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UTENSIL-STRUCTURES
THE LANGUAGE OF INSTALLATIONS AS AN ITALIAN TECTONIC TRAJECTORY (1965-1975)

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ABSTRACT
The technological issue of the relationship between mechanical services and structural research in the architecture of 20th century became certainly one of the most important lines for development and innovation of Modern architectural style. With respect to this topic, the paper analyses, as a key of interpretation, the role of installations to determine the relationship between envelope and structural layout in the constructive logic of the framework. In this sense the paper highlights on the type of single-storey factories built in Italy between 1950 and 1975, analysing some built works by Marco Zanuso and Aldo Favini through the archival records. These works show how this type of building gain to paradigmatic innovations, transforming the tectonic joint into an integrated device, whose form was the result of the definition of the mechanical components as technical writing.

KEYWORDS
form and structure, mechanical services, tectonic, prefabrication, reinforced concrete

From the end of 19th century to date, the technological apparatus of the mechanical services has become increasingly pervasive within the architectural design. The current effect of the cost of system equipment on the cost of a conventional building ranges «to 30% of the total building cost-and in some cases more than 50%» (Paricio, 2016, p. 117). Today, this clearly emphasizes the importance to develop strategies that turn a logistical and economic issue in a technical and figurative potential for the architectural expressiveness. Despite the advent of technological systems dates from the early Modern (Giedion, 1970), the available literature on the relationship between architectural and plant design is quite minimal, compared to the current importance of the issue. Actually, the notion of comfort intertwines with the origin of sedentary living, as underlined by Reyner Banham: «The mankind started with two fundamental methods of environmental control: the first one, avoiding the problem and hiding under a rock, a tree, a tent, a roof (this conducted to the end of architecture which we know), the second one, struggling with the place weather, usually through a camp fire» (Banham, 1974, p. 138). It is in this connection that the issue of the mechanical services based on the ontological relationship between the mankind and environment, thus to the way in which the man interpreted the oppositional dichotomy between construction and nature.

In the first half of 20th century, the evolution of the concept of comfort spawned the

process of the mechanization of the building environment described by Siegfried Giedion (1970) and Reyner Banham (1994). This more and more bulky presence of the mechanical services was going hand in hand with an architectural research on the «spatial continuum» which was to correspond to a «thermal continuum» (Prieto, 2016, p. 63). However, the two needs of continuity engendered two different languages: one mechanical, consisting of pipes, cabins and ductworks, the other consisting of the architectural elements, such as walls, pillars, ceilings and windows. In order to avoid any figurative conflict, it is inevitable that the architectural language should face with the 'language of installations' (Cocito and Frateili, 1991). Can this dual conflicting language turn to a possibility for Modern Architecture innovation? Finally, if the coexistence between architectural and 'mechanical vocabulary' is possible, how this aspect can influence the evolution of architectural language?

On the basis of these questions, the paper suggests a reflection on the emblematic cases in which one can identify the milestone of Modern architectural language innovation and evolution, in the equipment problem. The aim is to help demonstrate that the Modern architecture provided for best practices examples in which air conditioning, lighting and drain systems are not additional elements 'a posteriori' with respect to the architectural design, but they play a substantial role in the technical-figurative innovation. In order to investigate this matter more thoroughly, the paper would assess the impact of mechanical services in the relationship between structure and envelope (Fanelli and Gargiani, 1999). As the use of the framework becomes more and more diffuse in the structural layout of modern building, the complexity of the envelope grows at the same pace (Beccu and Paris, 2009). In this context, the idea of well-tempered environment plays a fundamental role in those cases in which the architect chooses to turn the obstacle of the installations to a creative component, favouring a correlation to the definition of the envelope or the structure.

Focusing on the relationship between structure and well-tempered facilities, the paper investigates more deeply the type of the reinforced concrete single-storey factory in Italy, during the period between Fifties and Seventies of the 20th century. It can be established that this type is precisely that which shows the most interesting innovations in the relationship between the structure and mechanical services. Indeed, the architects and engineers focus on the design of tectonic joint beam/pillar that becomes an integrated device that consider the apparatus for the comfort in the factory as a «technical writing» (Graf and Marino, 2016, p. 10) which favours the expressiveness of the construction. Therefore, the paper will focus on a comparison between two authors' design methodologies – Marco Zanuso and Aldo Favini – which explore the issue of the essay through several built works. Hence, one will propose critic drawings which analyse the process of definition of the architectural order, shaped by utensil structural elements of the framework.

