Politecnico di Torino

Honors Thesis

Master's Degree Architecture for Sustainability.

Abstract

Strategies for energy and spatial refurbishment of Turin's school building stock through three archetypes

Tutor/Correlator

Fabio Favoino
Daniele Campobenedetto

Candidate

Federico Sanino

February 2025

In the period from the end of the Second World War to the end of the 1970s, Italy was hit by an unprecedented demographic explosion, which caused an enormous demand for new spaces for learning. Despite the climate of change and experimentation in the pedagogical field, the need to quickly meet the continuous demand for classrooms combined with the almost total absence of single regulations in the field of school buildings, have produced a heterogeneous and very low-quality building heritage. Today's legacy of that period is an obsolete, antiquated and energy-inefficient heritage. Although the theme is the subject of the most recent PNRR funding, this result is considerably distant from the threshold of acceptability and certainly not in line with the new European directives in the field of energy efficiency. The research aims to investigate the direct benefits obtained from energy saving and indirect benefits, given by the improvement of internal comfort conditions, produced by energy requalification interventions on existing school buildings, evaluating their economic convenience.

Starting from a typological investigation of the entire school building heritage of the city of Turin, three different archetypes were identified, which together represent almost all of Turin's school buildings. The investigation begins with the identification of the energy-architectural characteristics useful for the construction of different building typologies. In order to identify the information necessary for the creation of the new database, the data relating to the City of Turin contained within the APE energy certifications and those collected by the AES were analyzed. The numerous missing information were subsequently integrated through the combination of physical on-site and aerial inspections via Google Earth of the almost four hundred Turin school buildings.

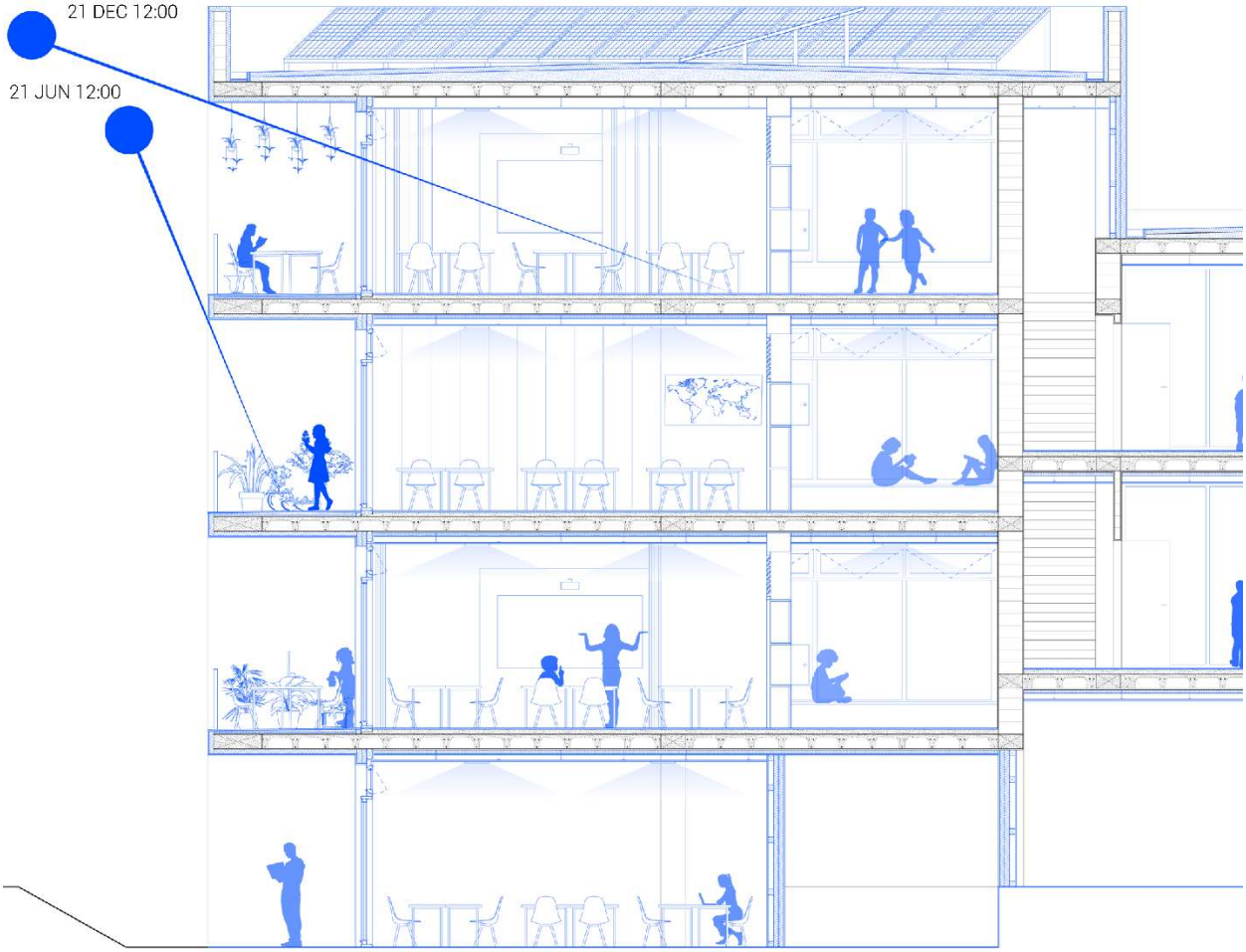
Each archetype was associated with a building: the "Gian Enrico Pestalozzi" Elementary School in Via Antonio Banfo 32, the "Leonardo Da Vinci" Comprehensive Institute in Via Degli Abeti 13 and the "Corrado Alvaro - Piero Gobetti" Comprehensive Institute in Via Romita 19, chosen as the most representative of the reference sample.

