

# STEEL AND CITY

## Metal construction in Rome in the 20<sup>th</sup> century

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### Abstract

The PhD research proposes a reflection about the relationship between the steel construction and the city of twentieth century in Italy and it examines, as an exemplary case, the urban context of Rome. The investigation analyses not only the design of steel buildings and infrastructures realised in a complex urban environment that is rich of historical signs, but it intends to demonstrate the existence of a significant architectural heritage, related to modern technologies that are radically different from the local building tradition.

The couple of terms "steel and city" doesn't mean a common connection between contents and container, but it is considered as a symbiotic relationship between categories that are apparently separated, indeed metal construction has played an important role for the modernization of cities in the twentieth century and this condition is deeply realised in Rome, where new offices, commercial buildings, and infrastructures, request steel for many reasons that are not only functional.

One hundred architectural works with steel structure, realised in Rome in the twentieth century, have been selected for the research and they have been listed in a catalogue, that is ordered not only chronologically, but also according to the different categories of urban morphology and perception. Most of selected works show the influence of international architecture and modern language due to the fact that Rome tries with many difficulties to acquire an imported linguistic code, but it is also evident the effort of architects and engineers to balance the modern language with the historical signs that have been settled over the centuries. In the "Eternal City", composed of brick and stone architecture according to popular imagination, the steel construction seems to mark a deep discontinuity compared with the urban context and the research focuses on the results of this dialogue: to understand how steel construction has assumed distinctive features of the city where it is located and which effects have been produced in the urban context following a new figurative lexicon due to the steel technology.

Christian Norberg-Schulz chose Rome as one of the best examples to argue the correspondence between location, settlement and architectural detail in his famous book "Genius Loci"<sup>1</sup>, so Rome seems to be the ideal city to analyse how steel technology is able to match the urban context, always suspended between modernity and tradition.

## 1 Aims, objectives and methodology of PhD research

The city is a matter of time: a complex container prone to continuous metamorphosis and an object that is able to grasp constant transformations through the built works, each one representative of a specific technology on the basis of time. Despite in each city it is possible to observe a gradual technological stratification, in some urban contexts built heritage and historic tradition constitute crucial influence factors for the introduction of new materials and techniques.

For instance, Rome is known all over the world for the presence of its precious historic heritage and it is usually represented by an urban scenario in which are used traditional materials like bricks, mortar and stones but also in this old city the upgrade of functional and infrastructural equipment, necessarily leads to the introduction of modern technologies, that apparently seem to be opposite for its appearance. Between them, metal construction and particularly steel, have played a key role for the transformation of the city and despite the application, sometimes their results are obfuscated in order to keep alive the stereotypical configuration of urban landscape.

The PhD research is a consequence of this introductive condition: it focuses on the relationship between steel construction and consolidated city of 20<sup>th</sup> century, considering Rome as the ideal case-study and proving that there are several buildings and infrastructures using steel instead of local building materials.

The first research objective is indeed linked to the great number of built works: Rome is not usually considered as a reference for the study of metal construction in Italy, therefore reaching a relevant amount of interesting cases is a decisive step towards the establishment of a technological heritage that is largely unexpected for experts and specialists of the city.

The second objective consists of describing the continuous dialogue between steel construction and urban context from the point of view of architectural language. Metal construction usually recalls an imported language, an international and derived code that is particularly influent in the 1900s and that has to match the expressive register settled in the Eternal City. Therefore the research focuses on the results of this dialogue: how steel construction grasps distinctive features of traditional language and which effects have been brought into the urban context using a modern figurative and technological lexicon.

The analysis of built works design, construction phases, type of customers, technological components and architectural expression, allows the establishment of a fundamental contribution to manage the knowledge that is useful to the future intervention programs. Some of them are starting these years and the most ambitious research objective is the foundation of a monitoring centre for metal construction in Italy, that could supervise progressive conditions of steel architectures, not only in Rome, paying attention to the respect of figurative and technological values of urban contexts.

