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125 CASES OF NEW SOCIAL DESIGN HOUSES COMPARED

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ABSTRACT

In early 2011, Assimpredil ANCE (Association of construction firms and related industries in the provinces of Milan, Lodi, Monza and Brianza), together with the Muicipality of Milan, the Milano Chamber of Architects, IN/ARCH Lombardia and FederlegnoArredo, organized a competition to form a directory for high-performance, low-cost housing buildings proposals.

Aim of the competition was to promote architectural quality, research and innovation in the housing sector by offering practical examples of high-performance, low-cost housing designs that fulfill the specific requirements. Participants were invited to submit designs on two themes: a 12 floors tower building and a 5 floors horizontal building, both intended with a GFA of about 5,000 sqm.

The proposal were asked to deal with:

- Prefabricated and/or traditional construction system with high performance standards.
- Attention to the building's life cycle and its operating and management costs from the perspective of environmental sensitivity.

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- Control and containment of costs and construction times with the contractor guaranteeing completion.
- Optimal usability and design flexibility.
- Optimization of energy efficiency and acoustic performance, low CO_2 emissions, minimization of indoor and outdoor pollution.
- Milanese architectural identity given a contemporary sensibility.
- Aggregability and flexibility of the apartments' building solutions.
- Use of innovative components.

After the selection made by the technical jury, 125 projects were admitted to the directory. A book has been published containing all projects told through images, technical drawings and a dashboard that summarizes, for each project, the technical performance and the assessment made by the qualitative jury. Editing the book, we had the opportunity to analyse in detail all projects, their structural characteristics, their performance and their architectural features. This paper aims to relate the results of this analysis, reporting, through a series of comparative studies, the state of the art of the Italian residential construction sector, its strengths and its weaknesses, the typological design strategies put in place and the available technologies.

Key words: buildings-directory, construction-firms, high-performance, low-cost, quality

Modalities of Participation and Goals

The participants were asked to produce a project whose design could meet the ideals of renewal in terms of architecture and construction. The aim of architectural quality had to be submitted to the hard view of the building firm, whose point of view is generally focused on profitability of the building and of his construction. This narrow road leads many projects through a good strategy of design, in balance between different points and requests.

The organizers conceived a two-step jury: the first one had the task to check the minimum performance levels and give a feedback on them with a comment in case of high score in terms of general efficiency of the design product. This was generally a building firm task, with a series of consultants on every point of the design. From this point of view a good help was introduced by the building materials producers whose experience has given a good contribution to the development of new strategy. A following jury had to acquire the judgment of the previous one and add his personal score in terms of architectural quality.

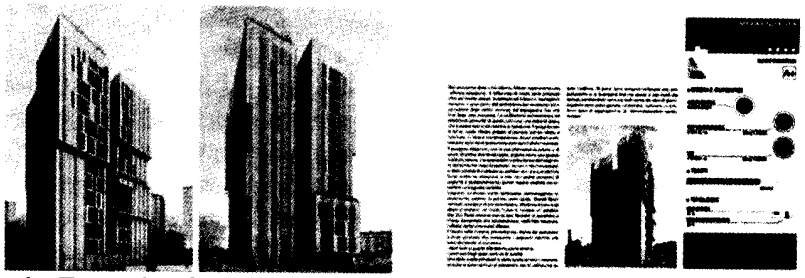

Figure 1 : Example of presentation of the project in the book: the first two pages.

The building's design should be planned for the climate of Milano in a suburban area, on an unspecified lot whose orientation is specified by the participant. Because of the building's location is to be considered the Municipality of Milan, technical rules and regulations are those of the Municipality of Milan at the time of the call for Proposals' publication. The definition of the buildings performances is described as follows:

- Dimensional characteristics.
- Apartment types (size, features, varieties, terraces/balconies and flexibility).
- The building will have a mixture of apartments in terms of surface.
- Each flat need a garage.
- Energy and acoustic performances must be considered as earthquake proofing, fire proofing, elimination of architectural barriers.

