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ITALIAN BUILDING MODELS IN THE 1950s. THE AGIP MOTELS

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Highlights

An important chapter of Italian construction in the 1950s was the assets of the Agip Company, later ENI, which began to build a dense network of petrol stations along the main Italian roads, accompanied by motels intended for the rest of travelers. Among these, there were many unique works never replicated, but there was instead a recurring type, called Model 59, which was re-proposed in at least 35 Italian sites. From the study of this type of building, we can understand how reinforced concrete buildings were built in the 50s, then formulating hypotheses on how we can intervene today to improve its behavior from a structural point of view.

Abstract

The paper deals with the performance characteristics of the Model 59 of the Agip motels, which is highly representative of the Italian construction during the economic boom of the 1950s and 1970s. A large-scale study has pointed out the position and the current state of all the fifty Agip motels designed and built between 1954 and 1970, thanks to a precise archival and digital research. Among these, the most common was the Model 59, whose project was drawn up by the engineers of SNAM Progetti and built in at least 35 Italian sites, with slight differences from a standardized construction type.

Keywords

Agip motel, Model 59, ENI, SNAM Progetti, Enrico Mattei.

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1. INTRODUCTION

The second post-war period is rightly defined by historians as a new "golden age", as these were years of "extraordinary economic growth and social transformation, which probably modified human society more deeply than any other period of similar duration" [1].

This quote is particularly appropriate for the Italian context, where there was a period of rapid economic growth between the 1950s and 1960s, which substantially changed the Italian panorama; Italy was transformed from a country with a predominantly agricultural economy into one of the main industrial powers in the western world.

After the Second World War, the Italian demographic trend experienced a long period of growth, at least until the beginning of the seventies, when a stabilization occurred. From an economic and productive point of view,

for the first time, in 1958, the number of employees in industry exceeded the number of employees in agriculture, following a process that allowed Italy to become a predominantly industrial country. With the reduction of agricultural activities, the production system and social relations based on the predominance of the human workforce were gradually abandoned, assisting the spread of machines and industry.

Industrial production was driven by the metalworking industry and the petrochemical sector; within this framework, in 1953 the *Ente Nazionale Idrocarburi* (ENI) was established with the presidency of Enrico Mattei, a key figure in post-war Italian history, whose actions left tangible signs for the development and economic recovery of the country [2, 3].

In 1945, Mattei was commissioned to liquidate AGIP (*Azienda Generale Italiana Petroli*), the Italian public oil company founded in 1926. However, Mattei opposed this liquidation and, instead of closing the company, he relaunched it; he opened new petrol stations and inaugurated a network of motels with the first petrol stations. Later, he promoted a drilling campaign in the Po Valley, which led to the discovery of methane deposits. Within a few years, these made ENI a holding company at the head of a varied industrial empire, with ramifications also in the production of synthetic rubber, fertilizers, and gas tanks.

2. THE NETWORK OF AGIP MOTELS

The construction of the so-called *Sun Motorway* (Autostrada del Sole) began in 1956 and it was completed in 1964 [4]; in these years, Enrico Mattei decided to start the ambitious project of a complex network to support this infrastructure and, in the 1950s, he started the construction of a series of service stations, which had to be attractive for travelers.

The design of these service buildings was based on the uniformity of the adopted techniques to make them recognizable throughout the territory thanks to the proposal of solutions that preserved the same characteristics everywhere, from the external appearance to the interior furnishings. The areas had to be always arranged with the same sequence and the rooms had to be organized with the same internal structure, in order to arouse a sense of hospitality and familiarity in travelers. The location covered almost the entire national territory, along the state, provincial roads, and highways of small and large cities [5, 6].

The petrol stations included mechanical workshops, a washing area, large squares, and spaces for parking trucks; often there were also rest stops with bars, restaurants, and hotel facilities. These were called Motel Agip.

The building typology of the *motel* (abbreviation for Motor Hotel) was born in America, where traveling distances were so long to make regular stops necessary. In the United States, famous architects gave their contribution in this sector, but a real architectural language has never developed with precise and recurring characteristics. Mattei had made several trips to the United States and he knew this situation; therefore, he decided to import it in Italy, but adding his personal intuition, making recognizable the motels in his chain, thanks to their replication with the same characteristics throughout the national territory.

So, starting from 1954, the Agip Company started an intense program for the construction of motels on owned lands along the main roads throughout Italy [7]; the purchase of these areas was assessed on the basis of careful studies, which analyzed the car flows, the distances from highways and the amount of long-distance traffic related to that location.

