Chapter 16
Modern Technical Heritage: A Survey and Analysis of the Water Tank in Corigliano d'Otranto by Gaetano Minnucci

Vitangelo Ardito and Nicola Panzini

Abstract The subject of this paper is a technical-constructive analysis, aided by archive documents and critical redesign, of a building that should be recognized really important in the modern architectural heritage of Apulia: it is the Water Tank in Corigliano d'Otranto (1937–1938) by Gaetano Minnucci (1896–1980). This is an industrial building realized by the Acquedotto Pugliese for supply of water in the whole of the Salento area. The huge volume of water (22,000 metric cubic) is stored in a cylindrical-shaped building made up of remarkably thick masonry wall, consisting of several layers that fulfill many requirements: functional, structural, and environmental. The Water Tank is about 30 m high, with a diameter of 30 m length: its silhouette dominates the Salento plateau appearing today as a part of the landscape – as Castel del Monte, which has become part of the Murgia plateau over time. Integration with landscape also takes place thanks to the technical invention of the external masonry wall, made from blocks of artificial stone (a kind of concrete). The masonry wall is constituted rhythmically by a surface divided into concavities, evoking the picture of a colossal column. In this work, Minnucci has been able to interpret the characters of place through an innovative use of a prefabricated material. In addition, the Water Tank belongs to the Modern's research on the technical building with new monumentality based on the relationship between construction and form, finding its theoretical roots in Germany between the two wars.

Keywords Modern heritage · Technical building · Active preservation · Minnucci

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16.1 Introduction to the Facts

In the early twentieth century, Acquedotto Pugliese S.p.A. (AQP, *Apulian Aqueduct*) established a program of works to solve the issue of water supply in the Apulia Region. The *Adriatic Water Route* was scheduled to reach the end of the Salentine peninsula. In Lecce, a pensile cement tank was realized, while in Corigliano d'Otranto, on a slight hill, barycentric between the Ionic and the Adriatic sides, a large tank was planned, 30 m high, with a diameter the same length as the height, and a water capacity of 22 million L. At that time, it would have been the largest in Europe.

The tank would have been superelevated and exploited the terrain's natural slope for water runoff in the surrounding area (Fig. 16.1). At the same time, it aimed to produce a visual relationship with the territory, as the "technical" building could be seen by travelers already from a dozen kilometers. Something similar occurs with Castel Del Monte, on the Murgian hill, a rock crest passing through Apulia by a part of its length until the border of Salento. These works certainly have different values and yet are similar and have an impressive size: with their absolute form – octagonal for the castle and circular for the tank – they express autonomy from the landscape; despite this, they have increasingly become an integral part of the same place.

The design of some works for the Acquedotto Pugliese (AQP) was entrusted to a Roman engineer, Francesco Uliscia, the owner of a construction company, who was also charged with the execution phases. For the Water Tank in Corigliano, Engineer Uliscia's project envisaged a cylindrical wall wrapping the cement wall of the tanks from a distance to produce a cavity for ventilation and cooling and to host a stairway reaching the roof for maintenance interventions and inspections (Engineer Uliscia).

Fig. 16.1 Water Tank in the landscape of the Salento area. (© Nicola Panzini 2023)

This uncovered the main design challenge of that project: finding a *technical* solution for this external cylindrical wall with its own identity with respect to the cement wall of the tank, provided with its specific expressivity. Uliscia had designed a stone wall covered with bands, with the coronation resembling a crenelated tower. It was a meaningless solution, which probably pushed him to turn to Gaetano Minnucci.

16.2 Gaetano Minnucci's Reflection on Technique

In that period, between 1936 and 1937, architect Gaetano Minnucci designed engineer Uliscia's house on Appia Road in Rome. The two known projects for the house display interest in the farmhouses of the Roman countryside, the local minor architectural style. The first and most meaningful one was for a two-story house with loggia on the façade; the second one employed a reduced solution, which was more straightforward but no less effective. Uliscia and Minnucci knew each other: not by chance, the house and tank projects are coeval.

Gaetano Minnucci (Macerata 1896–Rome 1980) had emerged just in the 1930s, in Marcello Piacentini's small group of collaborators, with the projects for the New Rome, established by the regime. The Water Tank in Corigliano d'Otranto belongs to the same period as the Office Building of the Universal Expo organization in EUR (1937). It was a central and fruitful period in his work.