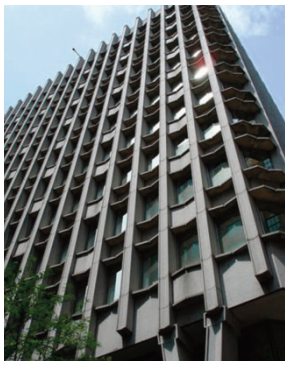
The language of air-conditioning system as determiner of the envelope in the framework structures – For focusing on the proposed issue, it is necessary to point out the

modalities through which mechanical services turns into deliveries of the building. Welcoming the belonging of installations to the well-tempered devices of the building, it is possible to cover two types: active deliveries and passive barriers (Banham, 1994). Active deliveries are the apparatus of mechanical services that produce environmental benefits through a direct impact (ventilation system, artificial lightning, air conditioning etc.). For passive barriers, one intends any architectural element that controls the environmental shifts between indoors and outdoors, in order to preserve or, on the contrary, facilitate the modification of the inner thermal condition (solar shading systems, opening and closure systems etc.). From the beginning of 20th century, the active deliveries raised two groups of problems for the designer: «the first group regarded changes to the building apparatus – especially the research for a space to arrange mechanical services and the necessary modifications to the construction.

The second group regarded the constructional modifications made easier by the installation of the new deliveries, especially the freedom to do not yet adapt the construction in order to provide to environmental qualities» (Banham, 1995, p. 67). Whereas, on one hand the presence of active deliveries raised new spatial integration needs, on the other hand it offered new possibilities for shaping architecture and structural language. The inner comfort of the building, that at the end of the 19th century worked with a passive barrier effect, thanks to the thermic inertia generated by the thickness of the perimetral walls, have been replaced by the transparency and thinness of the Modern structure, ensured by the active deliveries.

The most important consequence of this phenomenon was the separation between structure and envelope (Frampton, 1999). The control of the mechanical services played a fundamental role to determine this relationship, because it became an unavoidable aspect of the Modern building. In this sense, it seems to be interesting refer to the question of the control of air conditioning within the design of the façade in the multi-storey buildings. Indeed, this issue affected especially office and store buildings which provided for a diffuse inner compartmentalization, thus a widespread indoor air quality.

The need to equip this kind of building with a centralized system of ventilation, created a network of ducts, ramifying from a central cabin and branching the whole building. Starting from Fifties, one of the most common air-conditioning system was the dual duct that combined cooling and heating tubes: the first one was linked to a chilled water circuit, the second one to a heated water circuit. The ‘dual duct’ system has been used in two iconic Modern buildings as the Rinascente (1957) designed by Albini & Helg (Fig. 1), and the Blue Cross and Blue Shield Building (1956-60) by Paul Rudolph (Marino, 2016; Fig. 2). In both cases the ventilation system was «octopus-shaped, […] coming from the top and encircles the whole building» (Rohan, 2007, p. 100). The air conditioner mechanicals were placed on the rooftop and the ductworks branches to the perimeter, engendering a visual interference with the grammar of the façade. However, both designers saw the limitation of air-conditioning system for the façade expressiveness as an opportunity to discover new Modern



Figg. 1, 2 - Franco Albini, La Rinascente*, Roma 1956, Paul Rudolph,* Blue Cross and Blue Shield buildings*, Boston 1956 (credits: www.rchidiap.com; Sean Khorsandi).*

architectural languages, intrinsic to the 'accidentalità tecnica' (Marino, 2016).