The motels were located along the main roads of the national territory, in the capital cities and sometimes even along the highway itself, as is the case of the Agip motel in Modena, which was accessible both from the highway and from the city.

By the end of 1962, Agip already had more than thirty motels; despite the death of the inventor, Enrico Mattei, the project was later carried out by his successors, so that today we can count fifty hotels throughout Italy, that were born as Motel Agip. Six Agip Motels were also built abroad; in the late 1950s, following the choice of ENI to internationalize, a motel was built in Kenya, one in Tanzania, one in Madagascar, three in Ethiopia and in the Ivory Coast.

ENI maintained the petrol stations management, as well as the Agip Motels and the meal services, until the 1990s, when the company was forced to divest all facilities.

Nowadays, in some cases, the motels have been sold to private individuals while maintaining the same hotel function, or have changed use, or have been abandoned.

3. SOME UNIQUE PROJECTS

The design of the first Motel Agip in Italy was entrusted to the architect Mario Bacciocchi, who conceived the Motel Agip in Metanopoli in 1954. The motel was preceded by a courtyard, which was bordered by a narrow colonnade on one side and a stone-clad building on the other. The building had a three-story reinforced concrete frame structure and it was coated in wood and covered by a pitched roof, a recurring element in Baciocchi's architecture.

Between 1954 and 1956, Edoardo Gellner's motel was built in Cortina, who was in charge of drafting the city Master Plan for the 1956 Olympic Winter Games [8]. After an initial project drawn up by Mario Baciocchi, which was not approved due to the lack of adaptation to the landscape and to the local style, the assignment was entrusted to Gellner, who was also the designer of the ENI tourist village near Cortina. The designer adopted an individual and contemporary language; the building was supported by a reinforced concrete load-bearing structure with external walls covered with wooden planks, and the ground floor was set back so as to leave the structure visible.

In the following years, Mario Baciocchi [9] designed the motels of Bolzano and Voghera, dating back to 1962, which respected the architectural references of the area instead of those designed as a distinctive image of ENI.

Most of the subsequent projects were instead managed by the engineers of SNAM Progetti [10], the leading engineering company in the sector of design and construction of large onshore plants (such as refineries, pipelines,

Fig. 1. *The Agip Motels of Metanopoli, Bolzano, Cortina, Modena and Pisticci.*

and environmental activities in the hydrocarbons field) belonging to the ENI group. Between 1950 and 1965, SNAM Progetti was responsible for the design of the Agip service stations, the Ristoragip and the Agip Motels.

There were, however, some exceptions; singular cases were commissioned to the trusted architects of Enrico Mattei, Ugo Ratti and Marco Bacigalupo, who designed original and atypical solutions, still functional and well recognizable today (Fig. 1).

In fact, in the early 1960s, the architects Ratti and Bacigalupo designed the Agip Motel in San Donato Milanese [11, 12] with a 14-story reinforced concrete frame structure, which still functions as a hotel, and the similar Agip Motel in North Florence, in Sesto Fiorentino. In Matera, instead, there was the Motel Agip of Pisticci, an interesting construction carried out in 1964 and now abandoned. It is one of the most elegant solutions that the Bacigalupo and Ratti studio has ever designed for ENI; it is a two-story building, with a reinforced concrete frame of three levels and with a large planimetric extension, which rests on pilotis and uses the space below as a parking lot. The distribution system is located outside the building so the rooms are not accessed from inside the building, but from the outside, through a path hidden by a system of slats that regulate the entrance of the sun rays.

More recent are the projects dating back to the early 1970s for the Agip Motel in Modena, with a height of nine floors, which today was decommissioned after a fire; similar buildings were in Pescara, with an extension of five floors and still functional, and in Vicenza, which was demolished in 2008.

A further singular case was entrusted to the architect Enrico Fattinnanzi, who designed the Motel Agip in Duino Aurisina in 1967, with such a conformation to make it unique, located in a green area and mainly horizontally extended.

4. THE DESIGN SCHEME OF THE "MODEL 59"

At the end of the 1950s, Enrico Mattei, with the support of SNAM Progetti's engineers, decided to design a "typical" model for his motels to be re-proposed throughout Italy with the same characteristics; it was called "Model 59".

The main purpose was to create a simple and effective architecture that would become the symbol of Agip and that would be recognizable, where the traveler could find a familiar and welcoming resting place, regardless of the city where he was.