The research work comprised three main stages. The first one concerned the research of metal constructions placed in Rome, with particular regard to civil and infrastructural works using steel structure in the 20<sup>th</sup> century and the last decades of 19<sup>th</sup> century, when this technology has been introduced. Indeed it has been carried out a bibliographic survey with the help of historic architectural and engineering reviews, manuals and other publications using this data it has been written a long catalogue with one hundred realisations, that could be ordered not only chronologically, but also depending on urban location, designers and builders involved.

The second work stage concerned the consultation of archive sources in order to complete eventual gaps of bibliographic research. For each realisation it has been verified the availability of archival documentation: the most of it has been examined in Central Archives of the State, Architecture Archives Centre of MAXXI, Capitoline Archive, private archives of Roman designers and companies archives placed outside the city.

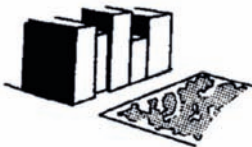
















**p.1**  
Square showing one hundred works of the catalogue



The third stage dealt with the selection of an argumentation criterion and from the analysis of built works it has been chosen two thematic addresses: description of metal technologies before the Second World War mainly follows a chronological key that allows the comprehension of the difficult relationship between city and new materials, instead for the second part of 20<sup>th</sup> century, because of the largest number of realisations, a morphological criterion has been chosen, therefore built works has been classified according to their physical features related to urban settings. The interdisciplinary study of urban semiotics, that concerns the management of useful tools for the description of physical city space and the interpretation of its numerous signs, has been fundamental and between the theories, that developed in 1960 by Kevin Lynch and shown in the book "The image of the city"<sup>2</sup> has been evaluated as ideal to draw a simplified structure of the city and to propose critical reflections related to steel architectures of Rome.

In the Lynch's theory contents related to physical forms could be classified in five types of elements: paths, edges, districts, nodes and landmarks. Metal constructions, that clearly are part of the urban structure, have been therefore divided in five groups, according to Lynch's categories, to which five thematic addresses are consequent. The classification is not only suitable to easily manage the location of built works in a complex urban texture, but it is especially advantageous to develop reflection criteria that are born from the relationship between urban contexts and physical-architectural features of realisations. Indeed each one has used specific composition and morphologic strategies for a particular urban area, that shows constitutive elements ascribable to Lynch categories. In this contribution couldn't be shown the totality of cases for each category, but it will be presented at least a couple of realisations, representative of an opposite behaviour for each one.

<b>1. EDGES</b>			
<b>2. NODES</b>			
<b>3. PATHS</b>			
<b>4. DISTRICTS</b>			
<b>5. LANDMARKS</b>			

**p.2**  
Connections between  
Lynch's categories, urban  
elements of Rome and  
steel architectures

## 2 Metal construction in Rome before 1945



The applications of cast iron, iron and steel in the years before the Second World War, represent a fundamental foreword and reveal a complex relationship, sometimes conflicting, between city and metal construction. Rome experiences for the first time the adoption of new materials from circa 1850, in a crucial period for its political and administrative history, by recourse to the importation of technological components and design knowledge, useful to provide for the underdevelopment of metallurgic industry and the absence of specific educational programs in engineering schools. However, in the city that becomes "the only capital in the world of two independent states"<sup>3</sup>, metallic construction is used to realise many architectures with a relevant urban interest, like large span bridges or roofs, multilayered buildings, sometimes introducing new typologies as in the case of department stores, or service buildings for production and new urban systems. The comparison between these latter cases permits to clarify openness and limits granted to metallic construction: in the department stores "Alle Città d'Italia", built in 1890s in Largo Chigi in the historical city centre, cast iron columns and iron beams are conveniently covered with gypsum ornamental decorations and the whole building is inscribed in a masonry perimeter, externally carved according to the features of the context and the eclectic taste of time<sup>4</sup>. Instead infrastructural realisations, like Ostiense gasometers or General Warehouses devices, show with ease their iron nature, even if also for this field there are some cases of hybridisation with the historic language of the surroundings, as in Garibaldi and Palatino bridges, that use different steel beams for the decks sustained by masonry abutments and piers, clad with carved stones in order to reach the better integration with the classic urban context<sup>5</sup>. Therefore dissimulation of metal construction is largely spread, because iron materials are considered necessary devices for the city modernisation, but they are also viewed as discordant elements in the traditional Roman panorama.