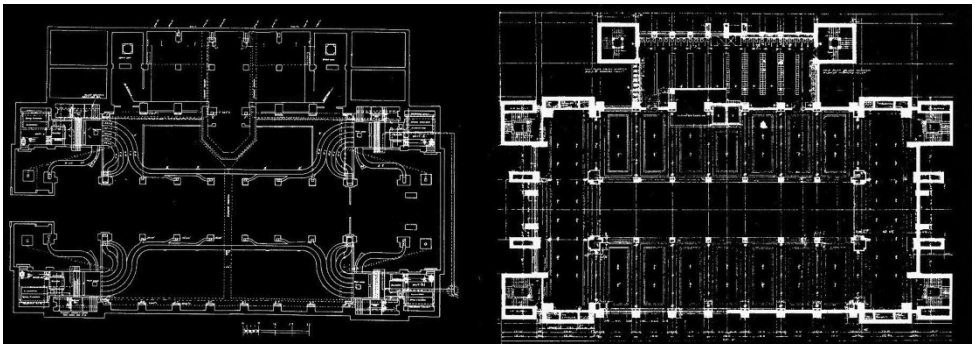
The Albini & Helg's design strategy identified the cladding system of the steel framework as the element to put in representation the 'services language'. Working on the thickness of the envelope, Albini designed wrinkled prefabricated panels which hided the ductworks and pipes within them. As Banham said, «the finally crimped envelopes are thus a dual role: passive barrier against exterior climate conditions, and active delivery vehicle for indoor environmental comfort» (Banham, 1995, p. 256). Paul Rudolph created through precast prefabricated panels a 'dummy exoskeleton' which replicates largely the grammar of the structure in order to put the hot and cold air ducts in the space in between, minimally they added secondary elements to the façade as the attenuation boxes under the windows and the mullions that housed the return air duct. Through these elements «On each floor, hot and cold air mixed in an attenuation box located between the columns and was then blown inside. A third non-structural pier, which was not backed by a steel I-beam, contained the air-return duct that sucked used air back up to the thirteenth-floor mechanicals» (Rohan, 2007, p. 99).

Whereas this first approach showed the possibility of mechanical service to create a façade grammar in a structural framework, the second approach adopted the strategy to consider the installations as spatial elements of the design. Thus, in this second approach, the mechanical services were no longer considered as linear elements, rather as three-dimensional and volumetric places. As Banham said, the idea of mechanical services as servant spaces stem from the traditional concept of chimney and water ducts as «intervention in plan and in section view of the building» (Banham, 1995, p. 13).

For understanding how developed in Modern history this traditional spatial idea of mechanical services, it is possible to refer to two authors: Frank Loyd Wright and Louis

I. Kahn. In the Larkin Building (1902-05; Fig. 3) Wright wrapped a brick wall envelop to a steel framework in order to impede to the surrounding factories emissions to reach the office building workers. For the same reason, the architect introduced in the corner of the building four ventilation towers (Fig. 4): sucking outdoor air from the top, the system makes it flow to the basement; here the air was cleaned and pumped in the building through the hollow pillars of the central hall. Hence, in this case, the question of the mechanical services turned in to a monumental effect of the building, that increases in massiveness through its envelope.

This possibility of the 'pochè' was developed by Louis Kahn putting the perspective of the relationship between installations and envelope to a new dualism between installations and structure. Whereas the structure engenders the space, the mechanical services assists in determining the shape of the structure. The case in point are the tetrahedral-shaped ceiling of the Yale Art gallery (1951-53), in which the structural cavities were needed to hold lightning and air-conditioning system (Fanelli and Gargiani, 1999, p. 594); the brick shaft towers of Richards laboratories (1957-64) that, similarly to Larkin building, hold the outdoor air ducts. The most interesting solution for the issue of this research is the preliminary proposal for the Salk Institute laboratories (1959-69). In this project the form of the structure corresponds to the Arcaismo Tecnologico of the



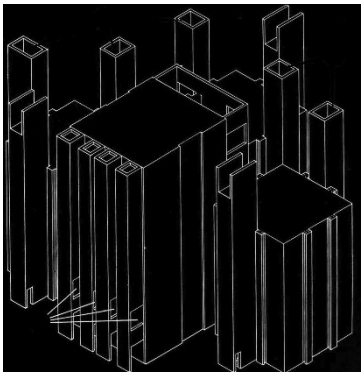


Fig. 3 - Frank Loyd Wright, Larkin Building plan, Buffalo 1902-1905 *(credit: by the author, based on a picture published on Fanelli and Gargiani, 1999).*

Fig. 4 - Louis Kahn, Ventilation towers layout in Richards Laboratories*, Philadelphia 1965 (credit: by the author, based on a picture published on Banham, 1995).*

Richards laboratories towers[1]. Here, the beams became «pipe spaces» that «carry the mechanical services in an underbelly designed for easy servicing and linear distribution» (Leslie, 2012, p. 783). Therefore, Kahn transformed the relationship mechanical services-envelope-structure in the constructive logic of the framework. Even if in the Albini and Rudolph's buildings this relationship became a stratified envelope that encircled the exoskeleton, in the case of Kahn the mechanical services were synthetically absorbed by the 'system-structure'. This system of «hollow stones» corresponds to a «whole range of essential bodies to constitute the shelter and making the space habitable» (Fanelli and Gargiani, 1999, p. 436). Both these trajectories may be established as milestones for some Italian built works.