The configuration of the "Model 59" consisted of a rectangular plan, with a variable number of spans according to the flow of travelers that were expected, and consequently the need for accommodation.

It was rigidly organized on a basement floor that housed thermal plants and machinery; the ground floor included the common services, such as the restaurant, the reception room, and the conference rooms; the upper floors were dedicated to the bedrooms and the attic floor housed the motel manager's apartment.

From an architectural point of view, the "Model 59" was formally very simple and made with low-cost materials, in order to devote more attention to internal details (Fig. 2).

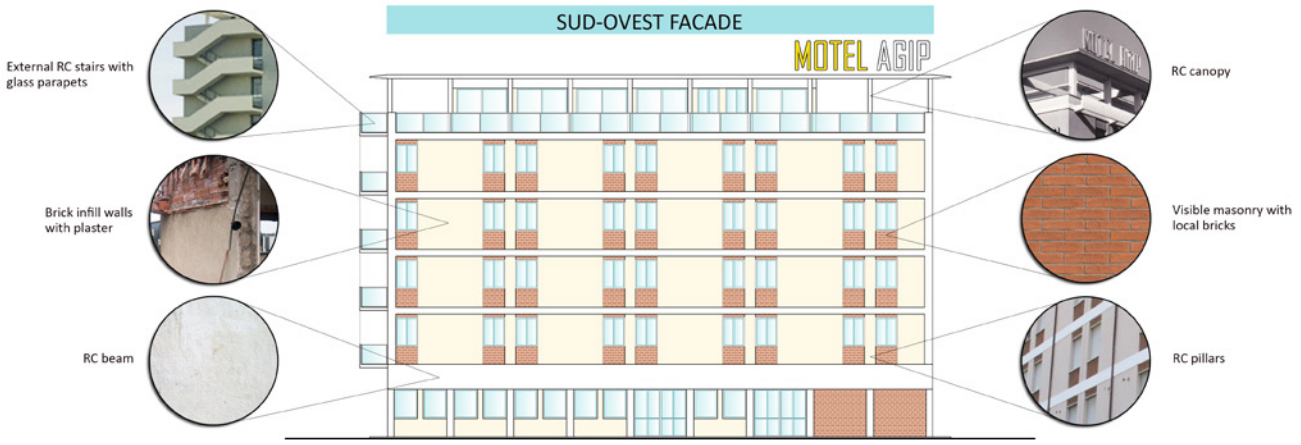

Fig. 2. *Façade organization of the Model 59 (graphic elaboration by Greta Casi).*

Fig. 3. *Distribution of Agip motels in Italy; in blue, Model 59. It should be noted that in Sicily and Sardinia, the present Agip motels were all from Model 59.*

It adopted a reinforced concrete frame structure, articulated on three, four or five levels, with pillars at a regular distance of 3.30 m, brick infill and a base with a stone cladding for the ground floor.

All the "Model 59" had in common a particular construction placed at the top of the building, a sort of canopy with a flat roof that followed the external perimeter and where the large "Motel Agip" sign was positioned.

The accurate archival investigation, conducted through the exploration of the ENI Historical Archive of Pomezia, in addition to an extensive digital research, has allowed to find out the location of all the Agip Motels on the national territory and to recognize the thirty-five still existing "Model 59". Some of them are still functional, others have been abandoned and others have undergone radical transformations (Fig. 3).

5. THE "MOTEL 59" IN BOLOGNA

The characteristics of the "Model 59" in Bologna find a perfect match with the motels of the same model built in other Italian cities, confirming Mattei's desire to create a type to be proposed repeatedly throughout Italy with small variations, linked to the localization area and the flow of cars.

The Agip Motel in Bologna was built in 1959 in the Borgo Panigale area, along the SS9, now called Via Emilia Ponente, the road connecting Bologna to Modena. It represents a standard case of "Model 59", without substantial variations if compared to the basic type. The lot, carefully chosen and purchased by Mattei himself, was located in a strategic position, as it is not far from the motorway junction and always traversed by vehicular traffic.

The first documents of the project date back to 1959 and represent the motel with the adjacent service station, built a few years earlier. One of the characteristics of "Model 59" was the constant presence of the service station facing the road next to the motel, to allow travelers to refuel and to stay overnight.

The building had a rectangular shape, simple and effective for a rational internal distribution, with a planimetric footprint of about 15x30 m. It stood on seven strictly organized levels: the basement housed areas that were accessible only to personnel, such as engine rooms, warehouses, thermal plants, laundry, and toilets for employees. The ground floor was divided into spaces for common use, such as the restaurant, the entrance hall, the waiting room, and the customer toilets; the first, second, third and fourth floors housed exclusively the bedrooms and, finally, the attic floor was intended for the director's residence, plus any service rooms for the employees (Fig. 4).

