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Teaching Construction in a School of Architecture: The Importance of Connections and Details

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The paper regards three important questions relating to the content of construction education: *1) How could the new content in construction teaching reinforce the relationship between design and costruction? 2) How can the teaching of construction incorporate the continuous development in innovation? 3) How does this new content affect student competence and skills necessary to practise architecture?*

The paper regards recent experiences carried out at the School of Architecture of Genoa (Italy) in two different courses, one workshop (atelier) concerning Construction – Technology of Architecture (second year of the first level) and one traditional course (Technological culture of architectural design, at the fourth year, second level).

The bases of the way of teaching Construction and Architecture nowadays are the new conditions imposed by the economic and cultural environment. Inside this new frame and looking at the actual situation of the Schools of Architecture around Italy, it is possible to distinguish many various tendencies, in some cases more orientated towards the relationship between construction and environment, in other cases towards the relationship between new construction and built heritage, in other cases, still, towards management and maintenance processes of the built heritage.

The specific attitude and purpose of the two courses above mentioned are, in some way, more focused on the traditional meaning of the discipline, that is a reflection over the world of techniques, especially in its complex relations with the theory and the practice of the architectural design process. Even though many years passed through, it is still actual the idea of Giuseppe Ciribini, who marked the difference between technique (method), intended as the way and the object of doing, and technology (science), intended as the way of thinking or, in other words, the theoretical reflection around the techniques (CIRIBINI 1984).

In our contemporary culture, the building market is rapidly developing, both producing new materials (or traditional materials added with new ones in order to achieve better performances), and testing new construction techniques. This condition in one way enriches the catalogue of available solutions but, on the other hand, may direct the teaching towards the presentation of different and various techniques, never really up-to-date, because under fast evolution; in such a way the contents of teaching become a sort of collection of a catalogue among which the student could choose, at the end of his design process and with more or less indifference, materials, details and building techniques.

The second premise concerns the relation between the teaching of Technology of Architecture and Architectural Theory and Design, especially inside our faculty. Although the two disciplines should cross each other, in many cases they remain parallel, without getting in touch; this fact obviously impoverishes the way of teaching. Architectural theory often forgets the materiality of the buildings; technology of architecture assumes an "interned" role or, more dangerously, doubles the design teaching, leaving again a apart its fundamental theoretical approach.

For these reasons, also "swimming against the stream" in respect to actual tendencies that prefer diversification and specialisation it has been assumed to come back to the foundations of the discipline, that in some way have been lost, especially regarding the correspondence between the *idea*, the *concept* and the *way* of building.

A few years ago Giancarlo De Carlo was writing: «decorative and constructive details leave the stage. We are no more able to connect correctly and with competence two or more different materials, neither to solve naturally and with elegance the transition from an horizontal or vertical plane to a sloped or curve one» (DE CARLO 1995, 22).

On the other hand the numerous architectural magazines propose a lot of images that, in the work of the student and thank to the use of digital technology, tend to rapidly substitute technical manuals edited in the last part of 20th century. The risk in the use of images, elaborated with digital technologies, is similar to the collection of a repertoire of shapes (false images) that could be proposed in different situations, out of context and loosing the real meaning od concept.

As a matter of fact this risk was been marked, prophetically, by Italo Calvino during a cycle of conferences held in the United States, concerning literature and culture. With regard to the «inflation of prefabricated images» (typical effect of the contemporary society, that is a society of images) he warned against the danger of the «recycle of the images used in a new context that changes its sense» (CALVINO 1993, 107).

Consequently nowadays it seems necessary to hardly propose again, as one of the main purposes of the teaching, the knowledge and the comprehension of the physical feature of architecture, in its complex material, constructive and linguistic meanings. Architecture, in fact, has always been the art and the ability to join different shapes and materials, dominating the mutual relations in the technical and constructive sense and solving, in morphological terms, the functional role inside the building. The entablature of the Greek temple, the Gothic moulding, the Baroque shelling, the research of building detail by the great architects of the 20th century, the contemporary envelopes divided into different layers are not only the result of a will of shape but often translate the solution of technical, structural, stylistic and functional problems, not enough enquired and taught.

Pointing on these considerations a new research it has recently started, and is in progress, strictly linked to the teaching experience, that aims to look at architecture and building within the complex relations between "intention" and "building convention", "sign" and "practicability", "image" and "intentional thought", working specifically on architectural details, that express the way and the shape to join parts, elements and materials.

Certainly the practice of assembling, huge consequence in the building market of the last industrial revolution, often completely modified the design process, turning it from the work of an artisan into a section of a more complex working structure, that is progressively depriving itself of the poetic content and delegate to specialised enterprises the choose of one, among the possible, detailed project (CAMPIOLI 1993).

However it still remains a wild space, also in the post-industrial society, to conceive architecture as a synthesis of *shape* (in the Aristotelian meaning), *function* and *executive technique*, in its turn conditioned by the material and the language.

