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CARBONIA 1937- 41. THE WORKSITE OF AUTARCHIC ARCHITECTURE

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Antonello Sanna, Giuseppina Monni, Paolo Sanjust

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Abstract

Carbonia is one of the examples of Italian autarchy before the beginning of World War II. Some of the main national construction companies and high-level designers, of which came from the previous experiences of Fascist foundation towns, focused on the new capital of the coal district. Carbonia is the last phase of this experiment, the most important in terms of size and strategic relevance.
Carbonia's urban scene is clearly characterized by two dominant approaches: Pulitzer's central European modernism, which features the "First Carbonia", and Montuori's Mediterranean rationalism, which features the next phase of the "Great Carbonia". Peripherality and lack of infrastructure, lack of supplies and delays in procurement, unavailability of manpower, and technical adjustments due to unforeseen events constant afflict the emergency autarchy construction site.
And while the Great Serbariu mine concentrates cutting-edge technologies at an international level, the company town continues to be built in conditions of extreme cost containment. The two parallel construction sites express technological osmosis and the driving role of innovation that the mine yard exercises over that of the city. Our long-term work commitment to reconstructing the history of the autarchic building sites through archival and field research, also documents the refined strategies of some of the most important designers of that period. They adapted their working methods to lead the process towards a unitary and high-quality outcome.

Keywords

Construction History, Company Town, Modern Architecture, Autarchy.

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1. INTRODUCTION: AN AUTARCHIC FOUNDATION

This work is part of the methodological thread of construction history and of the studies on Italian modernism [1], and is specifically dedicated to the relationship between project and construction at the time of autarchy, with particular reference to the fundamental aspect of energy self-sufficiency. These were the years before the beginning of World War II, and autarchy was an important part of the ideology and propaganda of the Fascist regime, with a call for nationalist action against the sanctions of the Western powers as a result of Italian expansion in the Horn of Africa.

Actually, this is also a political phase that saw the State intervening more intensively in economic matters, and not by coincidence, just after Beneduce created the

IRI (Institute for Industrial Reconstruction) and just after the banks' bailout after the banks Great Recession of 1929 [2]. The policy of energy self-sufficiency would almost immediately pivot around the coal in the Sulcis region and become a paradigmatic example of this. This policy, in fact, was implemented in a regime that was largely subsidised by public resources, with an original and ambiguous initial combination with a private company. The grand era of autarchic coal began in 1935 with the announcement by Mussolini of the establishment of the Azienda Carboni Italiani [3] (ACal) [Italian Coal Company]. Bacu Abis was the first centre of the private coal industry in Sardinia at the end of the 19th century and was marked by a precariousness that had hitherto appeared irreversible. And it was this small town that offered him the stage to announce the State's support for that industry. ACal was born as a merger of the Sardinian mine with the Istrian one in Arsia, which belonged to Guido Segre, a financier from Trieste who became the first president of the company. In those months, Segre was, in fact, managing the foundation of the new Istrian town, which was entrusted to the Trieste studio of Gustavo Pulitzer Finali. With a few variants, Pulitzer would use his plans for Arsia to double the size of the small town of Bacu Abis [4]. ACaI's policy immediately took off at breakneck speed, and this would always be a feature of its action. Already in 1936, the acceleration of the prospecting activities led to the discovery of the new, impressive reserves in Serbariu, a depository of truly strategic resources. The Sardinian coal district changed scale: the settlement programme was rapidly updated, and its centrepiece would be the new company town of Carbonia, designed at the mouth of the new mine. The aim, at that point, was to make the workers' settlement proportionate to the objective of extracting millions of tons of coal.

The town was the area behind the battle lines in the fight for energy self-sufficiency, and the battlefront was unmistakeably the Great Mine of Serbariu.

With the success of Arsia and Bacu Abis behind it, the Stuard Studio worked non-stop from 1935 to 1938, on an unprecedented design and construction operation, with hundreds of residences, workers' hotels, monuments and public buildings in addition to the planning work for the three new cities – Arsia, Bacu Abis and Carbonia – and for the mining infrastructure. Pulitzer, who until then had distinguished himself mainly as a refined naval designer [5], established efficient and credible design procedures for the new assignments. In Arsia, he tested and approved the application in Italy of an Anglo-Saxon model: the garden city. This model had already been adopted in Germany, in the years preceding the First World War, in the cultural climate marked by the foundation of the Deutscher Werkbund. At that time Pulitzer was studying at the Polytechnic University of Munich. The model has its roots in the company towns established close to factories or mines in the first industrial revolution which were then reformed from the mid-19th century through industrial paternalism.

But in the ACaI enterprise, the private party could not act autonomously: it was still an operation in which the earnings did not even remotely cover the costs. In this way, the government secured control for itself over the urban planning and architectural policy decisions (which Mussolini recognised as being of strategic importance) by placing the Roman architects Cesare Valle and Ignazio Guidi alongside Pulitzer from Trieste [6]. A transparent compromise between the two souls of the Carbonia enterprise: the entrepreneurial and Central European one and the government-run one with Valle and Guidi. After having worked with Pulitzer in the drafting of the Master Plan of 1937, the latter ended up loosening

Fig. 1. *The construction site of workers' quarters, the employees' district, the Hotel for Employees, the urban monuments of Piazza Roma: the City Hall, the Church and its bell tower, the Casa del Fascio, the Dopolavoro. (Image source: Mario Zara Private Archive).*

their grip on the construction of the "First Carbonia" (a town for 12 thousand inhabitants which was inaugurated by Mussolini on 18 December 1938). However, they did leave one of their brightest and most respected young collaborators to assist with the works: Eugenio Montuori, not yet thirty years of age.