This scenario is strongly embittered in the period between the two wars: the linguistic choices of Fascist Regime favour the adoption of the Rationalism in architecture, for which stone claddings and sculptural composition of volumes leave little room for metal construction expression<sup>6</sup> furthermore in a paradoxical way, despite the period is characterized by the strong increase of metallurgic industry due to wartime reasons, the shortage of raw material consequent to autarchy penalties, makes metal elements rare and unavailable for building constructions<sup>7</sup>. However also with these difficulties, there are sporadic cases of interesting technological experimentations addressed to the field of large span roofs: the Aviary of City Zoo is one of the first metal diagrid structures made of exposed steel tubes, instead for the large hip roof of Palazzo dei Congressi in the E42 district, steel beams and joists are concealed again under cladding materials like wood and travertine panels.

### p.3 - Comparison 1

two pictures up: Alle Città d'Italia Department Stores and its covered iron structure (G. De Angelis, S. Bucciarelli, 1890)

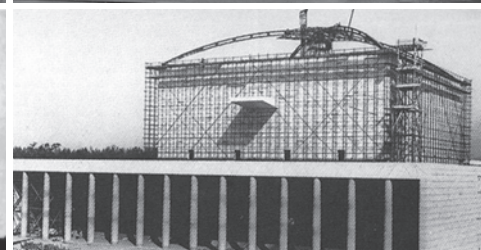
picture down: Ostiense Gasometer and its exposed metal frame (S. Cuttler & Sons, 1910)



### p.4 - Comparison 2

left: Aviary of City Zoo near Villa Borghese and its diagrid tubes structure (R. De Vico, 1936)

right: large span roof of Palazzo dei Congressi (A. Libera, G. Covre, 1943)





### 3.1 Steel and historic edge - Exhibition, dissemblance and antiquities

The edges represent containment lines of urban textures, barriers characterized by high visual preeminence and low crossing permeability, that confer borders to the progressive development of built mass.

In the second part of 20th century, defensive fortification of Aurelian Walls, don't represent anymore a limit for the staggering urban growth of Rome, but it is a fundamental reference line for the city morphology, not only as a gigantic object, but especially as a massive and tangible memory of the ancient city<sup>8</sup>.

In the process of urban texture consolidation, relevant areas along the walls are gradually occupied by special buildings that use metal construction in order to comply firstly to construction needs, customers requests and tertiary typology features. However the close relationship with the pre-existence, favour unique technological and figurative research, that leads to an original assimilation of historic walls features into the modern register of built works, declinable according to two opposite conditions, exhibition and dissimulation of steel structure. For instance this dialectic is affirmed by two buildings that share the same typology.

La Rinascente department stores building, placed in Piazza Fiume, shows an original exposed steel structure with a parallel beam approach that seems to apparently struggle with the ancient roman ruins. Instead the structure is set with a classical order: outside are visible columns which end with welded capitals, trabeations that enhance string-courses between floors, a cantilevered cornice as a final device of a traditional hip roof all elements that are typical of classical roman palaces. Furthermore the steel texture is combined with backwarded and waved envelope panels, made of a mixture of concrete and coloured stones, in order to reach a chromatic integration with the ancient walls and so as to establish a strong connection with the shading effect of historic palaces façades, particularly those of Renaissance and Baroque period placed in the city centre<sup>9</sup>.