The framework in the reinforced concrete single-storey factories as scope of trial. The 'system-structure' in Italy between 1950 and 1975 – After the second post-war, in Italy, the industrialisation of building radically renovated the places of production. The coming of prefabrication and prestress in reinforced concrete technology transformed the idea of framework which, in the specific field of single-storey factories, allowed to architects and engineers new degrees of freedom and, at the same time, this innovation invited them to rediscover the classical meaning of 'trabeated' structure. The monolithic continuity typical of the Maillart and Hennebique's reinforced concrete structures was replaced by the discontinuity of prefabricated components which generated an 'atomisation' of the typical reinforced concrete framework and created a conceptual proximity with steel framework solutions. Thus, in the manufacturing of foundations, pillars, beams and decks, the architects researched an expressiveness of each one element[2]. This new kind of framework had to fulfil the request of the programme for a bulky equipment service, which must ensure to the worker the necessary comfort for the production.

These aspects quickly showed that «a building made by components is precisely at ease in the field of installations, because of favourable requirements, commencing with the industrial production of structural elements» (Cocito and Frateili, 1991, p. 87). As demonstrated by Albini and Rudolph, the possibility to predetermine the design of structural elements, offered by the prefabrication, allowed to optimise the interaction with structural layout and services layout. Thus, the 'system-structure' proposed by Kahn, which brought static and mechanical components in a unique shape, can be applied to the reinforced concrete single-storey factory. This implies that «the structure was not shaped with abstract criteria, without first being carry to a research on mediated combination with installation needs» (Cocito and Frateili, 1991, p. 90). The key architectural tool of this process is the bay, through which the second post-war Italian designers created as a question-answer mechanism (Gubler, 1985) the structural form according to the service apparatus. Indeed, the bay embodied a flexible and repeatable spatial-structural cell, which established a system of relationship between architectural components (namely the structural joint) and the control of the inner environmental comfort. In this way, the structure hid a network of canal-

Fig. 5 - Marco Zanuso, Comparison between the originary shape of the beam (with the air conditioning cabin) and the current state of conservation which reveals the structural hollow, Necchi Factory *in Pavia, 1965 on the left and 2019 on the right (credit: F. Ferrarese, 2019).*

isations, acquiring the typical proportions of the structural classicism: «solid in appearance but hollow in construction» (Graf and Marino, 2016, p. 30).

Each bay, as a 'spatial genome', was shaped as an environmental apparatus which had to equip the building with passive barriers (water-draining system, natural lighting system) and active deliveries (air conditioning system, artificial lighting system) for every unit of space. However, the dimensions and the key role, which these deliveries play in a general factory program, is such that each structural element was no longer simply the container of ductworks, skylights or channels, but the trabeated structure was shaped complying with a complex installation requirement. Thus, «the pipes enhanced trilithic horizontal and vertical elements that does not confine itself to support bending forces but brings the lifeblood of the architecture. The 'impianto-struttura' results in a new order» (De Giorgi, 1999, p. 19).

Marco Zanuso and Aldo Favini. The Utensil-structure in the Necchi and Kodak factory (1965-75) – Between Sixties and Seventies, Marco Zanuso and Aldo Favini proposed the most relevant experiences on the idea of system-structure, working on a new expressive architectural order related to the prefabricated reinforced concrete framework. The comparison between the two authors is the more interesting because they analysed this issue from different points of view: Zanuso was one of the most prolific architects of the second post-war Italy and Favini was a leading figure of Italian school of engineering, belonging to the 'concezione strutturale'.[3]

Marco Zanuso, as Kenneth Frampton underlined, was the Italian 'designer to industry' (Frampton, 1999). Since the early Fifties, he developed a design method for the factory, called 'progettazione a posteriori' (Guiducci, 1959), which created the Adriano Olivetti's confidence. According to Zanuso, in architecture the form is a result of «adherence to technical reality», within « the structure becomes architectural expression to the extent that it was conceived with the whole building […]. It exists an object, a form that drives […] from the definition of the joint […], to the distribution of a mechanical services» (Zanuso and Vittoria, 2013, p. 178). Roberta Grignolo affirmed that, «in his single-storey factories, the structure had not only a load-bearing role, but became in each case something more: a support for the lighting systems, a device for water draining and air conditioning systems, or a vehicle for the energy transport. In this way the Zanuso's sequence of projects can be read as a progressive complexification of the pillar/beam system, which incorporates several facilities» (Grignolo, 2013, p. 39).

