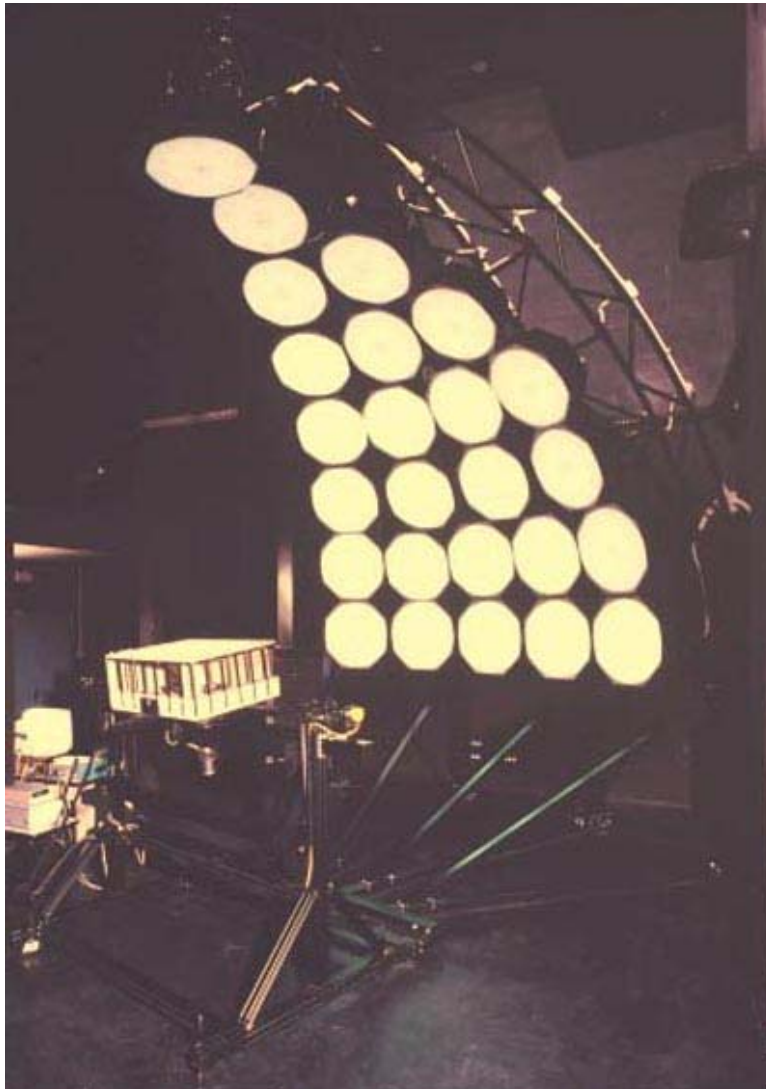


fig. 2: Portioned Dome Artificial Sky built in the CE.R.S.I.L

- **3 Application for the instrument of project at the “mansard roof”**
 - **Objective:** verification of the environmental performance of natural lighting with the control systems and with out the control systems
 - **Problematic:** verification the applicability of the parameters of the Decreto del Ministero della Sanità 05/07/1975 → $FLDm \geq 2\%$ e $Sf/Sp \geq 1/8$
 - **3 Typologies have been analysed** (fig. 3):
 - I CASE → two pitches inclinedes of 29°
 - II CASE → two pitches inclinedes of 23°
 - III CASE → one pitch inclined of 10°

SPERIMENTALS ANALYSIS CARRIED-OUT

SKY SIMULATOR: quantitative valuation of the I CASE, II CASE and III CASE

- 21 December hours 12 (pejorative condition of project)
- with out control systems

SUN SIMULATOR: qualitative valuation of the II CASE

- daily dynamic
- 21 December
- 21 March
- 21 June
- with out control systems
- with control systems: Venetian blind, Sunshade, Awning

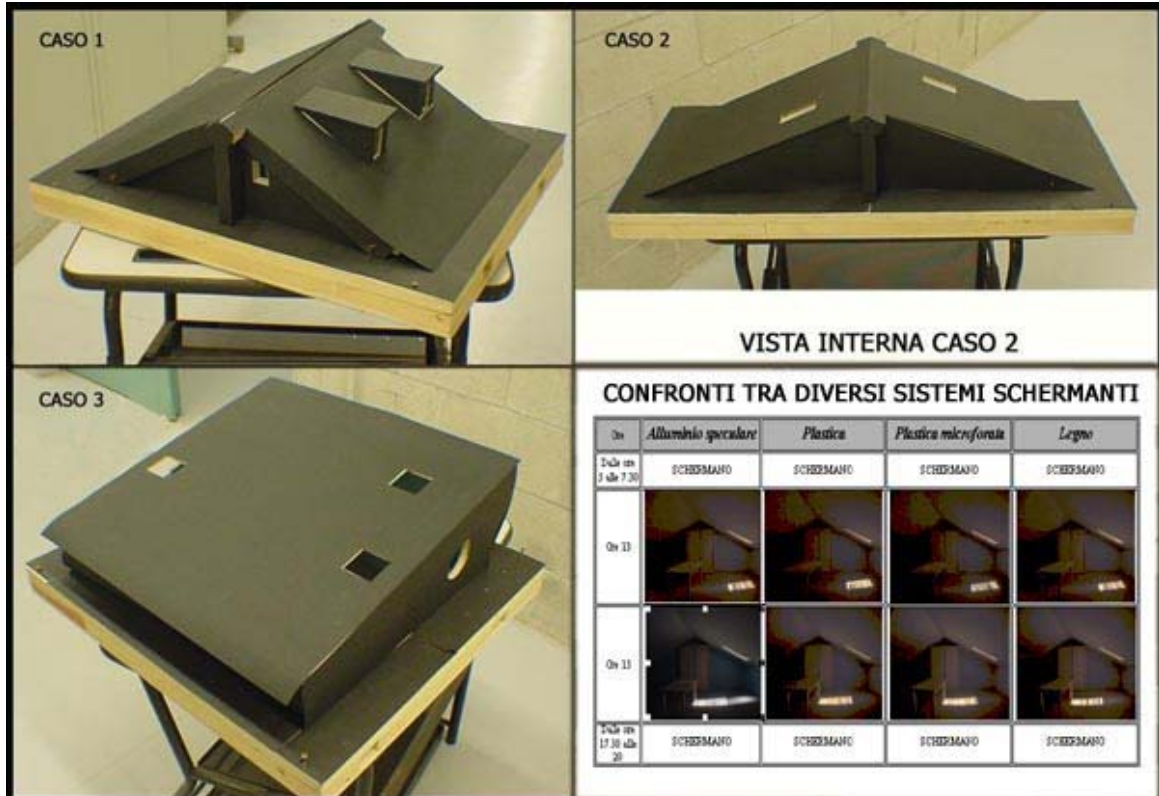


fig. 3: Cases of study

In the analysis there are many interesting appearances, as:

- Not applicability of the parameters of the Decreto del Ministero della Sanità 05/07/1975, and therefore the necessity to introduce new parameters.
- Comparisons between performance of different control systems on the basis of the penetration of the solar radiation during different periods of the year.
- Comparisons between performance of different control systems on the basis of the different materials of realisation, that determine different modality of luminous reflection, increase of the luminous distribution inside and phenomena of dazzlement.
- The importance of the mobility of the control systems.

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