The organization of the different juries allowed a clear session of work for the quality jury who could proceed his job on approved designs, free from every specific technical doubt. This choice also shows the deep believe of the organizers about architectural quality: it starts from an efficient design but is not the same thing; it deals with the shape, the volume, the relationship between a single part and the whole, the building and contemporary art or town.

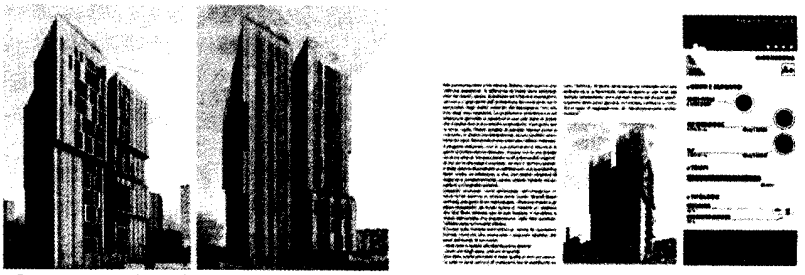

Figure 2 : Example of presentation of the project in the book: page three and four.

Types of Participants and General Considerations

At the deadline of the first edition of Housing Contest, in June 2011, after more than 160 expressions of interest, 132 projects were submitted by XX building firms, of which 125 passed, according to the strict evaluation of the technical jury, the binding parameters for accessing the directory. Companies and designers from all over Italy and abroad participated in the competition. More than a thousand people were directly involved including architects, engineers and other consultants, producing concrete examples of high quality residential buildings, achievable at low cost and in a predictable time.

The 58% of the proposals (73 cases) deals with the 5 floors horizontal building and the 42% (52 cases) with the 12 floors tower building. Judging by the performance of the selected projects, the tower buildings show a higher propensity to energy efficiency, reaching in the 37% of the cases the A+ class, achieved only by the 19% of the horizontal buildings. The tower option seems also the most cost effective, although with a quantitative difference perhaps not really relevant from a statistical point of view.

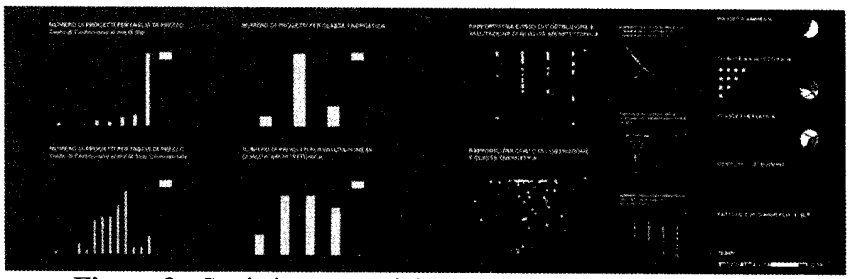

Figure 3 : Statistics on participants as presented in the book.

A further observation of some interest, although difficult to generalize, concerns the greater propensity of horizontal buildings to get a good architectural evaluation by the qualitative jury, with most of the tower buildings (54%) getting only 1 or 2 stars (out of 4).

We could not find any real statistical correlation between the construction cost and the energy class reached. Similarly, there appears to be no relationship between the cost and the judgment of quality expressed by the jury. This seems to us to show how quality, in terms of architecture and construction, is more a matter of design intelligence than of economic investment.

Buildings Aggregation Strategies

The tower buildings are constructed with quite similar aggregation strategies. Most of the buildings (around 61%) provide four flats on each floor, with combinations that go up to five or, in more complex cases, six. The stairwell is almost always central, defining an arrangement of flats, which tends to make the most of the perimeter of the building, giving a relative weight, in fact, to the orientation of facing. The majority of buildings of best architectural quality apply a similar design strategy, which consists in breaking the integrity of the volume bringing the natural light into the heart of the tower. This strategy allows a considerable improvement in the quality of the distribution spaces and of the flats and does not appear to be disadvantageous from the costs and energy efficiency point of view.