So, this was the context of the events related to Carbonia and its main players. Through an unprecedented and systematic work of research centred on the IFCP archives, we investigated the specific condition of the design and construction of the autarchic architecture. More precisely, we focused on the peculiar conditions in which the conception and design process was intertwined with construction constraints dictated by the emergency situation.

All the conceptual and construction scales were involved in this absolutely extraordinary climate, from the urban design to the smallest details of local or, in any case, autarchic materials, from local contexts and events to the role played by the political and economic great history. The underlying hypothesis of the research can be summarised as follows: Does Carbonia owe its peculiarities to the situation of emergency in which it was born, i.e., to autarchy? In today's world, this question has more than an academic value: although Carbonia, "the emergency town", is inextricably linked to the historical phase of hard industrialisation, it can acquire a new and significant relevance if we consider it from the point of view of contemporary crises.

2. THE START-UP PHASE: THE "FIRST CARBONIA"

The public-private collaboration between the company which ran the mine and the Fascist Institute of Social Housing (IFCP) closely followed the building site of the town. A special mission team was created to act as an operational meeting point between ACal and IFCP for the construction at full steam of the new, much larger autarchic coal hub. Immediately and on a very tight schedule, plans and programmes for the new town were produced [7]. In addition and in line with the continuous discovery of new deposits, the plans were progressively updated, multiplying over and over again the initial projections. The town embodied the very essence of the battle for energy self-sufficiency, which was being played out in the galleries where the coal was being mined. At the mouth of a mine, a collective monument to autarchy took shape literally on an architectural level, complete with public and managerial buildings and workers' quarters. While in April 1938, Art. 4 of Italian Law No. 710 established that "Normal residential buildings […] must be built in ordinary masonry", the town buildings had been frantically under construction since the latter part of 1937, on a base of red trachyte extracted locally, without protruding parts. The buildings were compact and "heavy": a clear statement, interpreting the ban on the use of iron which was already set aside for more strategic national purposes, as part of the economy of a war that had not yet started. Therefore, Carbonia became the paradigm of a town where the relationship between design and construction closely linked the autarchic constraints to the design, technological and linguistic strategies that were developed by the architects to tackle such constraints.

Among the leading players, only Pulitzer had already worked on the subject. He had developed a methodical procedure and was designing all the first urban monuments of Piazza Roma in Carbonia (except for the Church), and his studio was also involved in the design of some of the main residential building types of the first phase. But that was not enough. Pulitzer, who was a direct trustee of President Segre, had studied at the Technical University of Munich and was a pupil of Theodor Fischer precisely during the years in which Germany was experimenting with the urban and social reform of the garden city. Actually, he was there exactly in 1909, when Fischer, together with Richard Riemerschmidt, were chosen as architects for the design of the garden city of Hellerau [8]. This context, as we know, was one of the privileged testing grounds of the social, cultural, political, urban and architectural experiment of the German Werkbund, where designers of the calibre of Muthesius and Tessenow also worked. And if there is a method that connects Pulitzer to the same cultural and architectural environment to which Tessenow belonged, it was precisely the capacity to draw on the deep roots of workmanship and popular constructive craftsmanship. In doing so, he purified the drawn elements of any local vernacular reference, always targeting "total" quality obtained by eliminating any su-

perfluous decoration and the obsessive attention to detail which sublimated the *existenz minimum* applied to mass housing by rationalism. Pulitzer was totally modern in this and guaranteed that his designs and furnishings for the houses of miners in Arsia displayed the same care and precision as that used in the Lloyd Triestino transatlantic liners' interior design for which he had become famous. The context objectively showed "pioneering spirit". At least on the level of technical culture, the historical gap presupposes a real transplant which can almost be considered "colonial". For a century, tunnels had been dug in Sardinia, and some of the most internationally advanced mines had been created. The Great Mine was immediately up to the challenge. But a territorial, urban and building infrastructure of this magnitude had never been attempted before, moreover in a time frame of two to three years. Not to mention the shattering social experiment of a factory-town that managed to host and offer employment (undoubtedly, awful employment) to 50,000 people [9], including workers and families from all over Italy. Carbonia offered the workers standards of housing that bore no comparison with the poor conditions they were used to. They were given four-family villas with a vegetable garden and toilets, as well as social, healthcare, leisure and education services and facilities. Of course, all of this was provided in a situation of permanent and unpredictable emergency. The Fascist regime intended to make use of the propaganda effect of the image of the new town and, therefore, it exerted a sometimes unsustainable pressure on the design work [7].