The research is therefore based on the words and the shapes of *connection* in architecture, with a strong recall to the original meaning of the terms. In the Platonic and Aristotelian meaning *shape* is, in fact, necessary essence or substance of the things that have matter, that also means intelligible and conceptual character of material things. In the classical philosophy shape is not opposite to matter (as often

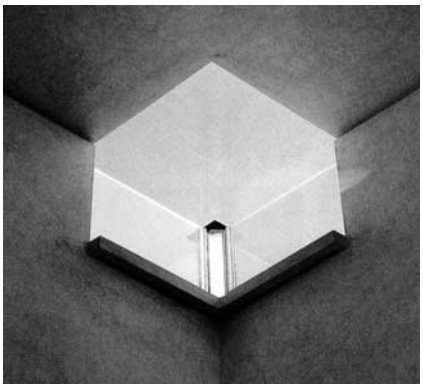

Fig.1
Carlo Scarpa, "Gispoteca Canoviana" in Possagno (TV), Italy, 1955-57.

Fig.2
Gerrit Rietveld, glass pavilion, Rijksmuseum Kröller-Muller, Arnhem, The Netherlands, 1965.

Fig.3
Traditional rural building in the open air museum near Gdansk, Poland.

occurs in contemporary architecture), but recalls it, assuming a role of priority. The matter, in fact, hold only the possibility of a shape, while the shape is the final cause of each substance, because, following Aristotle, it is possible to discuss of each thing as it has a shape and not for its material appearance. Therefore becomes very strict the relation between *shape* and *concept*, intended as term that express the necessary essence of the things.

Every great architectural masterpiece is based on one or more concepts that have been expressed through the choise of the material and the ways of connections, not banal, not repeated, able to confer uniqueness to the work. The architecture of Carlo Scarpa is an example of the conceptual research that subtend the design of details, for example in the glass dihedrals of the "Gipsoteca Canoviana" in Possagno (TV), where the shape of connection between two vertical planes (corner solution) is solved with the insertion of another glass slab rotated, on the horizontal plane, of 45°, making the angle free from the metal frame. In this way he obtains, using building techniques suitable to his time, a transparent prism anticipating the structural glass technology and, above all, the concept at its base. Scarpa, drawing this particular solution of the corner, was guided both from a poetic idea (to cut out the blue of the sky) and a functional need, becaude openings in the corner reduce the effect of glare the derives from the contrast between the light of the hole and the shadow of the wall.

In the same way, the glass pavilion glass pavilion by Gerrit Rietveld in the Rijksmuseum Kröller-Muller in Arnhem (The Netherlands), shows the concept and the research of the maximum transparency and lightness using simple glass, wood and glazing putty, many years before the

innovations introduced in the building market by the production of laminated glass and structural silicone.

The research started with the enumeration of the words used to express ways of joining elements and parts made of different materials and shapes (as an example "to draw near", "to superimpose", "to lean", "to embed", "to stratify") and from the collation of the meanings of the terms from different sources. Starting from this base different images have been gathered (both graphic and photographic) regarding details of existing buildings that express different solutions of the terms, both made of various materials and shapes and historical and geographical areas.

For example one of the first part and detail of the building that has been explored is the connection between the vertical support (a column or a pillar) and a horizontal plane. This geometrical junction could be solved in different shapes, in some cases conditioned by the use of materials, in other cases independently from them. The different shapes are directly expression of technical words. This kind of connection could be solved by simply superimposition of elements, or by partial or complete gain. Consequently, the way of connection changes depending also from structural and technical problems: in the case of the superimposition, as it

Fig.4
Gunnar Asplund, Skogskapellet, Cemetery of Stockolm, Enskede, 1918-20.

Fig.5
Traditional rural building in the open air museum near Gdansk, Poland. Detail of the connection between the wooden column and the roof.

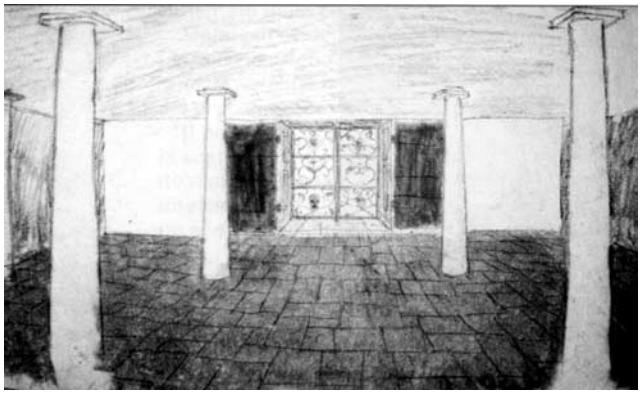

Fig.6
Gunnar Asplund, Skogskapellet, drawing showing the detail of the connection between the wooden columns and the roof.