Minnucci's buildings show his interest in new Dutch architecture, which he had studied and disseminated in his successful study "L'abitazione moderna popolare nell'architettura contemporanea olandese" (1926) (*The modern low-income house in contemporary Dutch architecture*). Berlage, Oud, and Dudok had suggested to him a building design through simple and plain volumes "under the light". This recalled an elementary classicism, suiting Piacentini's projects for Rome. This architecture had an explicit tectonic content expressed through a few structural elements. The Office Building is a meaningful example of this. Architectural forms and construction expression coincide, like two images that move close until they perfectly match up.

Especially in modern industrial buildings, which he approaches by studying American and German examples (Figs. 16.2 and 16.3), Minnucci deals with the theme of the "technique," which is central in his reflections. At a conference in Rome in 1932, Minnucci declared:

> "In architecture, the technique is the theme: that is, how a complex artistic expression is realized. […] When looking at an architect's available tools to raise an architectural work, a building, or a factory, it is clear that architecture and construction technique are so strongly fused that they can never be separated" (Minnucci 1984).

The construction concept and the architectural expression of a building, especially an industrial building, which best conveys modernity, coincide, as they generate the same spatiality and share the same formal content. This reflection, consolidated over the years, led him to be an Adjunct Professor of Technical

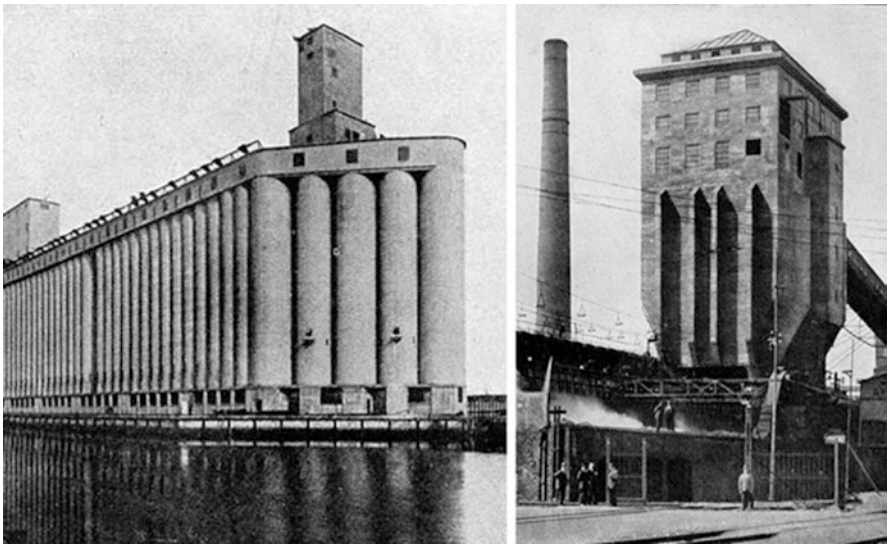

Fig. 16.2 Modern industrial buildings: grain silos in America; coal deposit in Germany, arch. W. Kreis. (From Minnucci 1926a)

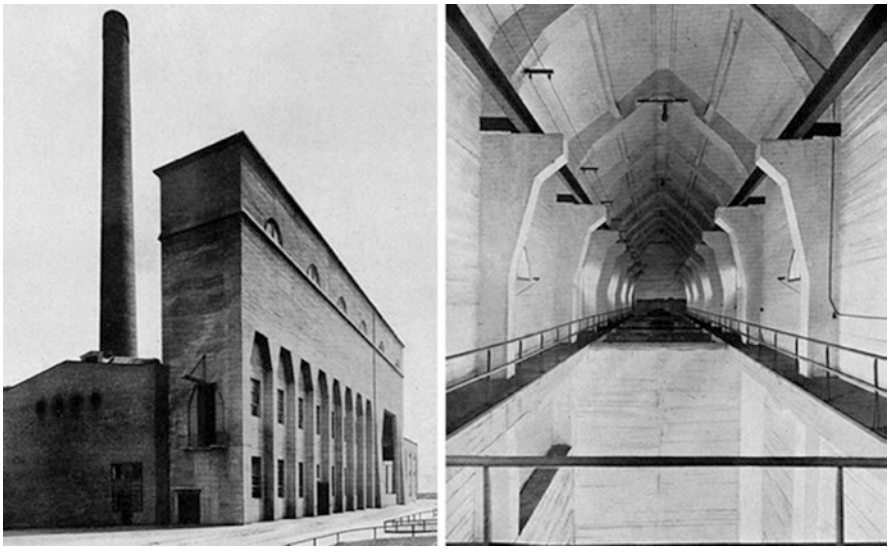

Fig. 16.3 Modern industrial buildings: coal silos in Germany, arch. C. von Brocke. (From Minnucci 1926a)

Architecture (1939) and Full Professor of Construction Elements (from 1939 to 1962) at the Faculty of Architecture in Rome. This set the bases for the discipline of Architectural Technology. Among his works, the Water Tank in Corigliano d'Otranto convincingly proves his statement: "construction is architecture".