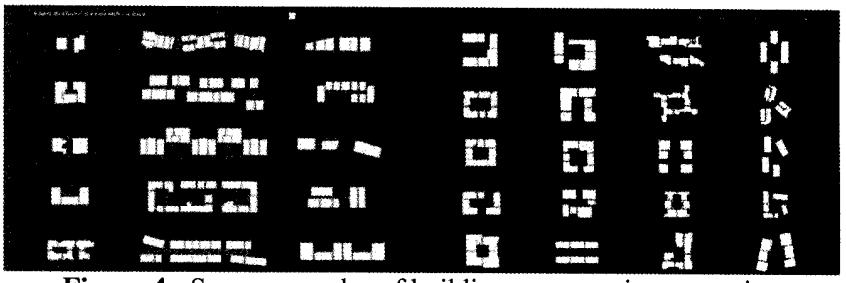

Figure 4 : Some examples of buildings aggregation strategies.

The horizontal buildings offer instead a wider range of approaches. Probably encouraged by the difficulty of managing a long building, many designers have conceived very complex aggregation proposals. The classic distribution with two or three flats for each landing (about 55% of the designers opt for this solution) is often overcome by hybrid systems with balcony (10% of the solutions), inner corridor (12%), courtyard or more complex clusters (up to 23%). Also in this case, not always the correct orientation of the facing appears to be a guiding principle. Many projects show some difficulty in providing cross-ventilation to all (or most of) the apartments, question perhaps overcome by the current technological equipment of the buildings but still firmly present both in the regulations and in the habits of the inhabitants.

Apartment Types

The building were conceived to have 100% of its GFA for housing, broken down, solely for the purpose of example, as follows: minimum 5% studio ap. 35 sqm of GFA; minimum 25% two room apartments, 55 sqm; minimum 15% three room apartments, 70 sqm with a bathroom and a separate kitchen; minimum 10% four room apartment with 100 sqm with two bathrooms and an eat_in_kitchen. From a certain point of view, the suggestion on new typology or evolution from a classical typology

were slowed down by the adoption of the Milan's building rules book and by the conservative character of the residential market in Milan. There is often a strict connection between administrative rules and the typology of the single flat, as if it is too difficult to break ancient schemes; the participants succeeded in evolving the single plan very rarely. From this point of view, the competition showed the whole inertness of a design approach weak in front of a rule.

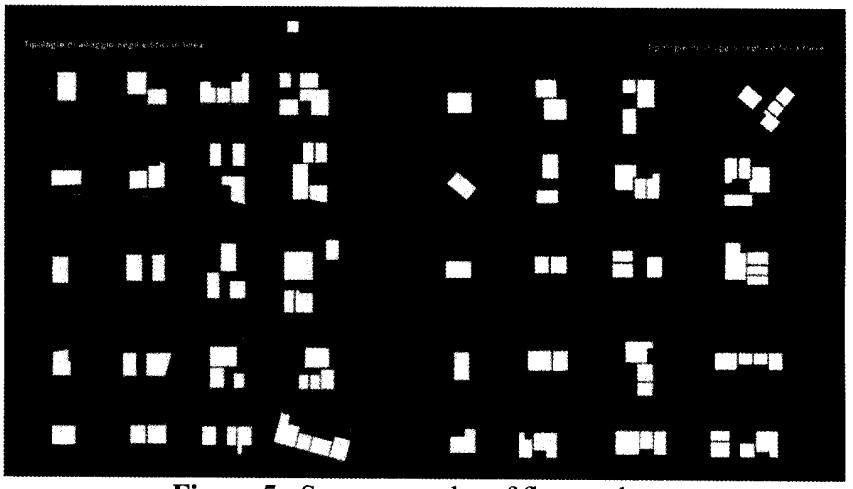

Figure 5 : Some examples of flat typology.

Nowadays we are waiting for a new building rulebook for our municipality. The hope is that, having shown the stiffness of the previous one, Milan can grow with more flexibility. The flexibility of the floors of the single flats remained mainly compressed between the minimum floor size and the necessity to cut costs. The strong contradiction between the rule lives inside the envelope where flats battles with the regular size of the dimension of a room and the necessity to cut costs and optimize surfaces.

More freedom was applied on different part of the single flat, such as balcony, whose necessity has been determined by costs approach and design choices.

Building Technologies

The most important contribution given to the development of the built section comes from the respect of the energetic A class of the building. This input affected:

- The thickness of the floors and of the vertical walls.
- The materials of the windows and the thickness of the glasses.
- All the joints between the outside and the inside surfaces.
- The construction of external walkway or terraces.