Externally, the Agip Motel in Bologna replicated the image of the similar models, with the reinforced concrete frame left visible, brick infill walls painted in a neutral color, two-door windows that underline the vertical scan of the facades. Only the attic floor had larger windows. Like every "Model 59", in addition, the attic was surrounded by a reinforced concrete canopy that supported the large white and yellow "Motel Agip" sign. The external stairs were also in reinforced concrete and completed by a glass parapet.

As already mentioned, the load-bearing structure consisted of a reinforced concrete frame, with pillars

Fig. 4. *The "Model 59" in Bologna. Images of the exterior and interior spaces in the 1960s.*

at a 3.30 m distance and with dimensions varying from 45x40 cm maximum in the basement to 30x30 cm minimum in the attic floor.

The foundations were made with type 500 cement and smooth type Aq 42 rods, while for the elevation structures, type 680 cement and TOR bars were used. The floors were of the so-called "Excelsior" type, a particular hollow-brick floor produced since the 1930s by the Rizzi, Donelli and Breviglieri Company [13–15]. This type of floor was cast in place and had only parallel ribs, with the compression slab made of brick and not of reinforced concrete; it was generated by the hollow-brick upper conformation.

The "Excelsior" type of floor was widely used around the mid-1950s because it was useful for many reasons: it had a high rigidity, due to the collaboration between concrete and brick; it was quick and simple to build; it was efficient, since at the extremes where the bending moment was negative, it was possible to overturn the hollow blocks by placing the slab downwards so as to absorb the compression efforts, without therefore adding special elements; it was relatively light, thus allowing a decrease in the floors' own load. It was produced with a thickness of 12, 15, 18, 22 cm and the ribs had a width equal to 6 or 8 cm, with a weight between 110 and 200 kg/m^2.