In 1926, in an essay on the aesthetics of industrial buildings – with water tanks being among these types of buildings – Minnucci dealt with these themes:

> "Nowadays, architecture is increasingly international, and simple and fundamental geometric forms mark this characteristic. […] In industrial buildings, more than ever, the new architectural art starts to be mathematical, strong, rational, and firmly logical. […] seeking a new style is literature, what is needed is a set of tools more suitable for the new life, inspired by the moment" (Minnucci 1926a).

In this way, clearing the field from any stylistic will – think, instead, how much the Fascist regime's speeches nourished this stance, while some German masters performed a parallel reflection in the same years – he states that the use of modern technique, that is, correctly used "tools," will produce "a 'mechanical' style of our time, [which] has spontaneously arisen, as a logical consequence of this age",

> "based on the very essence of architectural construction. We totally agree that the construction layout does not represent an artistic manifestation per se; however, when this layout fulfills some harmonic relationships when its lines, masses, and plasticity evoke an emotion in us, then this construction coincides with architecture and is architecture".

First, Minnucci focuses on "harmonic relationships", underlying correct structural dimensioning. Then, among the characteristics required for the design of a "technical" building, Minnucci indicates the absence of decoration. That belongs to architecture, where it is "one of the best tools it can use to evoke particular effects", but it cannot belong to construction. Hence, he turns his interest to industrial buildings, "maybe the truest and sincerest expression of our age". He recognizes in them

> "an aesthetic direction based on the very characteristics of manual work, mechanical activity, that is, severity, strength, and simplicity of modern work energy, [which] must be foundational of the architecture of the industrial building".

The most relevant industrial buildings from the early twentieth century demonstrated the possibility of achieving a new monumentality with sole technical tools, following principles and logic that led to expressive construction. The industrial building did not require a monumental "façade" or a representative "style," as its essence lay in its construction's impressiveness. The examples mentioned by Minnucci in his 1926 book are the same published in the third Yearbook of the Deutscher Werkbund (1914): that is, the grain silos in Buenos Aires or Bahia Blanca, presented by Walter Gropius. "The simple tools of elementary tectonics have produced architectural forms that dominate their surrounding environment with a classical gesture" (Gropius 1913).

However, it must be highlighted that, according to Minnucci, this way of conceiving construction as an accomplished and expressive entity excludes founding the building on "duality", on the separation of a load-bearing structure and a representative "façade":

> "[…] the error of duality, of two distinct organisms: on the one hand, the load-bearing skeleton, the set of living muscles and nerves, produced by a technician; on the other hand, a superficial decorative covering, created by an artist who will hardly understand the spirit of industrial aesthetics, in this case".

Finally, Minnucci provides clarity on the materials to use, acknowledging both the advent of new products and the possibility for coherent use of local traditional ones:

> "[…] in natural stone buildings […] it is harder to detach from past architectural forms. Moreover, considering that the construction technique varies very little for that material, I see no need for that".

These observations date back to some years before Uliscia's call and stand as the immediate reflection of his architectural design, originating from construction principles and logic. Hence, they could be seen as the theoretical foundation of the project for the Water Tank in Corigliano d'Otranto.

16.3 The Water Tank in Corigliano d'Otranto

In the Municipality of Castrignano dei Greci, in the valley at the feet of the hill where the Water Tank rises, around a 100 wells with the forms of truncated cones or pyramids had already been realized in the late Roman age by excavating the calcarenite soil up to a depth of 5 or 6 meters. The wells, close to each other, are still present and used and are fed by rainwater, which is filtered through stone and fills the cavities. They are connected to the top through a small hole, protected by large stone ashlars that cover their inlets and allow drawing small water quantities for domestic uses. They are called *pozzelle* (small wells). It is still possible to see territories punctuated by these perforated stone boulders in Salento. However, this peculiar water supply system could not fulfill a vast area's water needs.

Minnucci had a deep knowledge of the German debates on the theme of industrial building, reformulating the problematic relationship between construction systems and architectural forms in modern terms. He also dealt with water management systems through dams and dikes in the Netherlands and wrote two articles about them in the journal "Ingegneria" (Minnucci 1924).