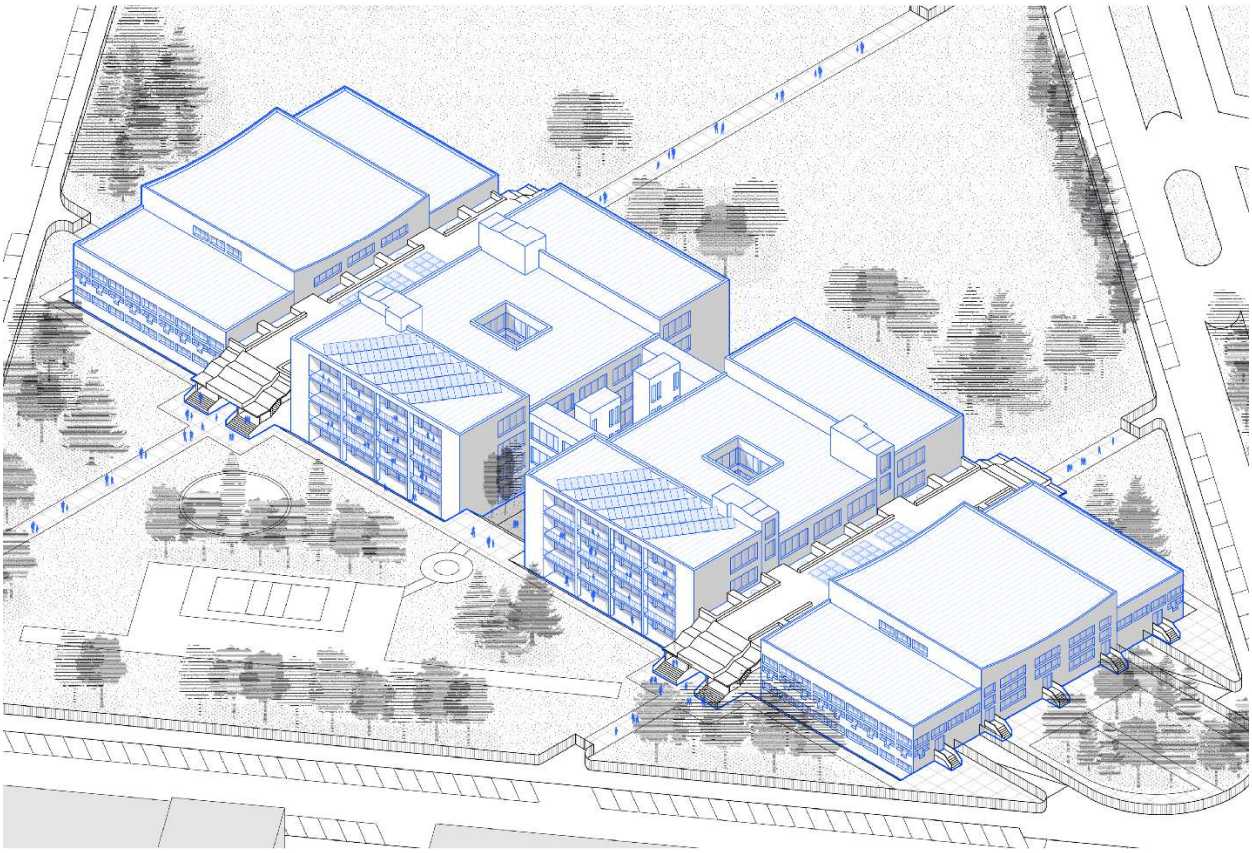
The redevelopment hypothesis of these buildings is based on an incremental design process, starting from a light refurbishment, passing through a mid refurbishment and finally arriving at a deep refurbishment. The union of the variables creates a "three by three matrix" with nine combinations, the research focuses on investigating its diagonal. Once the direct benefits have been quantified, through energy analysis, and indirect benefits, given by scientific research, of each design exploration, the comparison with the construction cost, calculated through parametric reference prices, allows to evaluate the economic sustainability of the intervention. The work includes a comparison with the current "continuous" financing strategies, with reflections that go beyond the individual case studies examined. The projects and analyses carried out, being referred to particularly representative "archetype buildings", allow to scale the results and reasoning on almost all of the Turin school building heritage, offering support to the preliminary project decision of the local administrative authorities.