In the "First Carbonia" of 1937-1938, even though Gustavo Pulitzer almost obsessively pursued the scale of detail, he was forced to rapidly change register. The design drawings for the civic monuments in Piazza

Fig. 2. *The construction site of the company town. In the centre, one of the axes manned by the Hotels for Unmarried Workers connecting the workers' quarters with the mine. (Image source: V. Piga, Carbonia: il giacimento carbonifero del Sulcis, Confederazione fascista dei lavoratori dell'industria, Roma, 1938).*

Roma were on a scale of 1:100 with some additional details for doors, windows and furnishing elements. The same goes for his Hotels for Unmarried Workers. The projects incorporated this low-detailed construction with a simplification of volumes, an essential and flexible design (today, we would perhaps define it as resilient) capable of absorbing imperfections and embracing probable variations during the construction phase without losing the overall functional and formal control of space and construction. It should be mentioned that in order to ensure construction quality, Pulitzer managed to appoint the engineer Enrico Ceppi [10] as building site supervisor for some of the blocks that he designed. Pulitzer had already worked with Ceppi in Arsia, and this allowed him to maintain a certain control over the difficult situations he expected to encounter in the construction phase. Failed deliveries, un-

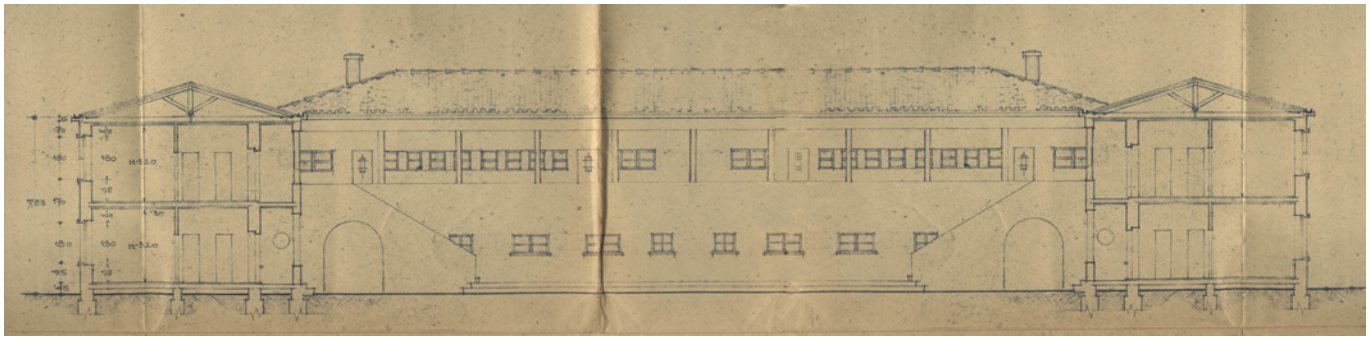
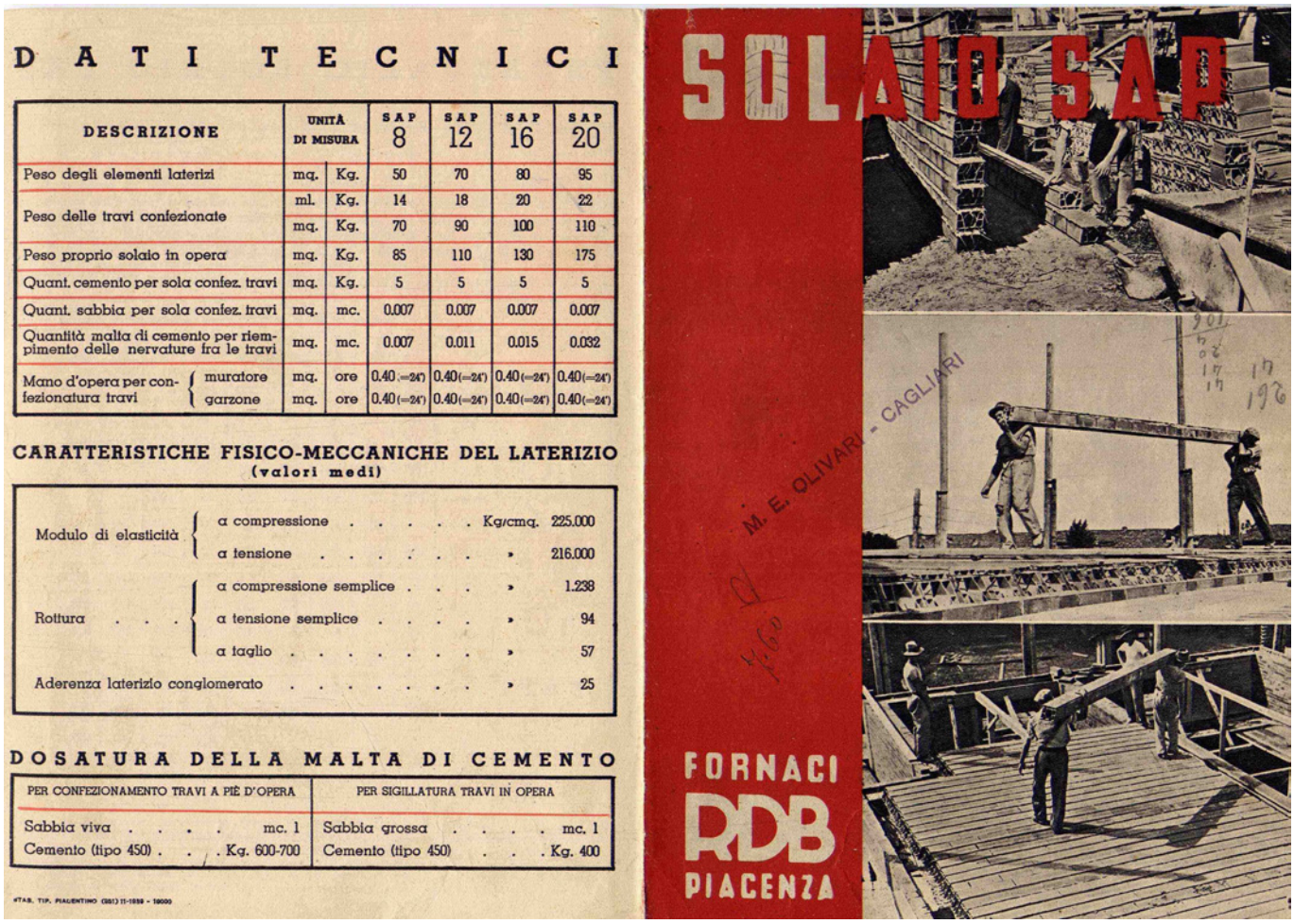