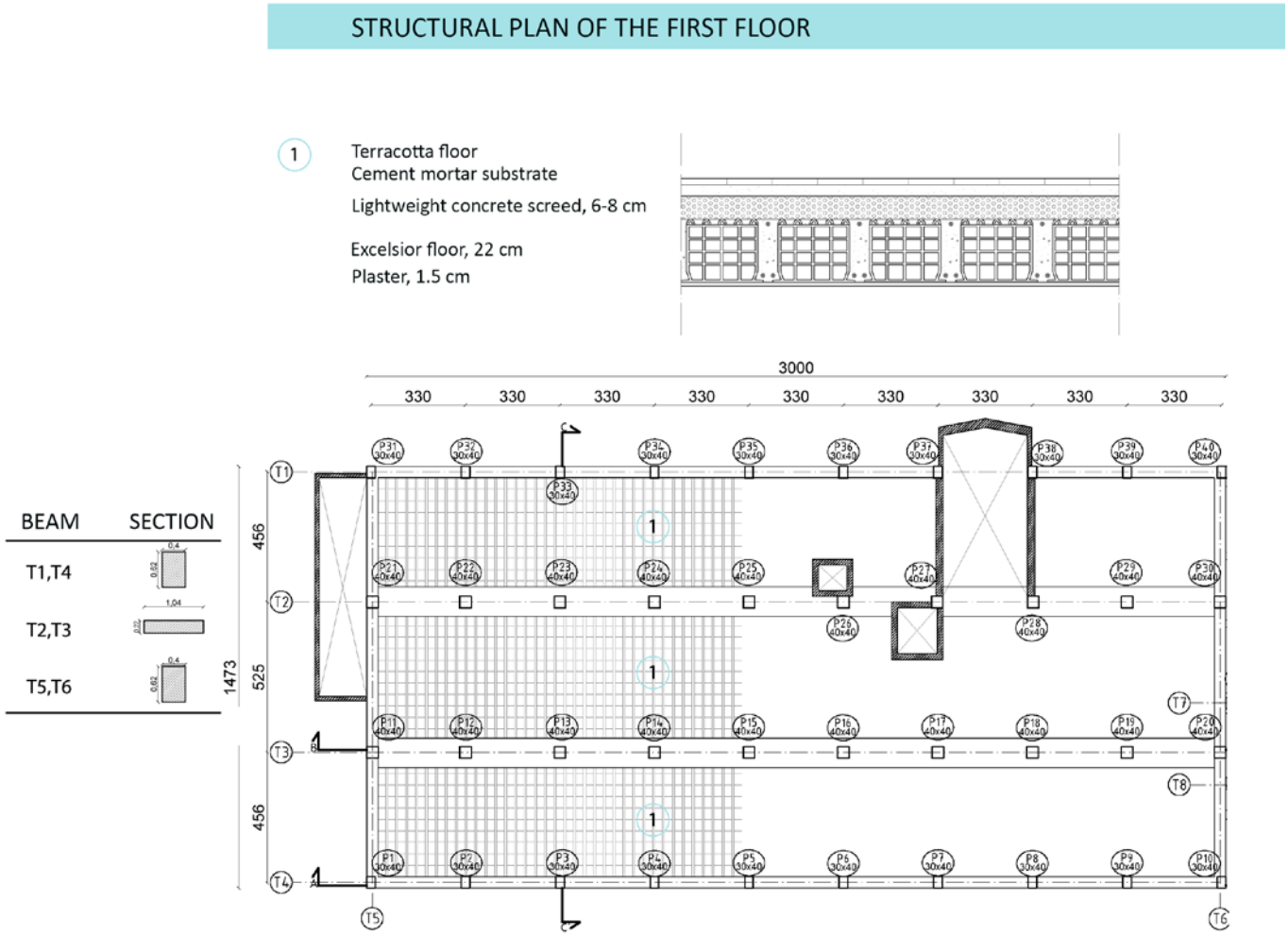

Fig. 5. *Structural plan of the first floor (graphic elaboration by Greta Casi).*

For the Agip motel in Bologna, "Excelsior" floors with two different thicknesses were used: 22 cm for the ground floor, the first floor and the attic floor; 18 cm for the intermediate floors and the flat roof (Fig. 5).

The nearby petrol station was also a model to be similarly proposed on all highways and state roads; it was also called 59, as it accompanied Motel 59. It had a single floor, hosting the workshop and car washing area, too. The external finishes were very simple, with exposed brick infill walls and a slightly protruding reinforced concrete roof.

In 1989, an expansion intervention was implemented on the Agip Motel of Bologna, with the construction of a new block having similar size and adjacent to the existing one, also carrying out an overall transformation of the facades. In 1992, together with other seventeen motels, the building was then sold to a private company, which maintained the hotel function.

6. THE STRUCTURAL BEHAVIOR OF THE "MODEL 59"

Once the construction characteristics of the building were analyzed, the current performance in terms of earthquake response was estimated through the use of finite element modeling software.

First of all, the critical aspects of the structure were identified [16]; these are the recurring vulnerabilities that we can detect in existing buildings that have been designed without regulatory requirements in terms of earthquake resistance, with lower quality materials than the current ones and with reduced mechanical characteristics for the application of the necessary reduction coefficients due to the lack of specialist investigations.

The analysis has therefore shown that, at present, 30% of the vertical elements are verified for shear and

buckling, and only 11% of the beams are verified for shear and bending moments (Fig. 6).

With the aim of maximum compatibility and minimum invasiveness of the improvement interventions [17], the proposed strategy envisages the execution of works which are capable of increasing the resistant capacities of the building as a whole, and local operations only on the residual vulnerabilities, with targeted and localized interventions.

Following this principle, the reasoned insertion of new reinforced concrete walls that support the frames in resistance to horizontal actions and the reduction of dis-