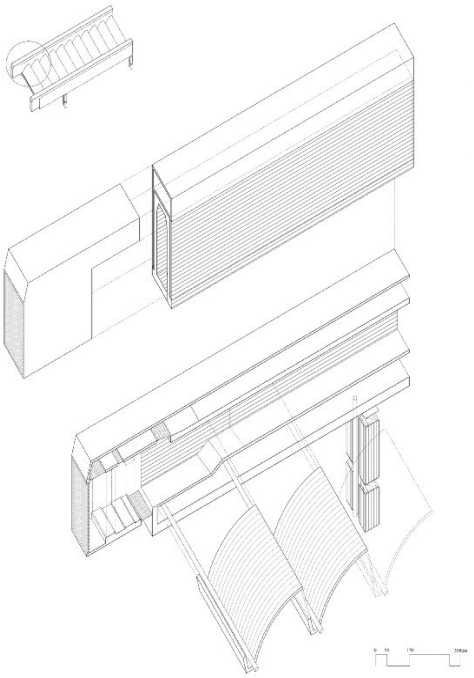
In this way, we would consider the Zanuso's gradual process of innovation: starting from Cedis factory in Palermo (1956) to the Olivetti's prototypes tested in the Scarmagno, Crema and Marcianise production plant (1967-72). In this process, the beam assumed the role of «genetic code of the building» (Faroldi, 2007, p. 34), providing for the external water draining and inner reflection of natural sunlight (in the Cedis Factory). In the Olivetti factory in Merlo the same structural element became a duct-beam, incorporating in the hollow section the pipes for air conditioning system. In Scarmagno,

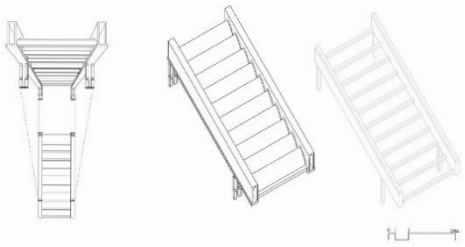
Crema and Marcianise, the primary and secondary beams were shaped on the basis of the grid of the ventilation system, working in a multidirectional way. However, the Zanuso's radical innovation consisted of transforming each beam in an autonomous air conditioning system. This approach would mean that the centralised ventilation system, as one saw in Albini and Rudolph work, was replaced by the introduction of local conditioner for each beam of the structural layout. From the perspective of structural language, this strategical choice generated, an interesting consequence: the beams were no longer simple containers of the installation's ductworks, as the Kahn's principle of integration between systems and structure, but Zanuso disclosed their utensil role exposing the crankcase of the ventilation box. This device gave to consider mechanical service as the ornament of the architectural language. The outcome was a calibrated balance between unveiling and concealment of the mechanical facilities, interchanging the principle of integration with juxtaposition between structure and systems.

This operational concept reached an interesting conclusion in the Necchi factory in Pavia (1965): the considerable dimensions of the structural bay, stood 7x28 meters (Fig. 5). The bay consisted of two cyclopic duct-beams (m 3,80 high x m 83,60 long), ten vaulted sheds, four pillars hinged both on the centreline and on the top. The programme requested by the customer was specifically complex: «The structure needed to be efficient for the placement of air conditioning system, possibly with differentiated treatment and it must provide for the distribution of all complex equipment such as, cold and hot water, lubricants, acetylene, electric energy, vapours» (Zanuso, 1965, p. 103; Fig. 6). This explains that «the roof framework consisted of great hollow rectangular-shape beams, capable to house inside the ductworks for water draining system, the pipes for air conditioning system and on the head, the cabins of ventilation» (Zanuso, 1965, p. 103).

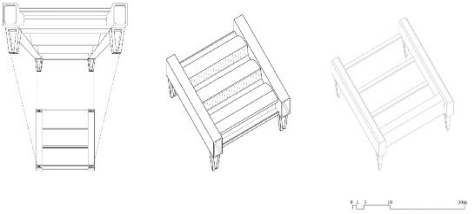
With respect to the design for Olivetti factory in Merlo praised by Banham, the clip-on solution of the ventilation nozzle was transformed in a shell which enveloped the outline of the beam, creating a unique continuous form (Fig. 7). The presence of the air conditioning cabin within the horizontal structural element, was exposed on the façade through the grill of the nozzle, as an ornament of the beam head. In addition to the reasons set out above, the Zanuso's design choice moved in the direction to create a «technological dolmen» (Prina, 2007, p. 70), giving a cyclopic outcome of the trabeated structure, amplified by the hidden installations.