Fig. 3. *A section of a Hotel for Unmarried Workers, G. Pulitzer. (Image source: Azienda Carboni Italiani Archive, AREA).*

availability of manpower, and technical adjustments to local conditions that could not be predicted in advance were the order of the day in the building sites during emergency autarchy. The first lot in the works for the new town began with the construction of the Hotels for Unmarried Workers. The company which was awarded the works contract in January 1938 was Massarani & Pacca. Massarani belonged to a well-known family of intellectuals and entrepreneurs of Jewish origin, similarly to the president of ACaI, Guido Segre. This may also have been the reason why he encountered considerable difficulties that forced him to abandon the works in progress just before adding the roof structures to all the buildings. The Church of San Ponziano was the most complex and challenging building. The company repeatedly listed the extra costs incurred to deal with basic infrastructural deficiencies: the opening of new quarries, a new electrical substation, even an unexpected and significant number of temporary accommodation huts for the workforce and the difficulty of finding iron supplies and transporting them from Genoa, also given the limitations of the nearby port of Sant'Antioco. The fact that Massarani was still there at the beginning of 1938 is an indication that Segre had the management of the new Carbonia firmly under control, even in the details. But the failure to obtain an extension to the contract requested by the company is symptomatic of the imminent change of reference points. In fact, Massarani from Milan abandoned the works in June of the same year, and Gnudi, a company from Rome, took his place. In the meantime, however, Massarani had proposed some technical variations which had been approved. The most interesting one was the replacement of the timber trusses with thin-section reinforced concrete ones. After the works were completed, the difference was not noticeable because a false ceiling made with Perret hollow slim bricks concealed the structure. But since these are the same trusses that were put in place in those same years in the workshops of the Great Mine of Serbariu, we can deduce an evident technological and also entrepreneurial similarity between the two parallel building sites. This also indicates the innovative thrust that the building site of the Great Mine had over the construction site of the town. Moreover, even if the archives of the mine are now lost, we can easily argue that Pulitzer may also have had a decisive role in the Great Mine of Serbariu [11]. We can find an almost literal confirmation of this in the Spaccio Centrale (Central Store) in Carbonia, designed by Pulitzer, which practically replicates the structure and shape of the Workshops of the Mine of Serbariu.

Therefore, it was a variable autarchy in which the iron economy could be transgressed with good reason to promote innovation and in a broader view of the cost-benefit ratio [12]. Carbonia is also a prime example of that side of autarchy that created innovation with national products. The terrace of the Director's Villa is insulated with Populit panels; the floor slabs Sap are self-supporting with low reinforcing steel content, while Italian marble cladding is widely used in all public buildings: Apuan marble, Cipollino marble, Bardiglio marble and Calacatta marble are the main types, in addition to Roman travertine. But the first Carbonia, effortlessly responding to the main precept of autarchic architecture, according to which normal dwellings were to be built only in masonry [13], was also a remarkable example of how "local" materials could be used in a contemporary way. Red trachyte was used to build the base of all residential and public buildings, almost without exception. Trachyte bases and boundary walls are the real unifying element of the urban landscape, built in such an essential way that it is almost unaltered even now, 80 years later.

This undoubtedly represents a model of intelligent use of poor resources and how the design can interpret constraints by transforming a state of necessity into architectural quality. On elevation walls, trachyte was almost always used in the form of irregular blocks, which were then rendered. Sometimes the blocks were hewn and processed, but they were rarely properly squared. In this way, trachyte met the needs of the historical moment: abundant use of mostly unskilled manpower in a building site with very low industrialisation processes; direct availability in loco; versatility with respect to significantly different wall construction techniques. From an autarchic point of view, the use of the arch, which gives a twentieth-century imprint to the first Carbonia, responded precisely to the above needs. The Stuard