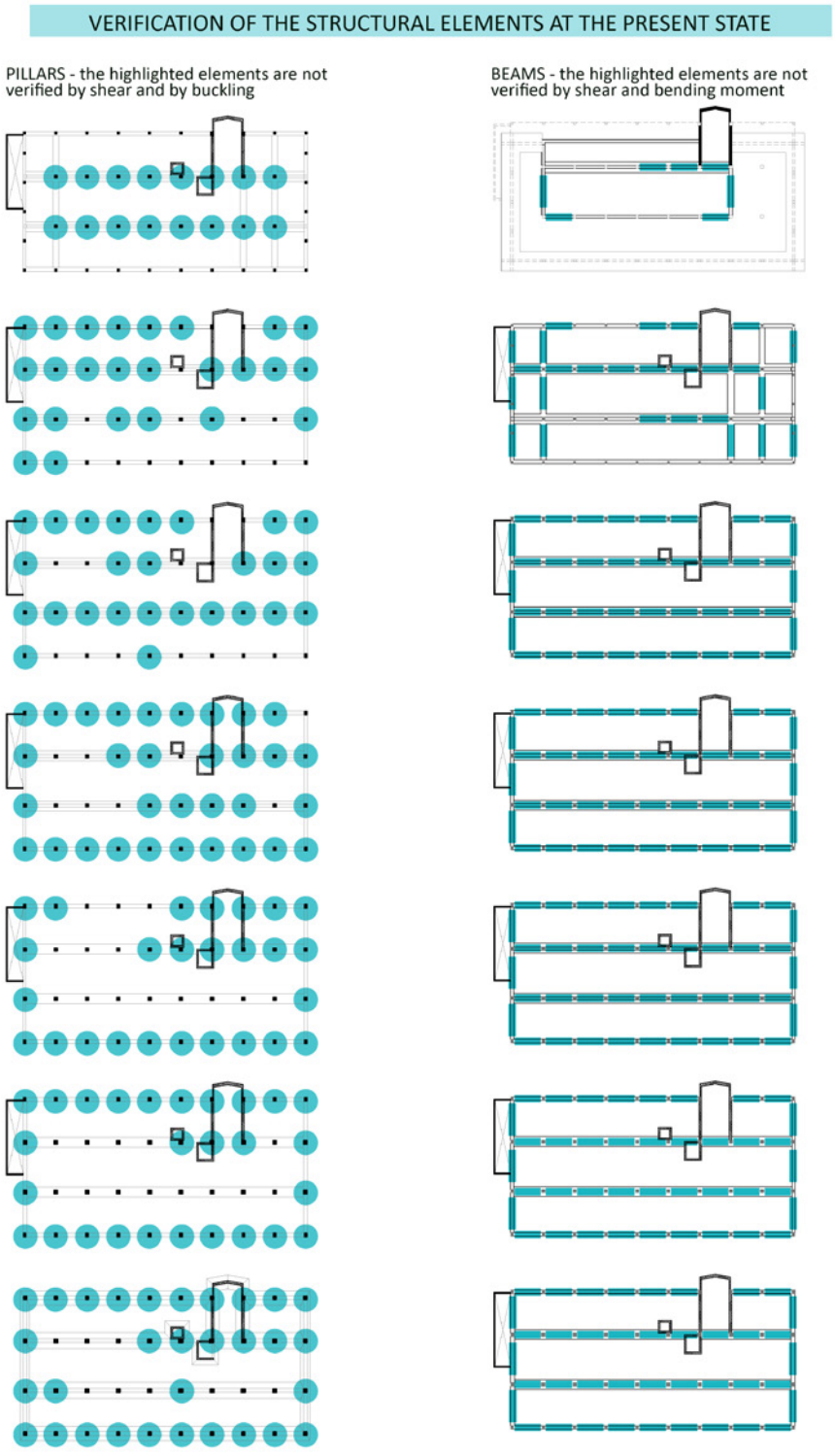

Fig. 6. *Not verified structural elements by shear, buckling and bending moment.*

placements was assessed. This allows a high increase in rigidity, given to the entire structural system [18].

A second possibility aimed at improving the seismic resistance capacity is constituted by the insertion of steel reinforcing braces within the structural spans of the reinforced concrete frame [19]; this strategy appears to be the most appropriate intervention for frame buildings with pillars of reduced cross-section, which are slender and flexible, and allows to reduce the construction times if compared to the integration of new reinforced concrete elements [20]. The braces are added to the pre-existing structural scheme in a less invasive way than the shear walls; in fact, while for the latter it is also necessary to create a new foundation, with steel braces this is not necessary, as they are connected with joints to the pre-existing structure, ensuring a remarkable simplicity of construction.

One aspect to be carefully evaluated for this type of intervention, however, concerns the more complex design of the stiffening structure, which must be correctly braced, considering the local instability phenomena of the compressed elements and trying to favor a collapse due to the yield stress of the tense elements [21].

The aim is to add rigid and resistant elements which are capable of absorbing the seismic action and relieving the most vulnerable elements, such as reinforced concrete beams and pillars, while not drastically transforming the structural behavior. However, this strategy can induce considerable additional stresses in the structural nodes, which often require punctual reinforcements in order not to generate local collapses. It is possible to reduce excessive axial forces between the bracing system and the reinforced concrete frame by creating an internal counter-frame connected along the perimeter, thus ensuring the adequate transmission of the stresses and avoiding their concentration in the nodes.