Owing to compete in terms of economy the construction timetable was a good parameter to reach the economy of the project and a good incentive to choose building technologies of quick assemblage. It is the time of structural sandwiches in wood and concrete, of structural wood panel, precast floors and beams. Drywall construction was used as a real solution from many questions: from acoustic problem, to necessity to reduce time of site. The elevation often deals with systems of balcony whose construction is added to a volume generally clear and entire with recognizable materials: iron, wood, plaster in different colors.

A good comparison was created by some building firms that involved different architects on different construction systems: from a traditional one to the most pre built across mixed building systems. They succeeded in compare prices, speed of execution, and results in the organization.

Traditional system in framework and bricks is generally no more considered as appealing for a low cost construction by itself: it must be increased in terms of pre-built elements in substitution of traditional parts which need more human work on site, generally specialized workers. Some of the firms appeal to pre-built components, no structural, such as toilets blocks, in the hope to save time on site and to have a better quality of the built.

Not often the builders show satisfaction for these elements that presume to have a different organization on site and different lifting site machinery and find them not always ready to accept the news.

The second step in the evolution of the use of pre-built elements was the introduction of static elements such as partitions, often in connection with cooperating floors. This evolution, already described, drive to the last evolution of the building system occurred, dealing with structural panel walls such as X-lam. This product seems to be very adaptable to our project theme but was not totally promoted from the builders, perhaps not yet ready to accept this technology or not yet aware of the richness of shorter times in developing the site if compared to saving money.

The winner of all the selection is drywall construction: speed of sediment, price, and easiness of process introduce it in a larger consume for the future.

To sum up at the end, basically we can consider two marked trends in the constructive proposals for the elevations in the competition: opaque elevation, inert, with a low energy meter, and an active one, generally glass built, with ventilation as a sort of secondary producer of energy well integrated in the climate plant. This second one is still a second choice, being chosen only by less than 5% of the examples and mainly in mixed solution. The opaque elevations are the main choice enriched by control devices such as blind systems and venetians blinds. There are no cases proposing

double skins with internal ventilations, some rare case with proposals of internal ventilation channels in the shape of corridors or large open ducts.

Structure is still the less creative theme in the presented project where statistics present 50% of the examples in beam and pillars concrete, 20% appealing to structural wood, 20% steel and 10% to mixed systems between structural panel ad punctual pillars.

According to the two main points, elevations and structure system insulation is mainly considered as a part of the external theme: thermal insulation is often a traditional external thermal insulation, with better devices in the study of joints, completed by more frequent application of vacuum systems. Co-winner of the external insulation are mixed systems where a control of the whole packaging and the inside of the building establish an appropriate system of control of energy consumption.

In terms of heating the research goes to a heat balance to be reached with the contribution of solar installation, photovoltaic systems etc. but still far from a complete solution of the theme. 50% of the examples appeal to heat pumps as a possible improvement on the theme of energy consumption/heating.

Performances and Costs

As stated before, it was not possible to find any correlation between the buildings construction cost and their performance. This seems one of the most interesting findings of this work. In the context of the normal production of low cost housing, this issue is the subject of frequent clashes between architects, builders, property developers and public administrations.

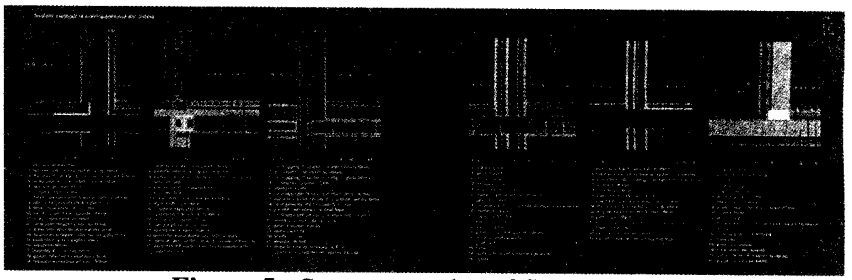

Figure 5 : Some examples of flat typology.