D A T I T E C N I C I

DESCRIZIONE	UNITÀ DI MISURA		SAP 8	SAP 12	SAP 16	SAP 20
Peso degli elementi laterizi	mq.	Kg.	50	70	80	95
Peso delle travi confezionate	ml.	Kg.	14	18	20	22
	mq.	Kg.	70	90	100	110
Peso proprio solaio in opera	mq.	Kg.	85	110	130	175
Quant. cemento per sola confez. travi	mq.	Kg.	5	5	5	5
Quant. sabbia per sola confez. travi	mq.	mc.	0.007	0.007	0.007	0.007
Quantità malta di cemento per riempimento delle nervature fra le travi	mq.	mc.	0.007	0.011	0.015	0.032
Mano d'opera per confezionatura travi: muratore	mq.	ore	0.40 (=24')	0.40 (=24')	0.40 (=24')	0.40 (=24')
Mano d'opera per confezionatura travi: garzone	mq.	ore	0.40 (=24')	0.40 (=24')	0.40 (=24')	0.40 (=24')

CARATTERISTICHE FISICO-MECCANICHE DEL LATERIZIO
(valori medi)

Modulo di elasticità	a compressione	Kg/cmq. 225.000
	a tensione	» 216.000
Rottura	a compressione semplice	» 1.238
	a tensione semplice	» 94
	a taglio	» 57
Aderenza laterizio conglomerato		» 25

DOSATURA DELLA MALTA DI CEMENTO

PER CONFEZIONAMENTO TRAVI A PIÈ D'OPERA		PER SIGILLATURA TRAVI IN OPERA	
Sabbia viva	mc. 1	Sabbia grossa	mc. 1
Cemento (tipo 450)	Kg. 600-700	Cemento (tipo 450)	Kg. 400

SOLAIO SAP

FORNACI RDB PIACENZA

Fig. 4. *A floor slabs SAP leaflet. (Image source: Azienda Carboni Italiani Archive, AREA).*

Studio became immediately confident with this way of operating, with an exercise widely applied to large public buildings but translated into real sophistication in residential developments. The garden city of Pulitzer consists of workers' quarters with neatly organised sequences of two-storey four-family villas. The houses were built according to a rural character distinguished by the absolute essentiality of structures and shapes with pitched roofs with overhangs. This model, however, was not an imitation of the local style as it cannot be found anywhere in Sardinia. The design rule was diversified in seven typological variants, which were, for the most part, designed by members of the Roman group with the exception of the "Lacchi Type" (Italianisation of Lach, Slavic name of an architect in Pulitzer's Studio) which the Stuard Studio managed to develop independently.

The distinctive character of this type lies in the main elevations, made of wall septa and arches which act as buttresses for the small segmental vaults of the intermediate floor structures and support the staircase, which gives access to the two dwellings on the first floor. This scheme had already been tested by Pulitzer in 1936 in Arsia and then in Bacu Abis. Budget problems and supply difficulties slowed down the use of full or hollow bricks. So, walls were also built using stone and *opus incertum* or concrete blocks produced on-site, although the latter did not ensure quality or durability. Other times, reinforced concrete was used alongside stone but hardly ever left exposed and was only used in place of stone when the type of building required it. It coexisted with stone and replaced it for constructive reasons or when the building type required it. The concrete frame was used only in buildings that were significantly high such as the Bell Tower of San Ponziano (but not in the Torre Littoria) and in the canteen of the Hotels for Unmarried Workers.

