POLYTECHNIC OF TORINO
FACULTY OF ARCHITECTURE 2
Degree in Architecture
Honors theses

Natural lighting environment in existing school buildings: experimental studies and renovation design proposals

by Amoretti Laura and Taraglio Rossella
Relatore: Aghemo Chiara
Correlatori: Pellegrino Anna, Serra Valentina

The main study purpose consists first in **natural lighting environment evaluation of existing school buildings** placed in Turin or in its area, then in **building renovation proposals** to enhance visual comfort.

To evaluate **natural lighting environment** means to analyse the interaction of:

- **confined room**, that presents particular characteristics and that takes in several fittings;
- **fenestration** perhaps with control system, that has an influence upon coming light performances;
- **outside lighting environment** that is yielded by sun and sky and building site obstructions shape.

Users peculiarities, their **main activities** and also **room functions** are very important in lighting environment and so it is necessary to take the interaction of **user** and **visual task** characteristics and lighting environment in consideration, with reference to visual comfort parameters and indices reported in technical legislation.

Public Education efficiency, offered by **school buildings** selected to develop on this study, can be sure only if it takes care of classrooms environmental quality.
This kind of buildings involves also **high energy use** because of their great volume; since users make the greater part of the activities during the day it is important to optimize the daylighting systems design.
Then to optimize the energy efficiency too it is necessary to take care of solar radiation that is source of light but also of heat and so it needs to study both visual and thermic features together.

The **main thesis theme** is natural lighting in **high school buildings** and especially in classrooms and computers laboratories, common spaces, and so comparable, in this kind of school.

Students, in those schools taken in consideration, are from 14 since 19 years old: these ages are fundamental in their growth and education.

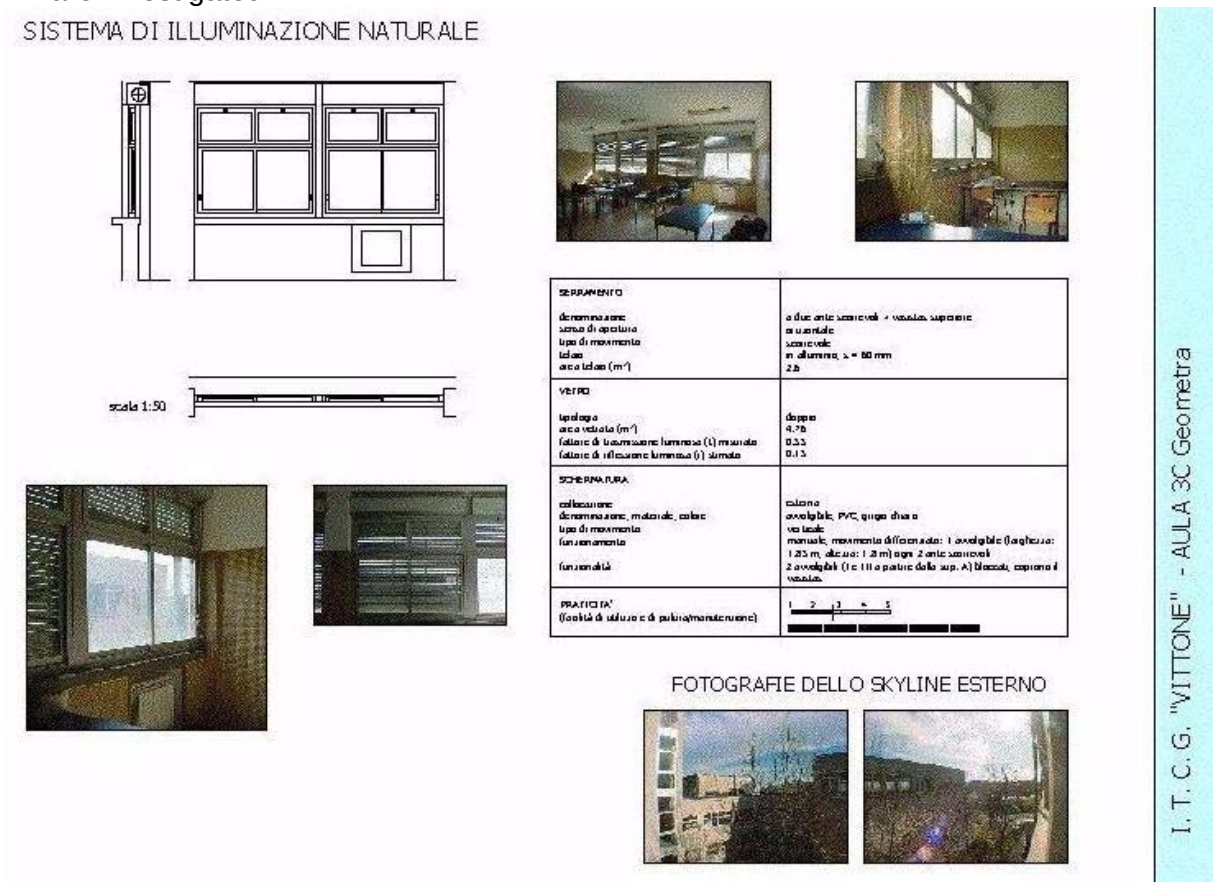
Thesis is developed into **two parts**:

- **existing school building general knowledge** in Turin area;
- **renovation design proposals** of studied reality.