We believe that the audit carried out by the technical departments of the companies and by the technical jury on the calculations and, above all, the commitment of the companies themselves to build the proposed buildings at the stated cost, make, from this point of view, the cases present in the directory comparable to real buildings. If

so, the absence of any statistical correlation between the building cost and the acoustic and energetic performance, and even the severe qualitative assessments of the prestigious jury is, in our opinion, a staple in this long outstanding question.

A Reflection on the Proposed Architectural Languages

On the whole the competition was a very successful one with medium quality of the design high. This is a surprise if we consider the general opinion on low level of architecture systems in Italy nowadays. One of the point of the competition, the any-place-around-Milano collocation, allowed a race on the typological theme more than morphological ones, leaving more space to the upgrade in terms of figuration and proportions between the part and the whole, proposition of the elevations.

Some of the firms proposed the mixed use of the typologies as to propose a part of a new built town. Some of the best proposal studies how to lighten the rigid solution emerging on the elevations from classical distribution with the varied use of places between in and outside. This helps to avoid the box that is what grows in our suburbs. Specially for the 5 horizontal floors building one of the first step is how to use, if to use, ground floor or if to leave it with no indoor use. With a the same cure the long volume was deconstructed, treated as something that is always too big and must be metabolized using several opportunities such as: dividing the volume in different smaller parts, give it different axes with strong or light angles, use different heights, combine the volume with applied parts. Folds and projections populate the renderings. The tower is a different case: the necessity to split a volume is weaker, but it offers the possibility to thin the volume and gives more opportunities to surfaces for insulation, balcony, and different treatments of materials and warp. The solid wall always remains as a classic back while the more external surface enjoys contemporary architecture, different disposals of rhythms, different scales as different dimensions of the external surface compared to the one on the background. It is often the use of fragments in an out of scale order to enrich the meaning of the building of new meanings. Sustainability goes through natural materials: wood is more present in movable objects on the elevations such as movable shutters, mullions, external floors or covering. There are no examples with large glass surfaces owing to the necessity to reduce costs, energy consumption, and maintenance of the building in his life cycle assessment. Generally the intention of the authors was never in the way of down play the theme by itself, on the contrary. The theme was assumed as a general elevation of the quality standard of residential social buildings, now land of new social categories with new necessity of living and spaces.

The Role of Furniture in Housing Production

FederlegnoArredo, association that represents the whole Italian wood-furniture sector, being partners of the competition, has drawn up a list of furnishing items collected from its members, specially selected and arranged in an on-line catalogue. All participants were required, by drawing from this list, to define the project of the interior furnishings of a standard floor within a cost that should be approximately € 250/sqm of the GFA.

This appears to be an important innovation for the Italian situation, where combining the construction of the building with its furniture is not at all usual, even for structural parts such as the kitchen. The projects, however, show that this direction is particularly interesting for the low cost housing market, being able to maximize economies of scale in favor of the end customers.

Some Conclusions and Some Auspices

Housing Contest was the first attempt in Italy to organize a private competition to create a directory of high quality, low cost buildings. The projects are proposed by groups made up of building companies, able to implement the proposals within clear time limits and defined costs, and professionals (architects, engineers, and many other specialists) ready to work in a compact and coordinated team. The average level of the proposals is satisfactory, significantly higher, from many points of view, than the average of the realizations of these last decades. The competition procedure was, as predictable, very complex and in the course it was possible to understand some possible improvements. The examination of the results has allowed identifying the parameters that were more difficult to reach and those by now of normal management. For all these reasons it would be extremely interesting to repeat in a few years, as is suggested in the announcement, this experience. Equally desirable is the use of the material produced by the participants for the purposes of a systematic comparison of the solutions adopted for both scientific goals and research as well as for a short-term improvement of the quality of the procedures in this field. Also for this purpose has been edited the volume summarizing the whole directory.

It being understood, of course, the main objective of the operation, or the actual construction buildings proposed list or of projects derived from them directly.

Reference

1. Bolognesi, C. and Mazzoleni, P. (ed.) – Housing Contest: Design Directory for High Performance, Low Cost Residential Buildings, Edilstampa, Roma, 2012.