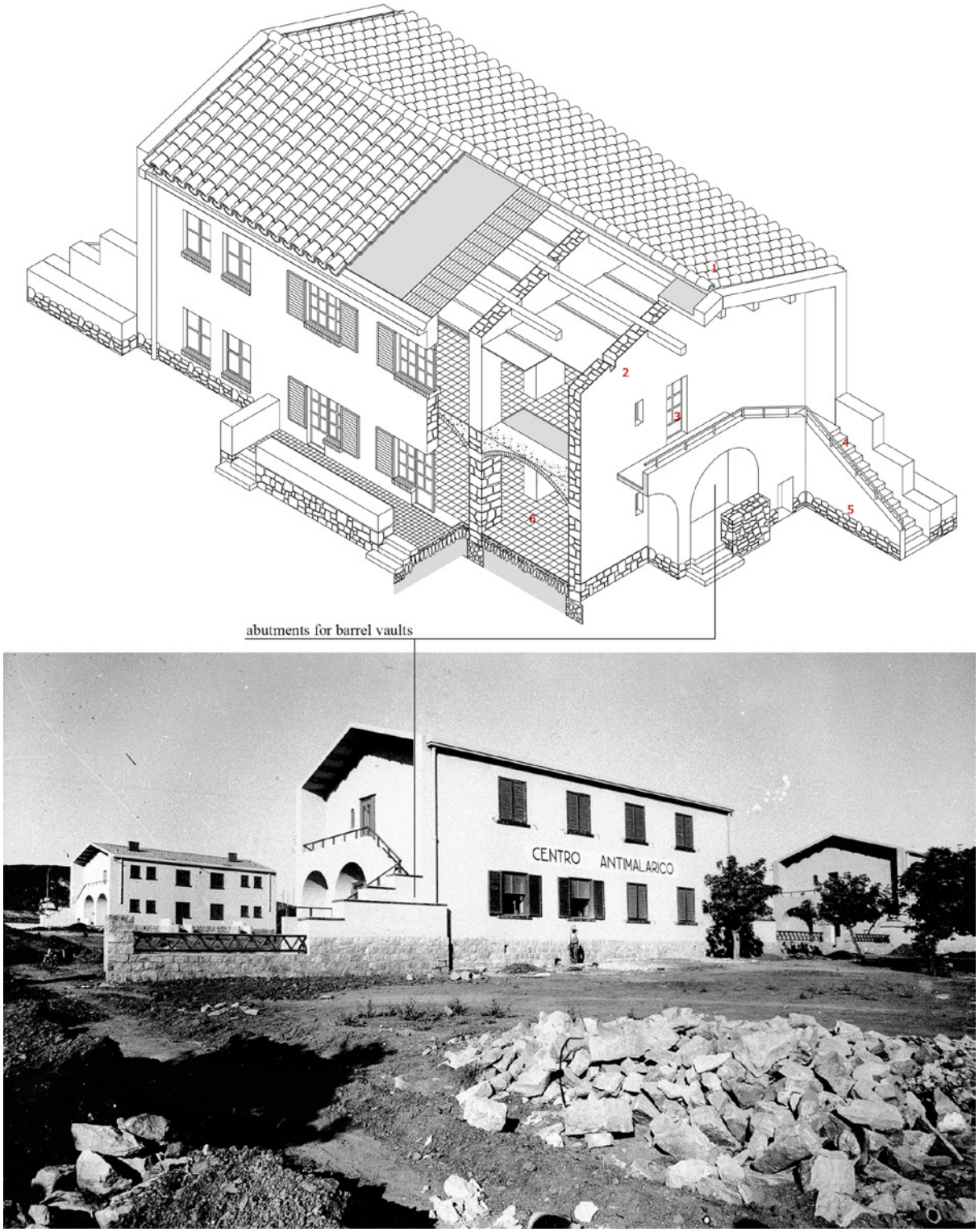


Fig. 5. *Axonometric section (drawing by V. Saiu and G. Monni) and historical photos (Carbonia in chiaroscuro: memorie quotidiane, SSL-BIS, Envisual, Carbonia 2002) of the Lacchi Type House. 1. Roof: tiles, hollow plank, large reinforcement in Trieste fir wood beams, gutter clad with a layer of asphalt, artificial slate pipes, false ceiling in perforated brick tiles, 2. stone and cement lime mortar masonry, 3. pitch pine or chestnut wood window frame with shutters, fir wood glazing frame, brick window sills, 4. staircase: stone and brick masonry, steps in hard trachytic stone worked at the big tip, tubular hand rails, 5. exposed masonry base with raw mosaic workmanship, 6. horizontal base closure: small concrete stone floors, concrete screed, shapeless stones arranged by hand. 7. solid brick vaults. (Image source: Sezione di Storia Locale del Sistema Bibliotecario Interurbano del Sulcis).*