In the same years as the project in Corigliano, between 1937 and 1938, he designed the workers' district in EUR on Laurentina Street, where he placed a civic tower containing a water tank on one side of the square. The tower had the form of a brick parallelepiped, a monumental-sized geometric object, as required for urban elements in the fabric of the Fascist city.

Due to its location and size, the Water Tank in Corigliano required a different effort. Due to the decision to realize a single reinforced concrete cylindrical tank with a trapezoidal section suitable for resisting water pressure, the impressive size suggested realizing an additional wall outside the tank wall (Figs. 16.4 and 16.5). To protect from summer overheating and decay due to agents, producing an "air cushion" between the internal and external walls was necessary. Moreover, this could reduce seismic stress, limiting water leakage in case of cracks. Minnucci would have realized the outer wall in local stone if the high costs had not forbidden it.

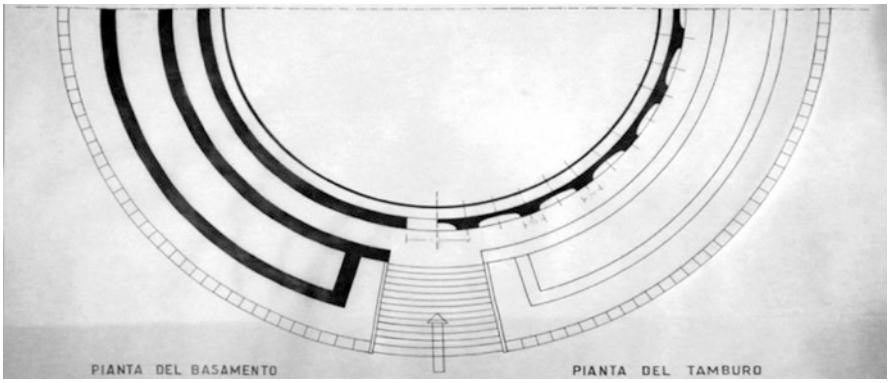

Fig. 16.4 Plan of the Water Tank, about 1937. (© Acquedotto Pugliese Archive, 18-2-C-6-120/121)

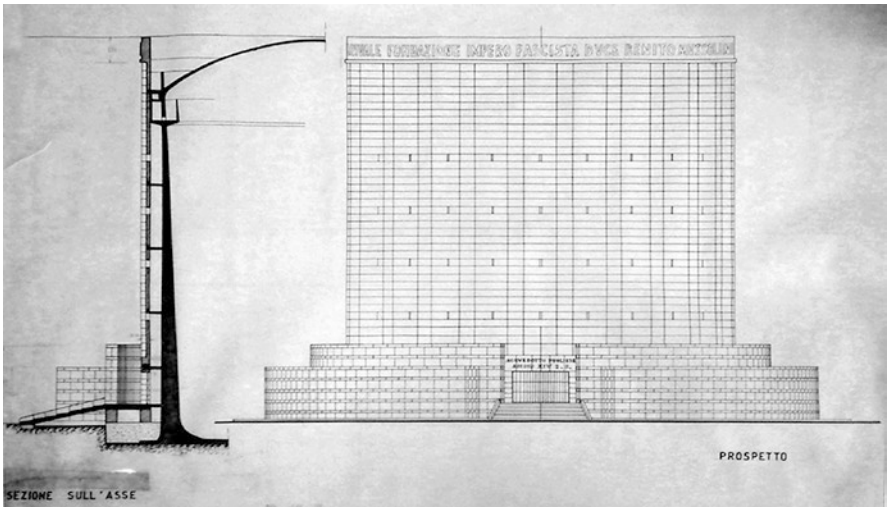

Fig. 16.5 Front of the Water Tank, about 1937. (© Acquedotto Pugliese Archive, 18-2-C-120/121)

In the end, the external wall has been realized in concrete blocks with high thickness, between 30 and 80 centimeters. The exterior surface is concave to reduce its weight. The result recalls the flutes of a giant column drum: here, technical needs and formal expression are perfectly unified. According to the dominant autarchic thinking of that time, the blocks were realized on-site, and the assembly was performed through mechanical lifts. Hence, the concrete blocks can be seen as a modernization of ancient stone ashlars. This transformation has employed a production process that favored workability and eased installation (Fig. 16.6).