Despite the fact that La Rinascente soon becomes a reference architecture not only for Rome, its model isn't always repeated. Coin department stores building, located in a corner of Piazzale Appio, is composed by a stereometric volume, marked by pure and minimal geometry. A thick stone skin continuously clads the building and it is interrupted only for the backwarded band of the roof and for the big corner curtain wall facing Porta San Giovanni, where the brand logo in giant type stands out reflecting on the glass<sup>10</sup>. Therefore steel structure is completely concealed by the envelope, it is solved with building elements jointed through bolted nodes fit to be quickly assembled, loosing only after fifteen years, the handcrafted quality expressed by steel construction for La Rinascente.

Despite the opposite behaviours shown by the buildings, for both is evident an unavoidable conditioning triggered by the old Roman edge and the gradual exhibition of metal construction represent a significant expressive answer to the uncovered layering of bricks and stones displayed by Aurelian Walls.



#### p.5 - Comparison 3

left: La Rinascente Department Stores and its exposed structure behind the walls of Porta Salaria (F. Albini, F. Helg, G. Covre, 1961)

right: Coin Department Stores and its concealed frame behind the arches of Porta San Giovanni (P. Montini and Ass., G. Romaro, 1975)

### 3.2 Steel and completion – Assonance, dissonance and urban void

Nodes are intersections of relevant paths or focal points corresponding to city parts of various size, that show specific functional and cultural values, fundamental for the development of a well-structured network<sup>11</sup>.

In the second half of 20<sup>th</sup> century, the areas located near the focal points in the city centre and in particular outside the ancient walls, in the urban texture characterised by a rapid enlargement, are considered strategic cores for the city and therefore they are easily tackled by a sudden process of building saturation. Both for construction on lots that are still free and for substitution of obsolete buildings, the dynamics of completion promotes the formation of a compact urban texture near the nodes and sometimes it involves steel, as interpreter of a deep revision of traditional technological and expressive features. Metal construction deals every time with the management of urban voids, treated according to two opposite orientations: the mediation with the settled linguistic signs of the context, and the accentuation of progressive behaviour, that display repulsion for surroundings through the figurative elements. The couple of terms assonance and dissonance, summarize these design addresses and though they're taken from the musical lexicon, they clearly express the main modulations imposed to steel architecture placed close the urban nodes.

In the case of Enpam Headquarters, located in Via Torino near Piazza della Repubblica and Termini Central Station, one of the most congested city nodes, building fronts are solved with a metal frame composed of steel struts and beams that have a structural function and at the same time they draw the façade generating spaces for the symmetrical introduction of windows and stone panels. This allocation is measured according to the projection lines of adjacent 19<sup>th</sup> century buildings, condition that is also affirmed by the cantilever platform roof, arranged at the same height of adjoining cornices. The building doesn't refuse also a progressive approach, proposing a stiffened high beam, that detaches from the ground the body of the building, sustaining it with only two supports<sup>12</sup>.

Instead a dissonant behaviour in its context is shown by another office building, located in the eastern side of the city, in Piazza Sassari. Even if it follows in the volumetric arrangement the main lines imposed by the surroundings, the complex is composed by three blocks, treated with a contrasting architectural appearance: in the canonical scenario dominated by the carved façades of eclectic buildings of the early 1900s, the designers opposes with impetuosity a series of big reflecting surfaces, giant displays characterised by the dense rhythm of exposed steel profiles, joined with a fan shape on the head of robust concrete columns of the ground floor<sup>13</sup>. Although the complex appears an alien microcosm compared to the context, its air of lightness and transparency attempts a deep renovation of urban linguistic codes and it experiments a significant strategy of void decomposition, allowing a urban porosity that is denied in the first case.



#### p.6 - Comparison 4

left: Enpam Headquarters and the assonance with the adjacent buildings  
(P. Barucci, A. Caré, 1962)

right: dissonant and progressive approach of Office Complex in Piazza Sassari  
(V. Ventura, E.A.Romaro, 1965)

### 3.3 Steel and infrastructures – Minimalism, abundance and connection

Paths are important tools for the operation of a urban organism: they constitute the arteries responsible for its users circulation, they represent special perception devices, but above all they guarantee within them an unlimited motion capability thanks to the continuity of layouts.