From the distribution point of view, the steel stiffeners are suitable for buildings where the maintenance of the current use of free and open rooms is necessary, as is the case on the ground floor of the Agip motel, where

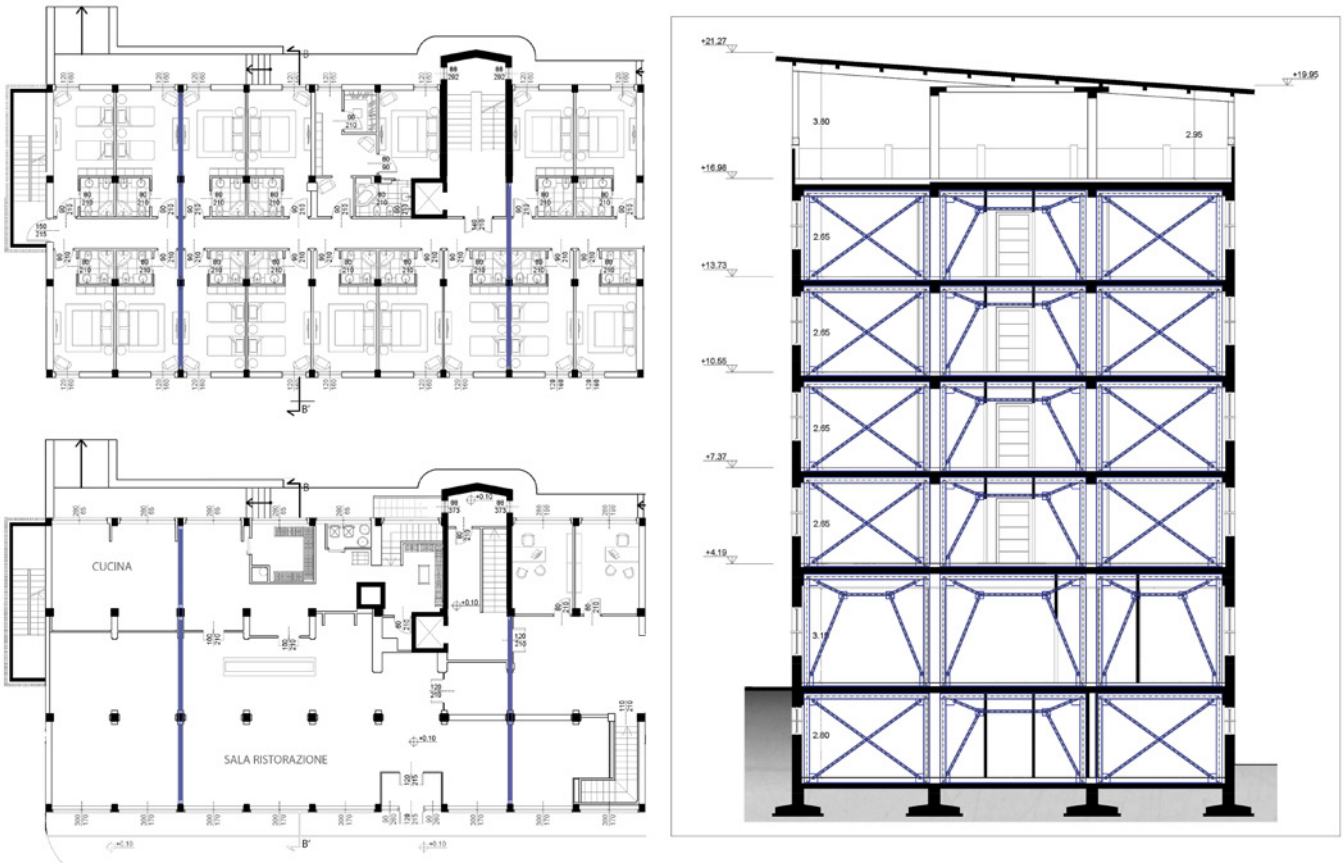

Fig. 7. *In blue, on the left: the proposed arrangement of the steel braces on the ground floor and standard floor plan; on the right: the arrangement of the steel braces in elevation.*