LIGHT REFURBISHMENT
Elementary School “Gian Enrico Pestalozzi”

MID REFURBISHMENT

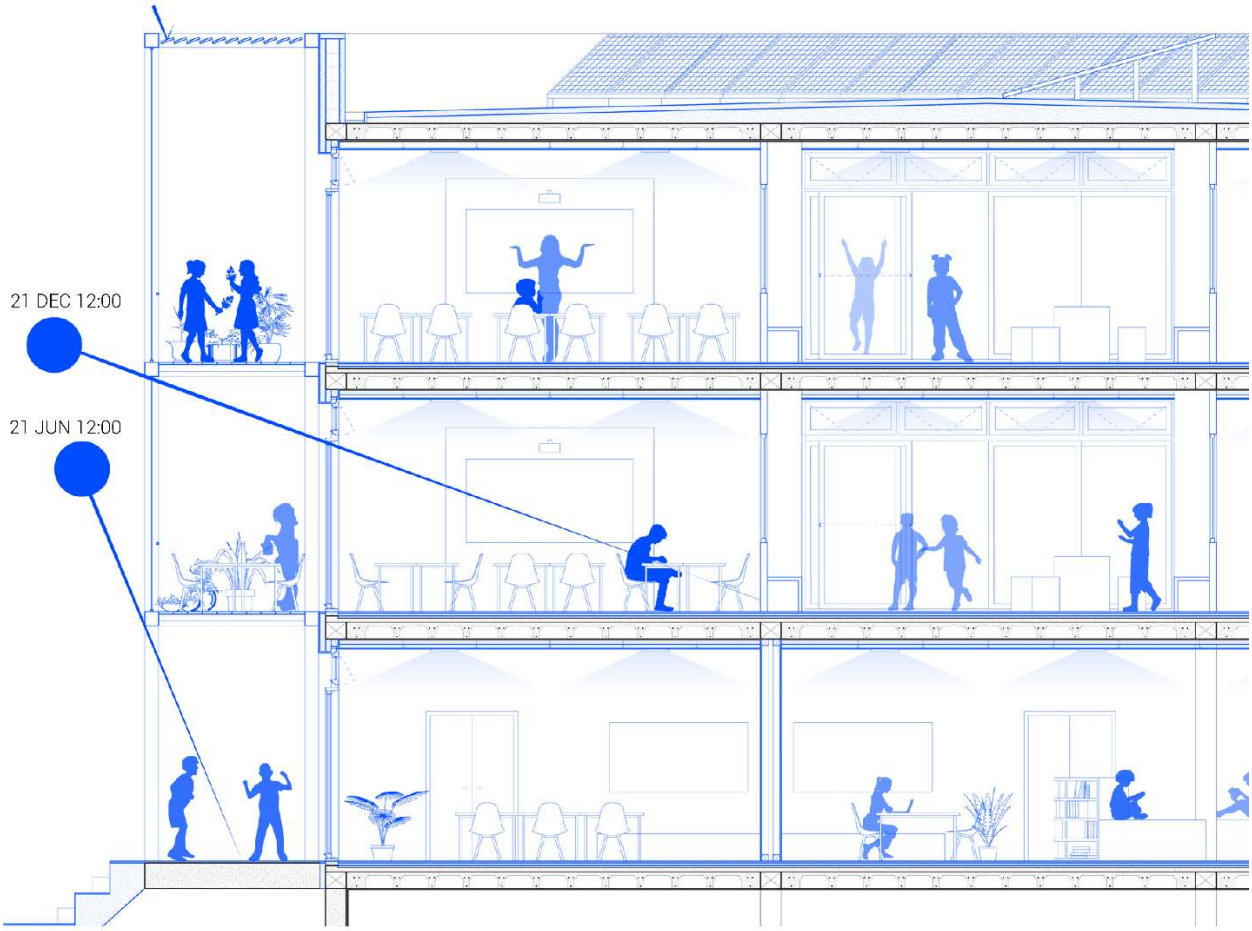
Comprehensive Institute “Corrado Alvaro – Piero Gobetti”