To overcome many obstacles of different origins placed in the urban territory, it is necessary to resort to connection elements, infrastructures like bridges, viaducts and overpasses, assigned for a continuous link in the urban network<sup>14</sup>. In the city that has dealt with the Tiber crossing from its foundation, metal construction has been largely used for infrastructures of the second half of 1800s, thanks to imported iron bridges of different typologies placed in the city centre and unfortunately demolished after a few years of operation, due mainly to the incompatibility of metal appearance in the city centre. Also after a century, when Rome is hit as other cities in Europe by a feverish realisation of dirompent infrastructures in the urban texture, following a model which is largely experimented overseas, metal construction isn't favourite because it often doesn't satisfy economic requirements, binding conditions for public built works. Though reinforced concrete technology appears as ideal for this field, there are also important infrastructural connections made of steel, built works that apparently show an "engineering" taste, exhibiting their naked structural truth according to economic and design reasons, solving relevant connection problems in the city. San Lorenzo high-line, is a vehicle viaduct, a "street in the sky" composed by high steel cylinders that sustain for a long extension two roadways, sometimes overlapped and obliged to use large span beams held up by special supports, due to physical and morphological difficulties of the area. Exposed metal structures create long raised filaments and remarkable binds of joints and ramps, as in the case of the triangular interchange located along Via Prenestina and they represent an unusual image in Rome, a metal jungle sometimes aggressive for the repetition of gigantic steel elements and for the proximity to the houses<sup>15</sup>. This scenario is contrasted by the expressiveness of Magliana systems and pedestrian bridges: they reproduce the model shape of the nearby viaduct designed by Riccardo Morandi, showing a different chromatic finishing and greater structural lightness, both reached thanks to the use of Cor-Ten construction elements. Formal similarities developed for the two service bridges, paint in the river landscape of Portuense district an harmonious scene, characterised by architectural signs moderation and enhanced by the contrast between the complexity of the city in the background and the simple elegance in the foreground<sup>16</sup>. The two examples show different infrastructures typologies and in the second case figurative lightness could be seen as a direct result of the lower load bearing, instead the context implicates a crucial influence on metal morphology which is wisely balanced according to lines that shape the urban landscape.



**p.7 - Comparison 5**  
 left: San Lorenzo Viaduct  
 and the abundance of  
 giant steel devices  
 (F. De Miranda, CMF, 1972)  
 right: one of Magliana  
 service and pedestrian  
 Bridge and the  
 Tiber crossing with a few  
 architectural signs  
 (Cimolai, 1975)



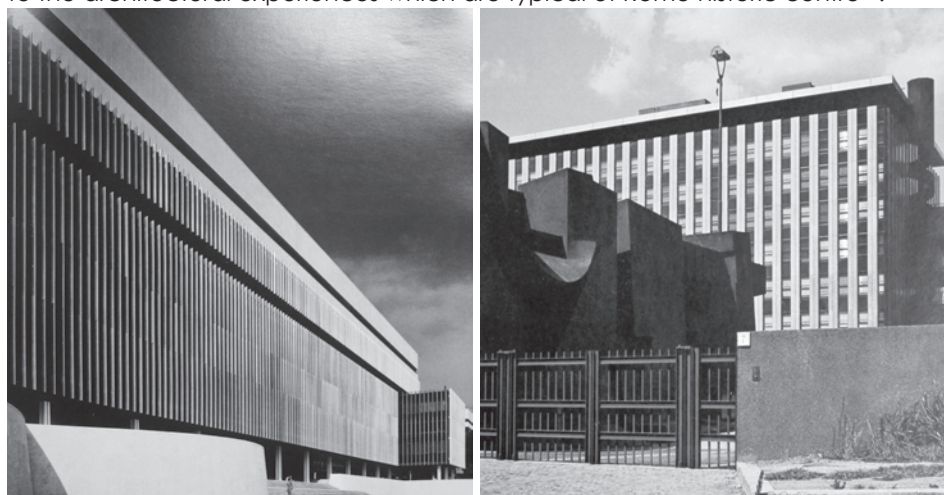
### 3.4 Steel and new city – Internationalisation, regionalism and representativeness

The city could be seen as an assembly of linked parts, areas of different size, named districts, that clearly become recognizable through special and distinctive characteristics. Despite the most of them are gradually grown over the centuries without a prearranged plan, sometimes they rise up quickly according to specific programs and it is the case of Eur, the settlement planned by the Fascist Regime in order to host the Universal Exhibition of 1942.

