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Rehabilitation Methods for Residential Buildings

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Summary

In the sixties in most larger cities of northern Italy we had a firm growth of public housing. Many residential district, that grew close to the industrial sites, were distinguished by prefabricated buildings, mostly made of concrete prefabricated panels. Nowadays most of these buildings presents deep deterioration and performance losses. Therefore a deep restoration is now required but is a complicated matter. If we test a sample of these buildings we can notice a series of heavy inadequacies, compared to topical residential requirements. A large number of these inadequacies concerns the habitability of flats, in term of flexibility, the environmental confort condition and the building pathologies connected with construction faults. These faults might be caused by design mistakes or by a wrong execution. Our method consists of an analytical approach and of a following program of building's rehabilitation.

Keywords: Performance loss, pathology, load - bearing panels, virtual model, real model, indicators, classes of values, conform solution, strategy of intervention.

1. Research Methodology

The renovation of the existing real estate, which consists of building systems with different technologies and morphologies, is a complicated problem of quality in construction. The intensive urbanisation of past years, due to speculation or ideology, shows the need of planning over the outskirts of our cities. The degradation of the urban context is a peculiarity of several residential areas close to the historical centre. In such a negative situation for the environment and for the users we really need to think over the building organism and its relation with the urban system. We must start from the general requirements and the needs of the users. The deep knowledge of our buildings is indispensable for the restoration process. Remodelling the interior (environment) and the container (building system), one encounters values and angles of different disciplines. The complexity enlarges retraining districts with prefabricated buildings, both for social consequences, for reduced performance standards and for the capacity to set off pathologies and environmental degradation.

At the Politecnico of Milan - DISET - we researched a method in order to define the operations for the improvement of real estate residential buildings, as result to our rich previous experience on this theme. Our aim for a new housing concept moves from these four main features:
- a home where to spend more time (identity)
- a home custom made (flexibility)
- a healthy home (salubrity)
- a sustainable home (conservation of natural resources).

The common principle is the relation between users and home, and between home and its context, that breeds a relation between the inside and the outside and improves the living quality.

At the beginning of the 60's the "Istituto Autonomo Case Popolari of Milan", to stand up to the considerable request of houses to be built in a short time - 25.000 units in 5 years - started the construction of buildings with prefabricated load-bearing concrete panels. A market research of the prefabricated construction types available, suggested the selection of the French types Balency, Barets, Camus, Caignet and Fiorio, because they best fulfilled the technological and formal requirements. The Italian contractors have acquired the manufacturing licence, thereafter introducing some technological and distributional modifications. Therefore we have a common background for the considered interventions, which are derived from a constructive system. This is very important for our research methodology. As a matter of fact those elements which may be considered lacking in the considered real estate are methodically dispersed and are referable to the following principles:
- Inadequate typological distribution: apartment size, unit composition, bathroom and kitchen supply, flexibility of use for the various and changing needs of the customer.
- Physio-environmental quality deficiencies: hydrotermal, acoustic, energy efficiency and visual comfort.
- Transformation of the urban context with a considerable change of the stress conditions operating on our buildings.
- Pathologies due to congenital building defects and to dilapidation with time.

A research program regarding the operational strategies of real estate maintenance is a complex issue that involves all the branches of design and building technology. Our team has set up a comprehensive and effective method that clarifies the outlines for maintenance where each operational case and each stage of the process is reduced to an organised system. First we had to face the constituents of the problem, which are: processing, spatio-functional issue, environmental-technological issue, economical issue. In correlation we identified 5 indicators of performance loss, to which all quantitative and qualitative parameters have been referred:
1) Risk: as an indicator of the probability of the occurrence of events that may be harmful to the users.
2) Pathology: as an indicator of building system failures and abnormalities.
3) Discomfort: as an indicator of a deficiency in the well-being of the inhabitants.
4) Dilapidation: as an indicator of normal and predictable decay of buildings.
5) Obsolescence: as an indicator of a drop or loss in the functional efficiency due to new needs.

Our method consists of two different stages of analysis on the residential estate. The first test is on the original design and has a systematic character. The result of the reconstruction of the project, referring to the requirements and the provisions of that time, is a "virtual model" that shows the original spatial, environmental and technological characteristics of buildings, manufactured through a common type of concrete bearing panels. The second test is on a sample of buildings and has a phenomenological characteristic: it consists of recording deterioration and pathologies that eventually occurred using the buildings: the result is a "real model".