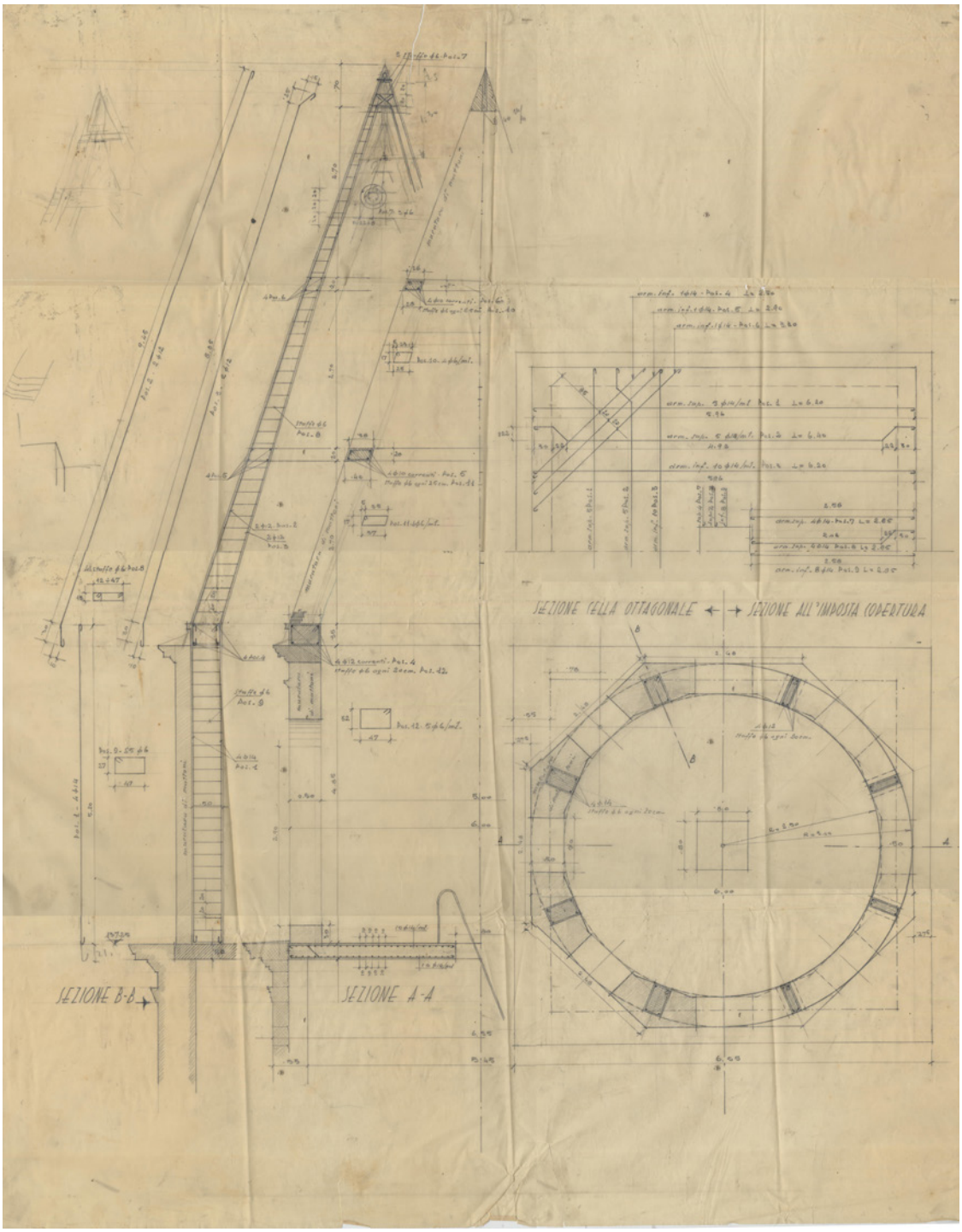


Fig. 6. *Section of the belfry and the spire covering the bell tower, probably developed by the Massarani & Pacca Company. (Image source: Azienda Carboni Italiani Archive, AREA).*

3. CARBONIA CAPITAL OF THE AUTARCHY MINING DISTRICT

The coal company town, conceived for the first 12 thousand miners, was still being built and populated when the urgency for energy self-sufficiency required a drastic update to the whole project. The mining district changed scale; at its centre, Carbonia took over the role of provincial capital with a planned size of 50 thousand inhabitants (a number which was, in fact, reached after the war). Around it, a number of satellite towns were planned, but only Cortoghiana was built in 1940, according to the exemplary project of Saverio Muratori. The "Great

Carbonia" [14] was developed seamlessly with the first one. However, it was immediately clear that the increase in accommodation capacity for the population, i.e., for a rapidly expanding workforce, could not be satisfied by a proportional enlargement with increased extension. Indeed, the infrastructure and social costs would have been totally unsustainable. Therefore, the sequence of actions that addressed the new, binding directives from the command centres was inextricably aimed at increasing the density of the town rather than extending it. In fact, the villas of the first phase were multiplied on the same urbanised land, and the sector around the Hill (then park) of Rosmarino was completed and supplemented.

The racial laws enacted in the second half of 1938 led to the rapid expulsion of the group led by Segre and, therefore, Pulitzer and his studio. The chain of command was totally redeveloped around the Roman group. The required consistency in the building and infrastructure processes of the town, and an acceptable efficiency, were ensured by a solid techno-structure. The Technical Office of the IFCP of the Company, with an internal and external direction assigned to the duo of Calini and Montuori (who opened a studio together a few years later), managed the projects, contracts and building sites. Thanks to this set-up, it was possible to maintain a coherent design in the urban system and its building lots for the entire two-year period of 1939-1940.

Eugenio Montuori, the new head of the design and construction of the new capital Carbonia, had already carried out important projects in the cities of the fascist foundation [15] and was certainly not a second-rank player in the first phase of the new town. He was responsible for the entire district for executives and employees, with the Director's Villa and the Hotel for Employees and the first district service centres [16]. In fact, Montuori essentially continued Pulitzer's strategy: an architectural project on a scale of 1:100, designed quickly with sketches and perspectives that clearly outlined the overall objective, and then a calculated number of details, the strategic ones to solve and keep under control in the executive phase the key points of the buildings. In mid-1939 Montuori had already delivered the project of the new four-storey houses with six apartments per floor: these were the Montuori O/5c Type Intensive Dwellings, called "Pistoni" [Pistons] by everyone. The *Pistoni* constituted a new settlement model. The relatively high buildings overturned the concept of low-density dwellings rooted in the ground: there was now a contrast between the original centre consisting of small villas in green areas and wide public spaces and the new outskirts of the town with a much higher density, consisting of blocks of flats with communal areas which were separated from the single dwelling.

The first lot of *Pistoni*, consisting of nine units, was entrusted to the Società Anonima Pasotti from Brescia, which began the works on 24 June 1939 and finished them one year later. This is how the first working-class district of Sardinia, with an independent reinforced concrete frame structure, took shape. The second one only appeared in 1953 in one of the first INA Casa (i.e. social housing) districts in Cagliari, designed by Maurizio Sacripanti, which was built by a construction company that had worked in Carbonia. A reinforced bond beam anchored the self-supporting brick and concrete floor slabs to the structure, protected and thermally insulated on top by Eraclit panels. The Pasotti company built almost all the units beyond the Rio Cannas and completed some of the ones which had been initially entrusted to Ferrobeton. Montuori presumably played an important role in this sudden change that was not clearly documented. Like Pulitzer, he also tried to overcome the difficulties due to the distance from the building site and the impossibility of defining every construction detail. He ensured that the work supervision and management were entrusted to a competent and expert person, who in this case was the architect and engineer Eugenio Paroletti [17]. He was probably responsible for a significant variant of this typology. To make savings on the use of iron, during the construction of the workers' units beyond the Rio Cannas, the company replaced the mixed reinforced concrete floors with brick vaults.