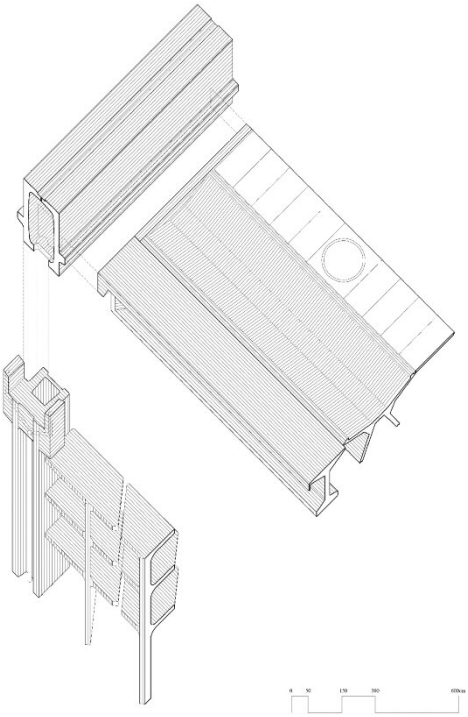
Aldo Favini – Gustavo Colonnetti's collaborator at Lausanne Polytechnique during the second war Italian emigration in Switzerland – is considered as one of the most important interpreters of the prefabrication and prestress technique in the reinforced concrete system. In the context of the architecture for industry, the Italian engineer focused on the research of concrete prefabricated components for elementary structural layouts, in which «the research of an essential design» was due to the «simplicity of execution and set up» (Molina, 2004, p. 11). Favini started his career as designer to single-storey factories and warehouses in the mid-Fifties. Through the collaboration with Carlo Rusconi Clerici, the engineer's structural alphabet developed in the direction to resolve the issue of mechanical





Figg. 6, 7 - Marco Zanuso, Necchi Factory, *Pavia 1965: Graphic analysis of the prototype; Section of the Beam (credits: interpretative drawings by the author based on some microfilm accessible in FMZ – Archivio del Moderno, dell'Accademia di Mendrisio, 2019).*





Figg. 8, 9 - Aldo Favini, Perugina Factory*, Perugia 1962, and Aldo Favini with Gianluigi Ghò,* Kodak Factor, *Marcianise 1972-75: Graphic analysis of the prototypes (credits: interpretative drawings by the author based on the panels available in FAF – Archivi storici del Politecnico di Milano, 2019).*

deliveries. Indeed, Rusconi Clerici built up considerable experience in the management of the installation in architecture, through the experience collected during the design of the Pirellone (1955-60) and the Siemens headquarters in Milan (1955-57).

The long cooperation between the two engineers started from the late Fifties in the occasion of the Perugina factory commission in Perugia (1961) and the FIMI factory in Rescaldina (1961). These buildings had the same typical plan and structural layout: the main roof framework consisted of prestressed box-beams, 2.40 meters in height, the secondary framework consisted of sheds shaped as parabolic-vaulted, already experienced in Dormelletto (1950), four pillars V-shaped, hinged on the foundations (Barazzetta, 2016). From the analysis of the Perugina factory's drawings, kept in the Polytechnique of Milan historical archives, one can recognise the form of a typical structural element in the work of Favini, such as the duct-beam. On the lines of what was done by Kahn and Zanuso, the beam became a spatial structure, in which the hollow section contained in the upper part the ducts of air conditioning system, in the lower part the water draining system.

The structural gigantism of this element not only created a servant space for mechanical services, but it implied that the beam-duct became an accessible technical plan. This invisible space housed on the inner side the air conditioning cabin that encircled all the spatial unit through the ductworks placed in the U-shaped beams of the sheds. These two frameworks, as hollow stones, were carved out in the upper part, in order to place the ventilation nozzles which ensured to the work a thermal comfort; in the lower part the rain-ducts crossed the secondary roof framework and engaged in the vertical strut contained by pillars. Thus, in this case, the issue of installations overturned the relationship between structural thickness and utensil thickness of the components (Fig. 8), generating, in the field of trabeated structure, a new expressive architectural order, based on archaic proportional dimensions. In the Max Market factory (1965), the water draining system became itself a structural system, gaining the role of tectonic mechanism. Indeed, the strut of the rain-duct, incorporated in the pillar became the tenon of the joint between beams and supports and ensuring the structural continuity and stiffness.