The **first part** main purpose is to evaluate environmental conditions in which users make their activities and to find out principal problems concerning visual comfort.

This part is divided into:

(1) a **"*General and wide research*",** in which several data about generical building aspects and activities, and about classrooms and daylighting systems characteristics are investigated



Characteristics of an analysed classroom, the daylighting system

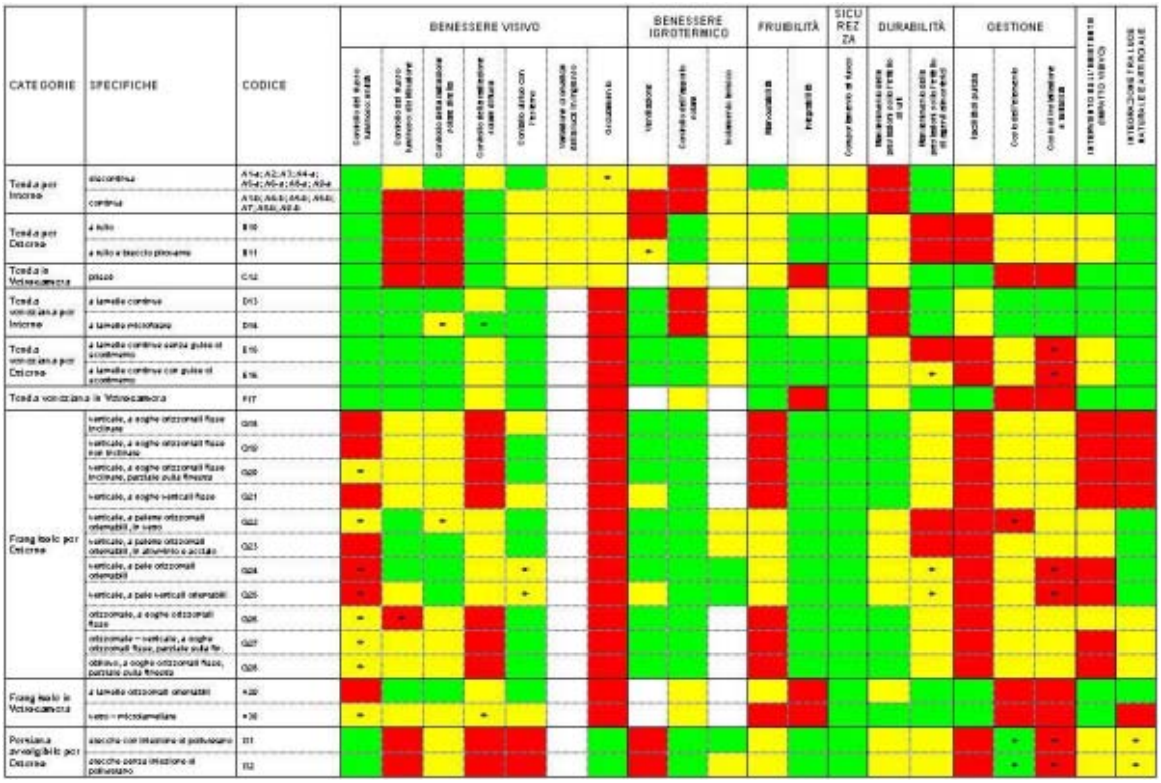
an **"*Experimental measurement*"**, through which an objective evaluation of visual comfort parameters in daylighting conditions is made

Illuminances and luminances results about an analysed classroom

Remarks and data obtained synthesis is the start point to develop the thesis **second part**, whose purpose is to make several **renovation proposals of examinated school buildings** to optimize visual comfort conditions, in the light of problems pointed out in the first part of the study.

Design proposals are organized in **"*Generical design proposals*"**, some marks to solve existing problems, and in a section set only to ***study in depth daylighting control system***.

Therefore thesis proceeds in making a **"*Performance Matrix*"**, that is an useful and versatile work tool and that can be used to select a possible control system for a specific classroom.
The Matrix is a statement in form of a table that shows several aspects of control system application



Performance Matrix about control system application

It is composed by:

- **real products**, selected through a marketing research, arranged on lines;
- **performance evaluation methods**, arranged on columns.

Then thesis proceeds in reading system controls performance through system controls direct comparison.
This comparison is useful to express a **judgement set** and **concise evaluations** about system controls performance during their using, and it makes to be able to select that system that optimizes the design.

This approach is an attempt to realize a **knowledge tool in picking out a daylighting control system through a well reasoned selection**.

For further information, e–mail
Amoretti Laura laura.amoretti@libero.it
Taraglio Rossella t-rossella@tiscali.it