Left almost unfinished because of the wartime, soon after the conflict the district is revamped hosting big events like a part of 1960 Olympic Games and it is managed by new administrative body thanks to special rules<sup>17</sup>. Eur rapidly takes on a clear directional vocation, attracting public and private institutions that want to build their own representative headquarters in the modern district panorama, involving steel as the main performer of construction and of appealing building figuration. These buildings, mainly offices, are designed with distribution and linguistic features that chiefly come from foreign models and architectures located in European-American directional centres and the internationalisation is also pushed thanks to the collaboration in the projects supervisory body of foreign consultant designers. Although the spirit of trending architecture of the time is dominant in the new district, otherwise some echos of the rationalist context and cohesion to local themes related to the expressivity of designers are evident for the built works and these features try to slow the international influence, bringing back design results to the traditional traits and typical features of the city.

Esso-Sgi "twin" complex is composed by two symmetrical buildings located along Via Cristoforo Colombo, drawn with a planimetric T-shape, with the heads facing each other so as to enhance the image of old "bastions" or "Hellenic Propylaea" at the entrance of the district. The horizontal articulation is marked by the curtain wall that consists of cantilever and shading metal plates, while the cornice is solved by metal panels that define flat surfaces. The complex shows a strong cohesion to international themes about company representation, a condition that is reached with the collaboration with architects coming from US, but in the mullions details of the façade is also recognizable the topic of "real and represented structure", a classic topic of Moretti's way of expression<sup>18</sup>.

Instead international influence is less pronounced in the case of Imi complex: the two buildings are clad with an envelope marked by a serial texture of upwarded vertical bands and backwarded continuous windows. This system apparently follows only the rules of International Styles, instead the fronts are drawn according to the nearby colonnades of the Museum of Roman Civilization and the buildings are combined by "characterizing" elements that simulate the traditional urban context. In fact a central metal obelisk, a short congress hall that is shaped like a "fake ruin" and many outdoor design devices, bring back viewers to the architectural experiences which are typical of Rome historic centre<sup>19</sup>.



#### p.8 - Comparison 6

left: Esso-Sgi complex and the international appearance balanced with foreign designers

(L. Moretti, L. Douglass, A. Bolocan, 1966)

right: Imi Headquarters and the presence of elements that simulate a traditional look of Rome city centre

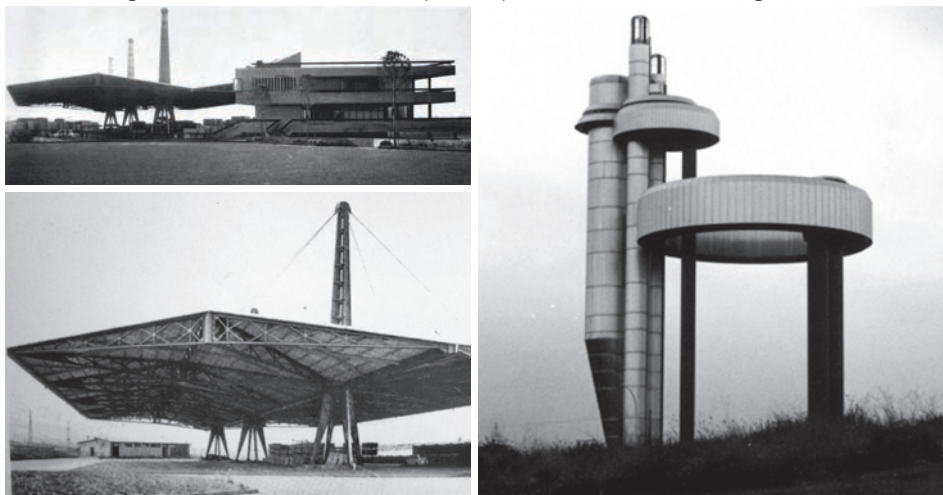
(A. Lapadula, A. Marchini, A. Caré, 1969)