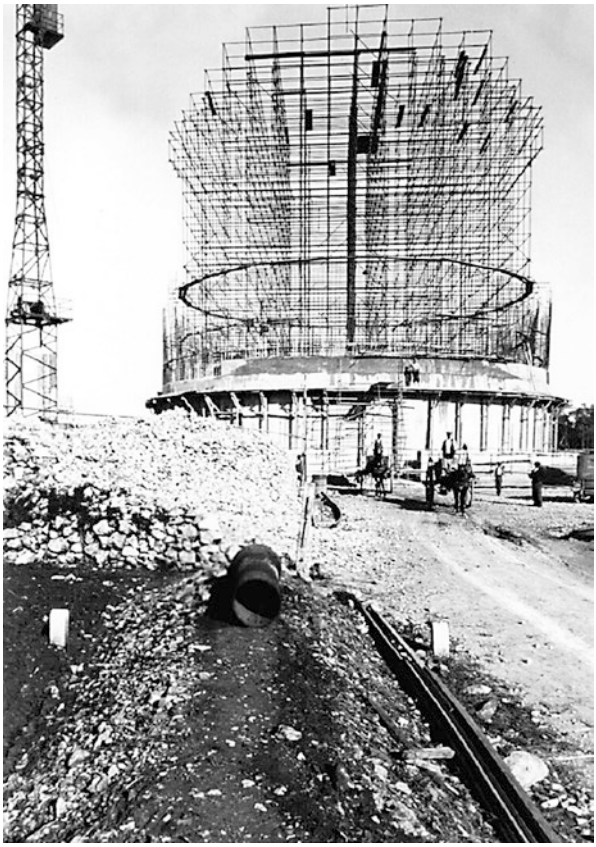

Fig. 16.6 Construction site of the Water Tank, about 1938. (© Acquedotto Pugliese Archive, 18-2-C-120/121)

The distance between the external masonry wall and the internal wall produced a cavity to place a helicoidal stairway that reaches the roof, a light spherical cap in reinforced bricks stiffened by radial ribs. Two inclined and parallel concrete beams hinged on the internal wall and the external masonry wall run along the two internal façades and follow the inclination of the stairway. The upper surface of the inclined beams is shaped to hinge prefabricated cement treads. Hence, the stairway only consists of treads, and the lack of rises allows good ventilation in the cavity. The curbs' upper surface configuration provides for placing the prefabricated concrete treads. At some points, the inclined beams are connected to high beams, "linking" the external masonry wall and the tank wall (Fig. 16.7).

Hence, it can be stated that the external masonry wall and the internal wall are not autonomous or that one is a covering for the other. The homogeneity of the material and the abovementioned "tacking" of the two parts with elements that can be considered akin to the transverse blocks of stone walls leads to thinking that Minnucci aimed to build a single, high-thickness hollow *muraglione* (massive wall). This construction principle was widespread in ancient Roman buildings.

Fig. 16.7 Helicoidal concrete stairway, located between the external and the internal wall of the Water Tank. (© Nicola Panzini 2023)

The unity of this hollow *muraglione* is confirmed by carefully analyzing the end nodes, in the foundation and roof covering. At the bottom, the solid slab foundation of the tank and the ring-shaped curb of the external masonry wall are made integral by a continuous cement element, which joins the two parts and provides unity to the foundation; at the top, the tank wall and the external masonry wall are connected by an additional slab, on which the covering cap is hinged. Hence, this load is distributed both on the tank and the external walls (Fig. 16.8).

Therefore, the external masonry wall cannot be considered a covering of the tank wall. Instead, it has been designed and built with no need for a cement wall to sustain it: the out-of-scale blocks, circled by cement curbs at different heights, make up a self-bearing mass overall. With its significant weight, this mass fulfills a static function. It constitutes a vertical load on the foundation, stabilizing the whole structure by rebalancing the tank's weight. The result is physical and formal unity (Fig. 16.9).

The solution proposed by Minnucci originates from a simple conception, stands as an effective construction solution, and appears in a suggestive unitary definition: this articulation of the large cylinder shows a clear construction idea with an ancient