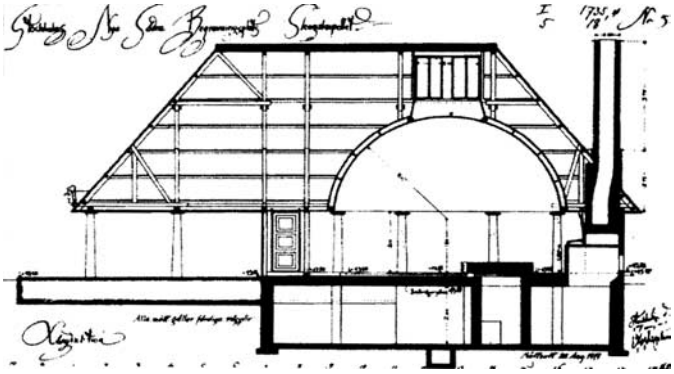

Fig.7
Gunnar Asplund, Skogskapellet, vertical section.

Fig.8
The corner of a Doric temple. Detail of the capital.

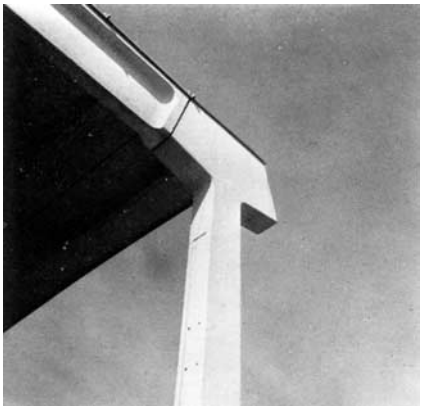

Fig.9
Angelo Mangiarotti, industrial prefab building in Milan, Italy, 1964. Detail of the connection between the concrete pillar and the beams.

is clear, often the junction is solved with the insertion of other elements able to better transfer vertical loads to the pillars, avoiding the dangerous inbond load (as an example the use of the capitals in classical architecture, that became a sort of archetype in the history of construction).

As a first approach they have been chosen masterpieces of the 20th century that, also for their constructive innovations, represent a high level of architectural language and expressions, in spite of some defects raised after time.

The research becomes very interesting and amazing, especially comparing the different solutions: it is possible to isolate the analogies and the differences, always effect of a particular architectural concept. There is an impressive analogy between the whole shape a rural wooden building in the north of Europe and that of the famous Skogskapellet in the Cemetery of Stockolm, by Gunnar Asplund. The woodland chapel is in fact a small natural construction, erected in the woods, among the vertical rhythm of the tree trunks. Approaching the building the differences between Asplund's work and the traditional one become evident. The particular way to solve the connection between the wooden columns and the ceiling (the beams are hidden by the ceiling and the junction is made of a

slight wooden slab) make the wooden-shingled roof seem like an abstract floating pyramid supported by a triple row of little Doric columns. The baseless columns, placed only a few meters from the same trees that it is clear they imitate do not seem to be holding up the low ceiling of the portico because their little capitals seem detached from the horizontal plane above them. New materials make possible to convert the shape of the connection between a columns and a beam from the superimposition (simple or improved by a groove-and-tongue joint) to the planar joint or the gain, especially working with reinforced concrete or new plastic materials, as it could be seen in the research of Angelo Mangiarotti, in the second part of 20th century. In his work the capital becomes a part of the vertical support and changes the way of connection into a gain. Of course, following such a language, the head of the pillar, inserted in the thickness of the roof, looses its original predominance; that is the reason why Carlo Scarpa, a sophisticated artist, decides to remark with different signs (a gilded collar on the head of the columns and the square "slot" on the surface of the concrete ceiling) as a memory and a modern interpretation of the archetype of the classical capital.

The collection of numerous images allows the reflection over the different relationship between the shape, the material essence, the technical and structural problems, the conceptual and stylistic ones. These images, now under implementations, allow to show to the students, each time, a rich heritage of architectural details and, moreover, a rich heritage of meanings and signs, to be re-interpreted and not simply copied.

During the workshop (especially linked to Architecture and Technology Construction Course) the students is

Fig.10
Exposition pavilion at the "Fiera del mare", Genoa, Italy, 1963. Detail of the connection between the concrete column and the roof.

Fig.11
Carlo Scarpa, "Banca Popolare di Verona", Italy, 1973-81. Detail of the connection between the concrete columns and the ceiling.

invited to explore "small architectural themes" (a roof structure, an opening, a staircase…), to choose autonomously materials and building techniques studying also in detail the relations between built shape, materials and way of connecting different parts and, of course, concepts and ideas that support the architectural choices.

Furthermore the student is invited to carefully reflect over the implications and the consequences of its personal choices on the field of the possibility to construct, the economic feasibility, the inclination to physical decay, the duration ad, at last, the way of future maintenance.

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Iconographic Sources

Figures n.1 and 11 come from the publication by Sergio Los, *Carlo Scarpa*, Taschen, Köln, 2002.

Figures n.4, 6 amd 7 come from the magazine "Controspazio" n.5, 1998.

Figures n.8, 9 and 10 come from the publication by Enrico D. Bona, *Angelo Mangiarotti: il processo del costruire*, Electa, Milano, 1980.