In this way, Favini initiated a process of tectonic assembly production, through a gradual refinement of design solution, leading to an interesting conclusion embodied by the commission of the Kodak factory in Marcianise, designed with the architect Gianluigi Ghò (1972-75). In the report of the project Favini declared that the form of each element of the bay came from the need to employ for static purpose the contours coming out from technological systems (ventilation, water drainage etc.); these equipment are strictly demanding, due to specific internal needs » (Biraghi, 1976, p. 653). The plan view of the pillar was asymmetrical H-shaped, in order to «on the external side, placing the drainpipe, incorporated in the capital on the top of the pillar […]. In the inner side, the pillar housed the air conditioning ductwork»[4]. The main beams were double C shaped, according to the reinforced concrete box-beam typology. This shape was due to the provision in the hollow part of the beam (1,50 x 1,20 centime-

tres), of an «[…] hidden pipe of air conditioning with entrance and exit holes on the lower face of the beam» (Fig. 9).

These ducts were linked, as the same technological octupus-shaped system described by Rudolph, to the air conditioning cabin placed in a upper volume in the center of the building. The 'copponi' (this term was used by Favini to indicate the secondary roof framework elements, supported by the main beams) were X-shaped, reflecting the static necessity to resolve the bending moment already experienced in the Church of Baranzate. Furthermore, this kind of section allows to optimize the inner flow of the air and turned to a rectangular shaped section near the support base, forming the lateral partition of the eaves drain pipes. The boarder beams were double T-shaped, in order to avoid the dripping on the façade; through a concrete lift which consent the continuity of water draining system. The envelope system worked as passive barrier in order to shade the building from the hard sun of the South of Italy. It consisted of five brise-soleil, prefabricated on-site, consisted of a strut with fixed size and three shelfs which changed grade on the base of their solar exposition.

The tectonic trajectory of the Utensil-structure – In conclusion, it is possible establish methodological consonances, in the restricted field of single-storey factory, between Zanuso and Favini. For the two authors, the structure, as spatial system which responds to all the needs of the human habitat, constituted a common field of research. However, the Zanuso and Favini's hollow architectural orders gain a new perspective, implementing the formal research with the adherence to the technical reality in which they work. In this sense, the issue of mechanical system is not separable from the structural concept of the architectural organism, but rather it is both part of the reinforced concrete structural language and the topological definition of the elements of the bay. In other words, the two authors designed utensil-structures: «Whereas the scientific research abstracts from particulars and investigates the rule which dominates and gather them, the technique, on the contrary, deals with natural elements in any of their parts, in order to achieving a synthesis of the purposed scope. Thus, the builder recognises in each stone of his building an individual, identified by a name with reference to the function. At the same time, the technician turns his attention to the purpose: the utensil must satisfy all the needs and processes of use. Thus, one looks beyond the construction (not the utensil in itself but the work it must to do)» (Dessauer, 1933, p. 17).

This kind of technical building can reach to architectural expressiveness, if the designer recognises its 'utensil nature' that resolve the issue of installations avoiding the genericity of the prefabrication. In the displayed designs, the structural elements, preserving their topological and tectonic relationships, turned to technical utensils, capable to fulfil a static, figurative and technological solution in a unique shape. The bay, as the control device of the element's relationships, become a mechanism that responds distinctively to the multiplicity of the architectural demand. In this regard, there is a still true tectonic trajectory for the technological innovation.

NOTES

1) The expression Arcaismo Tecnologico was coined by the section 'selearchitettura' with reference to Richards laboratories. See *L'architettura: cronache e storia*, anno VI, n. 6 (1960), pp. 405-411.
2) Looking at the Angelo's Mangiarotti industrial buildings, in the Sixties and Seventies, it is clear how the leit motif is embodied by the tectonic joint, made by the assembly principle. See: Graf and Albani, 2015.
3) The term indicated the renovation of the technical expressiveness, during the second post-war in Italy. See: Desideri et alii, 2012.
4) The description comes from the unpublished report of the project, written by Favini and kept in the Historical Archives of Polytechnic of Milan – Fondo A. Favini.

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