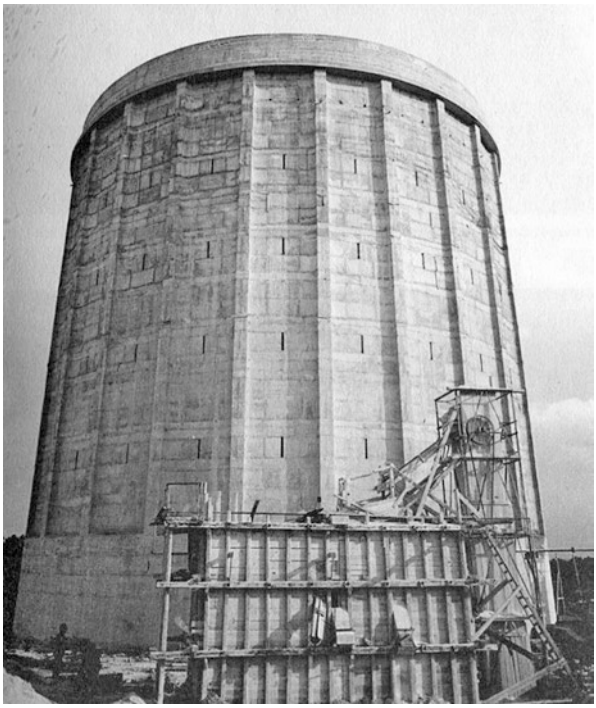

Fig. 16.8 Construction site of the Water Tank nearly finished, about 1940. (© Acquedotto Pugliese Archive, 18-2-C-120/121)

conception and a modern execution. It is a large, stratified masonry wall deriving from the superimposition of multiple rows; it is hollow inside and yet unitary, like an ancient stone wall.

16.4 Interpretations of the External Masonry Wall

Another aspect of Minnucci's Water Tank is the figurative and construction interpretation of the external prospect, resulting from a wall realized by combining just two blocks, opportunely laid to generate a composite yet ordinate and rational design. The first block has an "L-shape" with a rounded internal corner, representing the vertical rib of the masonry wall; the second has a rectangular section and closes each wall section comprised between two ribs. The blocks are almost dry-mounted, with the joints aligned vertically and horizontally to show the tectonic nature of the wall, with unclamped blocks "superimposed" by their mass. The vertical joint between the two "L-shaped" blocks, visible on the side of the rib, declares that the masonry wall is constructed by parts or "vertical portions". Hence, the cylinder comprises 24 independent portions, which are juxtaposed and slightly rotated from time to time on the axes of the ribs. Thus, the blocks making up the rows, with a regular height of around 1 meter, are alternated to cast-in-place curbs that circle the

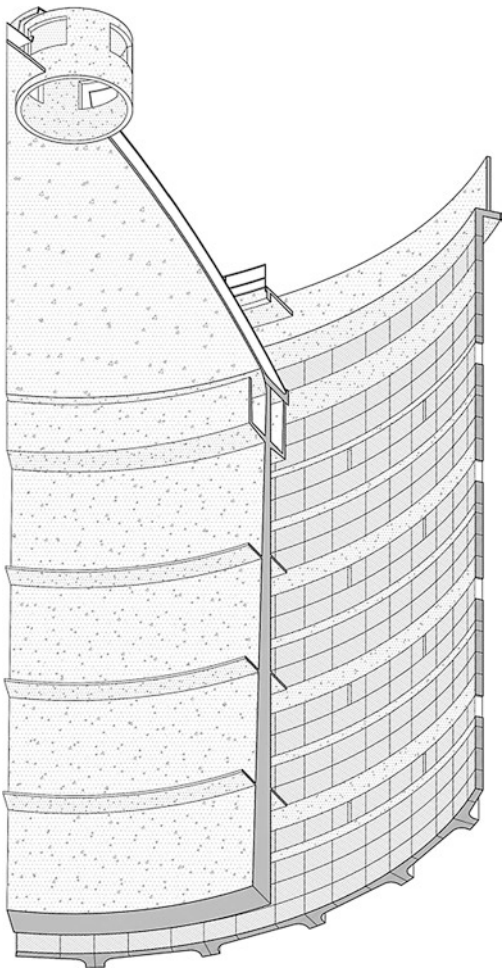

Fig. 16.9 Cross-section axonometry with the two parts of a single, high-thickness hollow *muraglione* (massive wall) of the Water Tank, composed by the external masonry wall and the internal concrete wall. (Drawing by Nicola Panzini)

whole masonry wall. Hence, they connect the 24 wall portions between them, restoring the unity of something realized by parts (Fig. 16.10).

A primal technique – that is, the construction by simple block juxtaposition – is modernized in this case with an interesting "prefabricated" production process, both regarding the single element (the block) and the part of the wall to which it belongs (the vertical portion). It could show distinct and separate blocks; instead, it demonstrates that a wall realized by distinct and separate parts can provide unity and integrity to the building.