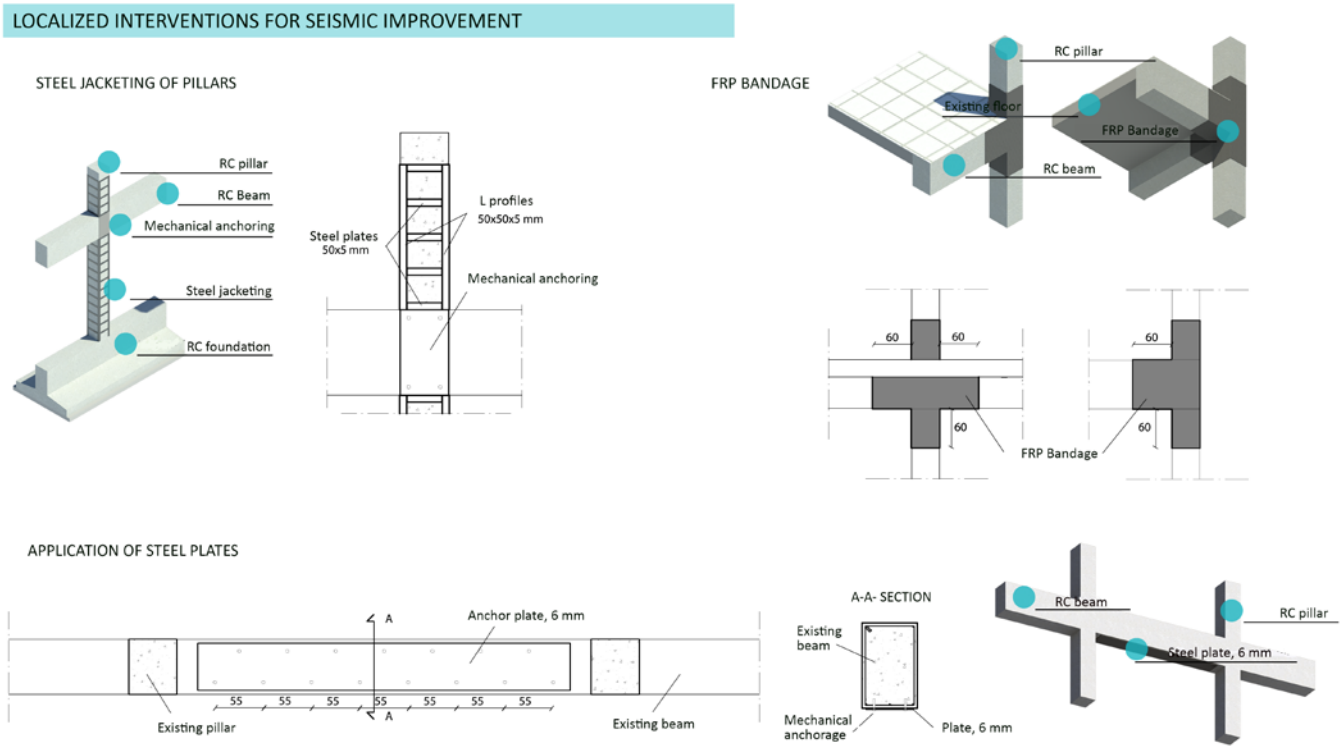

Fig. 8. *Hypothesis of localized interventions for residual vulnerabilities.*

the restaurant is located. The insertion of cross braces in the portions that do not need to remain open, together with K braces in the free portions, allows to achieve a regular distribution of the stiffening elements, without substantially altering the usability of the internal spaces (Fig. 7 and Fig. 8).

7. CONCLUSIONS

The reconciliation of performance improvement with the requests related to the protection of buildings as evidence of the built heritage of the 20th century is a complex activity, which requires the search for a balance between conservation and future interventions, in a close relationship between the will to ensure continuity of use and fulfillment of performance requirements related to structural safety.

Abandoning the idea of defining an intervention project simply on the application of codified rules, as happens for new buildings, the knowledge of the construction characteristics of this heritage must guide the choices, with quantitative assessments to be used as support tools in order to acquire a deeper awareness.

When it is necessary to intervene on existing buildings with a reinforced concrete frame that has been designed for static loads only, the resistant structural system generally consists of frames organized in one direction only and with the lack of connecting beams between the frames. The connection is carried out only through the floors, which do not have the proper stiffness characteristics due to the absence of the load distribution slab. This structural concept is unsuitable for seismic actions and requires interventions in order to make an adequate bracing system for horizontal actions in both directions.

In order to achieve the maximum compatibility and the minimal invasiveness of the improvement interventions, the most appropriate strategy is the execution of global actions, able to increase the resistant capacities of the building as a whole, and operating locally only on the residual vulnerabilities with localized interventions.

This includes the choices to integrate the existing structure with new stiffening systems with reinforced concrete walls, but also the insertion of metal bracings, much more suitable if the original structure is equipped with vertical elements having a reduced section and high flexibility.

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