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## **Building organic architecture in Italy: the history of the construction of the Solimene Ceramics Factory by Paolo Soleri in Vietri sul mare (1952-1956).**

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### **Abstract**

The Solimene Ceramics Factory (1954-1956) in Vietri sul Mare (Amalfi Coast) is an Italian example of organic architecture designed by an apprentice of Frank Lloyd Wright, Paolo Soleri. In 2005 the building was listed by the Ministry of Italian Culture due to its exceptional architectural value. The development of this project and its building process represent a unique case study of typical Italian post-war craft-based construction. This is a non-standard object erected with affordable yet ingenious solutions such as load-bearing walls made from terracotta vases and complex timber-work used as formwork, erected without a crane.

For several reasons, the building we appreciate today is only partly the result of the original scheme and this paper aims to reconstruct the sequence of changes and alterations that occurred in order to help define guidelines for its future restoration. The building is reported in few bibliographic resources and without full details of its method of construction. The account in this paper has not been previously published: while the construction photographs are from the archive of the architect in Arizona, the construction details of the façade were drawn by the author following a direct survey of the building and after consulting the archive of the factory.

### **Keywords:**

Paolo Soleri, organic architecture; terracotta façade; conservation; ceramics; factory; craft; building process;

### **Introduction**

Paolo Soleri (1919-2013), an Italian-born architect, became famous for creating a visionary prototype for a new kind of ecologically sensitive city named Arcosanti founded in 1970 in the remote desert of Arizona on a site roughly 70 miles north of Phoenix. Soleri started his apprenticeship at Frank Lloyd Wright's Office in 1947. This experience influenced Soleri's vision of, and his commitment to ecologically sensitive urban living evident throughout his career. Although his utopian city never flourished, Soleri's proposal for dense and vertical

settlements remains a legacy that might be realised in sustainable and green approaches to architecture and urban planning today. His utopian approach defined his whole career starting with his turbulent relationship with Frank Lloyd Wright<sup>1</sup>. After spending 18 months in Taliesin West, Wright described the design approach of Soleri in a rather peculiar way:

“... in his projects he [Soleri] seems more a brilliant painter rather than an architect. However, there are many paths towards Architecture and he might find his own one, if he would be patient enough.”<sup>2</sup>

Over the years Soleri's drawings have always manifest colourful and powerful 'ideas' of buildings often lacking in technical and constructional information. However, this lack of detail did not lead to a predictable inconsistency between drawings and physical buildings. The correlation between form and construction in the work of Soleri was achieved by his practical commitment on site rather than the production of technical drawings. This constructional knowledge was developed in practice beginning with his first commissioned job: the Dome House built in 1949 for Leonore Woods at Cave Creek in the Arizonian desert. The house was designed with his friend and colleague Mark Mills and erected by Soleri himself using locally available materials.<sup>3</sup> He managed the construction process himself, developing his idea without the need to share technical drawings or construction details with a builder: this approach clearly influenced the outcome of the case study analysed in this paper. With the exception of the Dome House, Soleri did not work for a client for the majority of his life. After leaving Taliesin West in 1950, Soleri returned to his hometown, Turin. Feeling unready to become a practising architect he toured Italy in a caravan built by himself. Arriving in Vietri sul Mare, a small town on the Amalfi Coast with a well-established pottery industry in existence since the 1930s, he built his only large project commissioned by a client proper: The Solimene Ceramics Factory.

This paper will analyse the construction history of this building and demonstrate how the influence of the client, Vincenzo Solimene, the structural engineer Alberto Brini, and the construction manager Francesco Immormino dramatically affected the outcome prefigured in the original panels drawn by Paolo Soleri.

The paper will focus on:

- The sequence and the reasons for frequent delays and interruptions in the construction process which caused substantial alterations to the original scheme

- Why and how the unique and polychrome fictile façade was built using terracotta vases instead of regular bricks;
- A detailed assessment of the alteration of the original building after the return of the architect to the United States in 1954;
- A detailed assessment of the current state of the damage to the building in order to evaluate the success or the failure of certain construction techniques.

A literature review critically exposed the lack of information regarding the construction of the Solimene's Factory. The main reference book (in English and Italian) wrote by Professor Iolanda Lima<sup>4</sup> (2003) addresses the oeuvre of Soleri from a theoretical and figurative point of view. In this book and, in general, in the academic literature about Soleri the analysis of his construction methods are only focused on the earth-casting experience in Arcosanti<sup>5</sup>. The experience of the Ceramic Factory cannot be fully understood without considering the active role of the client in the decision-making process that led to the building: this is why the research has been conducted combining different methodologies. Firstly, the author consulted the following archives: the Cosanti Foundation Archive in Arizona, which is open to the public and partially digitalised; the Archive of the Solimene Ceramics Factory, which is not open to the public and it hasn't been organised yet. Secondly, in order to address specific questions regarding the paternity of some constructional solutions the author interviewed Paolo Soleri in 2006, Giancarlo Solimene, one of the son of the client, in 2008, and shared email correspondence with Marzio di Pace, author of a dissertation in Architecture on the restoration project of the factory in 2016. Thirdly, the author ran a technical survey of the building and later compared the results with the drawings courtesy sent by Marzio di Pace. This comparison led to the construction details published in this paper.