From an immediate analysis, the large cylinder in concrete blocks of the Water Tank evokes a giant column drum forgotten on the upland, like Piranesi's surreal out-of-scale objects. It is also a veiled allusion to Adolf Loos's project for the Chicago Tribune (1922). Minnucci had proper knowledge of Loos's work; some

Fig. 16.10 External masonry wall of the Water Tank, with prefabricated concrete blocks in rows and cast-in-place concrete curbs. (© Vitangelo Ardito 2023)

references can already be seen in the cottage on Carini Street in Rome (1926). Moreover, a figurative affinity brings the Chicago Tribune closer to the Water Tank in Corigliano. Loos's competition project presents little information: the type-floor plan reports a sequence of lesenes completing pentagonal load-bearing elements, with windows in the intermediate area. In this way, the concave flutes of the façade are perceived through the position of the edge of the lesene and the setback of the windows. Concavity does not result from an excavation but from an artificial effect of plane articulation, which the Viennese architect dissimulated by skillfully shaping the surfaces. The sequence of lesenes sacrifices the continuity of the wall in favor of the vertical tension of the building.

Vittorio Bonadè Bottino focuses on the same theme – the nature of flutes in the prospect – in the Balilla Tower (1933) in Massa Marittima. It is a tall cylindrical building, realized for FIAT workers' children's summer stay. Though the image is akin to the previously mentioned examples, the theme is confronted by applying the same "duality" rejected by Minnucci: the cylindrical concrete columns, making up the structural part, are pushed against the circular and continuous back masonry wall, declaring a separation between the parts and, at the same time, an evident ambiguity in the frail unitary image.

In Minnucci's Water Tank, the blocks mounted at the center only serve as enclosures, while the load-bearing components are the vertical ribs. Here, there is an evident similitude with Loos's "columns". Hence, the external masonry wall can be intended as a rhythmic sequence of block pillars, coronated by a continuous

horizontal element. This top element takes a non-negligible meaning: from a structural standpoint, it provides more stability to the underlying construction with its weight; concerning visual aspects, its presence concludes a building that is already made a fragment by its nature. Therefore, the Water Tank could be seen as a curvilinear masonry wall frame consisting of T-shaped wall pillars.

According to one more hypothesis, it can be seen as an excavated massive masonry wall. This would explain the concave form of the subtracted mass and the L-shaped form with rounded block corners: a square corner would have suggested a different hypothesis of a buttress for the rear wall, which is not buttressed. Instead, the concave excavation originates from ancient Romans' ways of reducing the weight of masonry walls: the Pantheon is a circular building made of bricks, with a giant wall lightened by internal niches, some of which are circular.

The concave parts of the prospect deserve further figurative analysis. This choice could undoubtedly derive from the technical decision of giving stability to the significantly thick wall while lightening some parts not to hinder assembly operations. However, it could also reveal Minnucci's interest in Baroque architecture – Giovanni Michelucci, in a report about Minnucci, recounts their walks in Rome to discover the Baroque city (Zacheo 1984) – and its "popular" reinterpretation in the 1920s Rome, with the *barocchetto* (late Roman Baroque).

In this way, multiple references are overlapped in a constant reflection on construction as a starting point of architecture, evidently showing Minnucci's capacity to enrich a structural scheme by selecting historical architectures where construction is clearly more than structure and bears the seeds of form. Alternatively, using Minnucci's words, "this construction coincides with architecture, is architecture."

16.5 (Especially Technical) Construction Is Architecture

This building can stand as an emblem of the meaning of the expression "construction is architecture". Architecture is always construction, as long as it is acknowledged that its purpose is indeed to be built; however, the forms of a building may not belong to the realm of construction. Even when a purely representative role is assigned to construction, establishing apparent coherence between architectural forms and construction solutions, the origin is another. In Minnucci's Water Tank, instead, formal solutions coincide with construction principles. Or rather, we might say, the construction principles themselves give meaning to architectural forms. It could be a masonry wall frame consisting of a rhythmic sequence of T-shaped wall pillars; a sequence of wall portions with niches, wall sectors juxtaposed in a sequence and connected by curbs and the horizontal cornice; and an excavated and lightened masonry wall, configured in this case as a ribbed wall, where the joint on the rib only depends on construction processes (Stendardo 2006, 2008). In any case, this seems to us the most convincing interpretation: the formal origin of the building is in the realm of construction (Fig. 16.11).