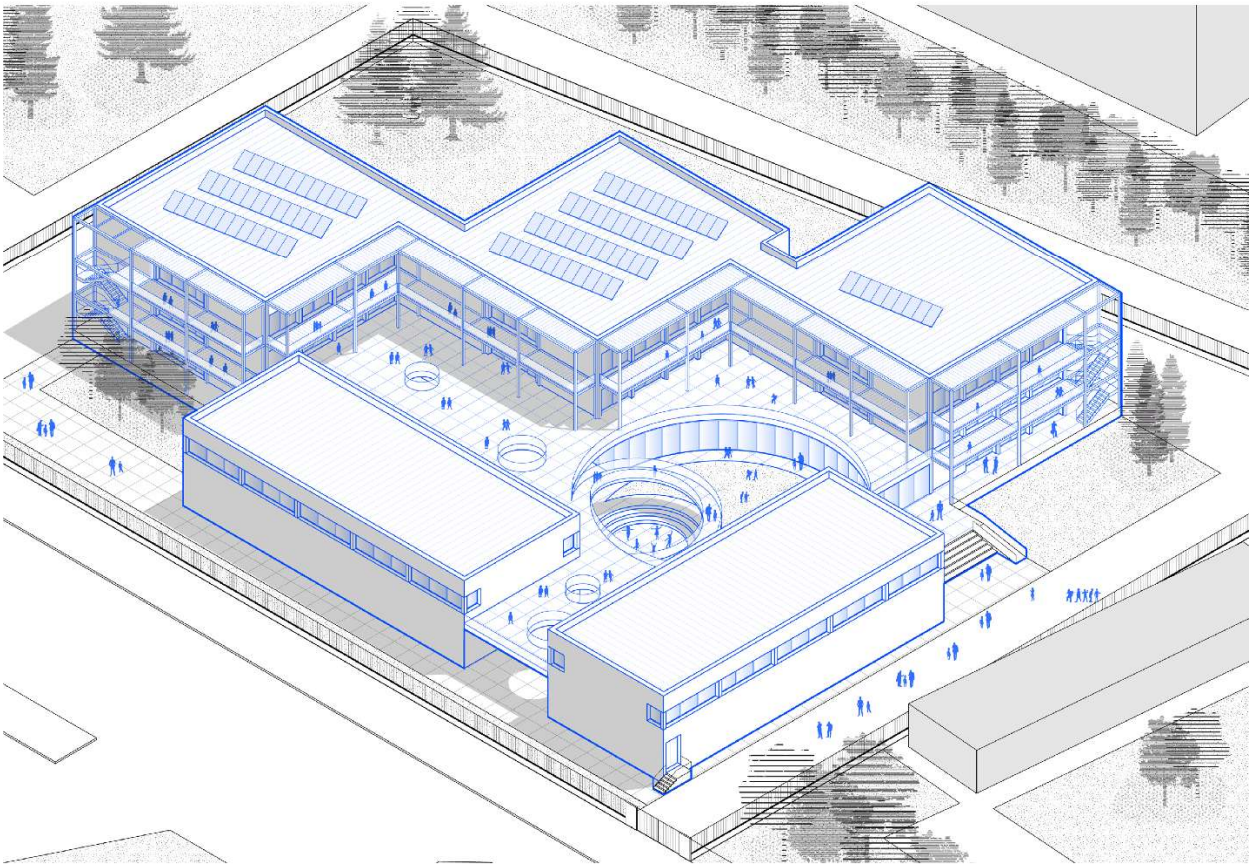




DEEP REFURBISHMENT

Comprehensive Institute “Leonardo Da Vinci”





For info:
federico.sanino@gmail.com