### 3.5 Steel and big size – Audacity, simplicity and monumentality

Landmarks are discontinuity elements in the urban texture, to which people attribute singular physical and semantic values, to the point that they perfectly fulfill as unique orientation and distinction tools for the parts constituting the city. Spatial leading position of a physical object is one of the main instrument to achieve a “landmark” status and the topic of large dimensions management is particularly significant for the 20<sup>th</sup> century: modern architectural theories about the topic, like those spread by the text *Groszstadt Architektur*<sup>20</sup>, to design principles of Sixties and Seventies megastructures, pushed in the academies as tools to shape the territory, all this ideology foster the proliferation of macroscopic buildings, adopting a controversial “Bigness” in architecture<sup>21</sup>. Also in Rome gigantic realisations are spread particularly in the areas characterised by urban texture enlargement and steel becomes an efficient tool to manage the big size with reduced structural sections, testing new unusual arrangements. Large dimensions inevitably lead to the enhancement of celebration values in architecture and sometimes metal construction is involved to achieve a monumental appearance, following the lesson deriving from colossal structures of antiquity that stud everywhere with audacity the historic urban centre. Anyway not all the realisations are primarily designed to reach a monumental charm, some of them are simply designed to satisfy various urban needs, but becoming reference points, through their big proportions, and acquiring people appreciation, thanks to architectural quality, they are considered as new city monuments.

Italtubi Warehouse, a large span roof for a goods storage production settlement, has been designed by Sergio Musmeci without any desire of reaching a representative behaviour, but its big dimensions are easily recognizable and attractive in the urban territory. Three high columns with a cross section and cables support a large surface shaped as an irregular hexagon, giving a clear reference point for the area of Tor Vergata, furthermore the organic shape of construction elements and the research of structural lightness, confer to this industrial architecture an unexpected architectural quality, unfortunately compromised nowadays<sup>22</sup>. A remarkable quality is also shown by Vigna Murata Water Tank, designed starting from the early Seventies and conceived from the beginning as a reference point provided with monumental allure for the future orientation of the districts located in the eastern side of Eur. The masterpiece of architect Franco Palpacelli, transforms a water tank in a fascinating device, composed by couples of thin towers supporting in a spectacular way two awesome ring shaped tubs. Despite its long construction period, the sculpted water tank is soon recognized as a real modern monument for design accuracy, that succeeds in recapping mechanical elements into pure geometrical figures, and for a stunning lightness given by the use of weathering steel, shaping a metal landmark visible with its elegance from afar in the city, every time able to amazing its viewers<sup>23</sup>.



**p.9 - Comparison 7**  
 left: Italtubi Warehouse, simplicity of its huge structure considered as a reference for Roman outskirts (A. Liviadotti, S. Musmeci, I. Stegher, 1967)  
 right: Vigna Murata Water Tank, sophisticated and attractive modern monument (F. Palpacelli, G. Romaro, 1974-1990)

#### 4 Conclusions

The realisations presented in the contribution show only a little taste of the great number of steel 1900s architectures located in the Italian capital, but they permit to outline the frame of episodes that are fundamental for metal construction culture. Despite it is sometimes restrained in its expressiveness and it is considered as an inconvenient element for the stereotypical image of the urban landscape, the integration between default steel configurations and urban context allow the development of an unexpected construction heritage metal architectures that shifting in a variable relationship between exhibition and concealing of steel, take elements from traditional language and morphology, proposing sometimes original figurative and technological experimentations.

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#### p.10

Contrast between a residential building of the early 1900s and Rai Headquarters building (F. Berarducci, A. Fioroni, F. De Miranda, A. Bolocan, 1965)