In the meantime, the scenario was changing rapidly. The nationally recognised companies were gradually joined by a group of Sardinian companies. These were almost always the same ones involved in the immediate post-war period: Carbonia would represent, for them, an important field of exercise in view of the Great Reconstruction of the '50s and '60s. Some units located

Fig. 7. *The "Mussolini Lot" formed by the Pistoni north of Rio Cannas and so named because it was the first lot of this type obtaining approval "through the intercession of the Duce" by the Ministry "even if requiring reinforced concrete for part of the structures". (Image source: Carbonia, nuova città della Sardegna. Architettura, 9, 1940).*

near the town centre were contracted to the Scano-Binaghi-Fadda-Tonini company from Cagliari, which during the works obtained three time extensions, but despite this, it did not manage to complete them. In a letter sent to ACaI, the company listed all the difficulties encountered on the building site: the need to use Serbian prisoners of war as labour, even though they were mainly farmers with no building work experience; the loss of hydraulic equipment at sea due to a war incident; the interruption of works due to the lack of supply of asphalt which was being replaced with phenolic resins (after several unsuccessful experiments with the *Idrofugo Lontra*, a water-repellent material which was, of course, an autarchic material); the requisition of all furnaces by the Military Authority. This was a paradoxical model of "eclectic autarchy". The sharp volumes of the *Pistoni* concealed a compromise between the reinforced concrete structure and the traditional way of building under the rendered surface. In an emergency situation, this was the most effective way to construct the modern building type par excellence: the *tall house*. Ensuring the formal unity of the complex must not have been a simple task.

The other fragments of the town beyond the river, which unfortunately became a suburban area, were also designed and built by Pasotti and took four years to be completed. South of the *Pistoni* district, in January 1941,

Fig. 8. *The Pistoni along Corso Iglesias built with trachyte masonry and brick vaults in an area south of Rio Cannas. In both cases, the works were carried out by the Pasotti Company. (Image source: MAXXI Archive).*

the construction of the B1 Type Intensive Dwellings [18] for workers was authorised, also designed by Montuori, which constituted an urban block of great formal and spatial quality capable of evoking some of the refined examples of the German Siedlung. Only 6 out of the seven units provided by the project were built. The north

Fig. 9. *The "Great Carbonia" (APMC). Two new four-family residential types, the Gra-M and the Gra-N, are combined in the great settlement that encloses Rosmarino Hill with the expansion towards the north. In spring 1939, while the last lots of the buildings of the first phase are being completed, the first houses of the new phase are launched. This is an updated and more standardized synthesis of the previous "signed" types, probably due to the interaction of the professionals within the Technical Office of the Fascist Institute for Public Housing. In the background the intensive typologies by Eugenio Montuori. (Image source: Massimiliano Carboni Private Archive).*

elevations of the units were connected by a low body of shops. These, together with the staircase and walkway system with large trachyte septa marked by arches and thin self-supporting floor slabs, made this type of building construction the emerging system on an urban scale.

This was also the most significant experimentation in the town of masonry structures in multi-storey buildings on the construction level. However, even in this case, the difficulty in procuring bricks led to an interesting variation during the works: in fact, in a commissioning report, it was specified that in one of the units, the brick and concrete floor slabs were replaced by brick vaults. The approval of the project by the Ministry of Public Works was issued on 15 January 1941, but it was granted on an "exceptional basis", provided that no other units were built in this way. Given the high construction costs, new social housing units were not allowed to be built if the dwellings were larger than two bedrooms plus services: the rents had to be adjusted to the miners' wages. And presumably, this was one of the many reasons why most of the rationalists Siedlung provided for in the expansion of 1940 beyond the Rio Cannas was never built in the end.

4. CONCLUSIONS

An extraordinary concentration of capital, ideas, professionalism, skills and experiences marked the very intense five years that went from the conception to the construction of Carbonia, the national capital of the energy autarchy. In dramatic emergency conditions and at the same time at breakneck speed, a highly diversified mission team addressed and conquered the challenge of creating a town that, ten years after its inauguration, hosted 50,000 inhabitants. The main role players were the four designers: Pulitzer, Montuori, Valle and Guidi. However, the first two were the ones who above all, accepted the emergency conditions as a stimulus to adapt

their design to the particular context conditions. The work of the construction companies was also highly remarkable as they were forced to progress among a myriad of difficulties and impediments to complete the works under a very tight schedule. Carbonia can be seen as the ultimate expression of resilience, in the sense that we attribute to this term today: the ability to adapt flexibly to crises, sudden changes in context and programme, but most importantly to "learn from crises", modifying and perhaps improving one's actions without losing the essential character of the original project [19]. The town and its popular buildings are built with "essential" (so as not to say "poor") materials and forms. This is the basic precept of the Modern Movement: to do one's utmost with the least, to use design and construction intelligence to make up for the scarcity of resources. Cities and buildings stay alive over time, not immutable but always well recognisable. International technologies and local materials and landscapes represent the two major Modern trends in architecture. The coexistence and comparison between these trends represent the very nature of the "emergency city". We can draw a pertinent lesson from this context in order to approach the great crises we are now facing [20].

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