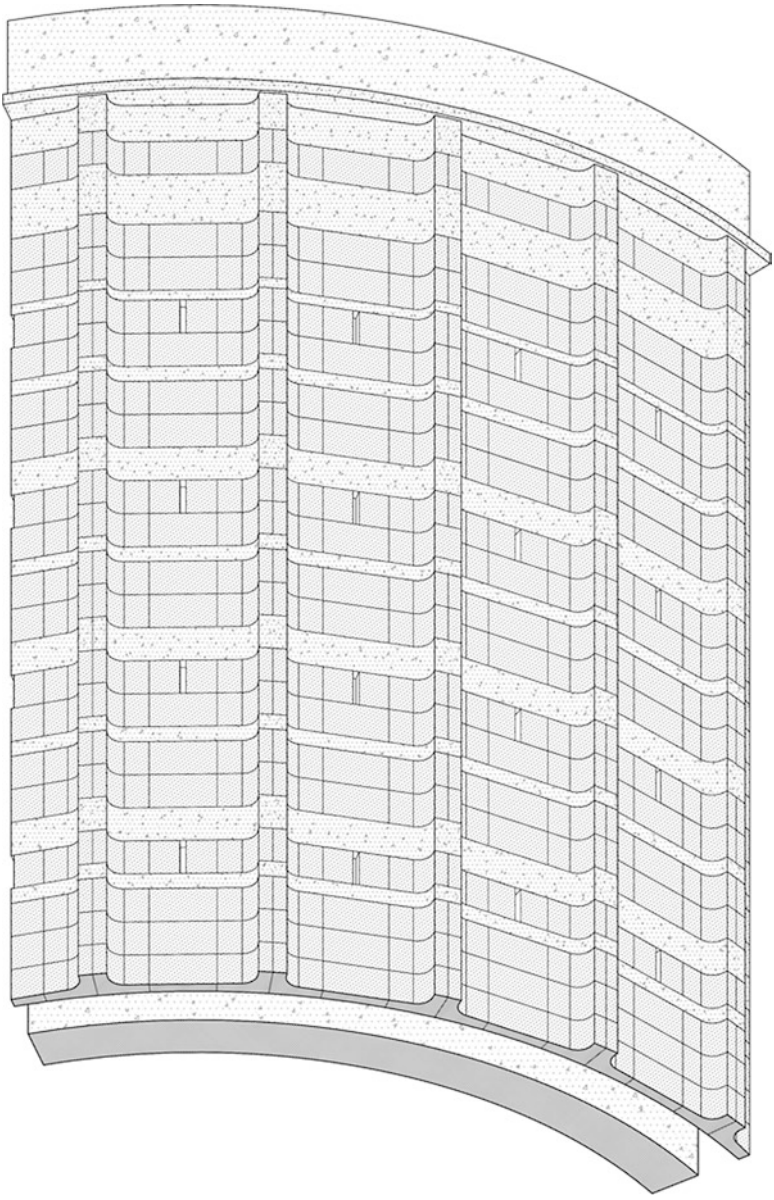

Fig. 16.11 Detailed axonometry of the external wall of the Water Tank, described as an excavated and lightened masonry wall, configured as a ribbed wall. (Drawing by Nicola Panzini)

In this case, construction is turned into a synthetic, essential gesture, which restores a recognizable character in architecture with "severity, strength, and simplicity". It might look like it does not belong to its time, as it does not welcome its style; it might even seem that it does not belong to any epoch and contain several of

them, hence taking an atemporal expressive language, which only derives from construction language.

All this can be found in the *technical architectures*, which Minnucci studied attentively and recounted in his 1926 article. Among these are the American silos and the European dams: "Undoubtedly, architecture derived from the rhythm and harmony of construction elements; hence, the evolution of technique cannot avoid creating new rhythms and new harmonies through the new forms and proportions" (Minnucci 1926b). Other examples are the German factories and coal deposits in reinforced concrete, "conceived with a true artistic sentiment, reaching great monumental aspect as a whole". Minnucci exalts the "special and perfect workmanship of their external surface" as they are "original and typical examples of the new construction forms and the new direction of architectural aesthetics".

All this can also be found in the Water Tank in Corigliano, whose construction concept is certainly industrial; however, like in the mentioned examples, "the elements required by the technique are laid to create powerful harmony and a monumental architectural rhythm". This is the signal of its surprising modernity.

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Engineer Uliscia's drawings are preserved in the Acquedotto Pugliese S.p.A. (Bari). Gaetano Minnucci's preliminary project drawings are kept in the same archive. The "Archivio di Stato" in Rome, "Fondo Minnucci", does not have any drawings of the Water Tank but only construction site photographs. Therefore, the descriptions and construction interpretations here have been based on a first-hand survey and analysis of the building, which remains the most reliable document

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