For the specific and unusual history of development and construction of this building, placing this historical analysis in a wider context referred to the construction of organic architecture is quite difficult. The building is an organic architecture but its development has been driven much more in relation to its character of industrial building, were the techniques were mainly invented to increase the efficiency of the material and reduce the cost of the intervention.

Although a restoration of this listed building has not been planned yet, this paper aims to support the practitioners who will be involved in the conservation of the building unlocking unknown materials and new facts that can positively articulate the debate for the restoration of this industrial monument.

### **The development of the project and its planning application process**

After World War II the first industrial development of Vietri sul Mare appeared close to the lido (Marina di Vietri), which was the most accessible point due to the sheer cliffs and rugged shorelines of the Amalfi coast. Small ceramic factories and woollen mills were established along the shore line around the mouth of the river Bonea, whose flow was used as a source of energy for the pottery-making process. The common layout of these ceramic factories was a vertical pot-kiln with two or three chambers overlapping each other, surrounded by tapered terrace for drying the terracotta and rooms for accomodating the pot-throwers. At that time one of the most profitable ceramic factories was owned by Vincenzo Solimene, a young entrepreneur who had established his pottery in the 1930s. After World War II his ceramics became gradually more prestigious thanks to fruitful trade deals with shops in Rome and to an exclusive trade agreement, signed towards the end of the 1950s, with 'la Rinascente', the biggest department store in Italy at that time.

In order to increase production and expand his business Solimene decided to build a new factory. For this purpose, he bought a small plot of land further up in the outskirts of Vietri sul Mare, in the small area called 'Cascietta', few kilometres north of the shore line. The site is near an important junction between the main regional road leading to Salerno and a narrow street leading to a small church dedicated to the Virgin Mary of Angels (Madonna degli Angeli). The site was on a very steep hillside with a change in height between the highest and the lowest point of 12 metres. The entire slope was terraced and cultivated with olives trees.

On 21 October 1950 Solimene submitted the first planning application with a scheme drawn up by a local quantity surveyor<sup>6</sup> who designed a standard warehouse-type factory. This project demanded levelling the ground of the whole site through massive rock-blasting work. The demolitions started on the 22 May of 1951, however they were stopped by the local authority just two months later as during the blasting some stone fragments hit the square and some houses in the vicinity of the site. This was the first of a long sequence of unexpected events that delayed the planning permission process of this building for nearly two years.

In 1951, Paolo Soleri arrived at Vietri sul Mare with his wife Colly, his daughter Kristine and his friend Giorgio Boetto. After spending many months wandering around the Italian peninsula Soleri's intention was to settle down in this little Italian community and learn a job as craftsman to subsidise his family. To this end Soleri began an apprenticeship at the Solimene Factory. After the disruption of rock-blasting for levelling the site, Soleri proposed to Solimene a new

solution for his factory. The project was firstly presented as a terracotta model (unfortunately now lost) and, after a period of indecision, Solimene welcomed the new project and asked to Soleri to develop it further. Soleri started working on the drawings for the new factory immediately after the appointment. The project is described in nine panels 1:100 scale, executed with pencil and black and coloured china ink on velum paper: they consist of five floor-plans, the elevation along via Madonna degli Angeli (Fig.1), a long section, a cross section (Fig.2), and a general perspective (Fig.3)<sup>7</sup>. Although these drawings lacked dimensions, technical and structural information, they were submitted to the local authority to obtain a new planning permission. As Soleri was not registered as a chartered architect in Italy, the drawings were signed by both himself and his friend Giorgio Boetto, however Boetto did not contribute to the project at all.<sup>8</sup>

In order to understand which part of the original scheme designed by Soleri was actually constructed it is crucial to describe in detail what we can interpret from the original nine panels. The site is long and narrow and it determines the way the factory was conceived. Analysing the floor-plans it is clear that the building is conceived in three main parts: a central production hall and two side wings. The section drawings reveal that the factory is developed vertically with a distribution of the production cycle referencing a more organised version of the spontaneous vertical layout found in the old factories along the shoreline of Vietri. Soleri's scheme describes a five-story building where the pottery-making process is conceived along a descending path: the clay arrives from the roof of the building which is designed at the same level of via Madonna degli Angeli at the back of the site:<sup>9</sup> on the top floor the pot-throwers shape the clay into plates and vases which are later bisque-fired in a multi-chamber vertical kiln occupying the whole height of the building; after that, the material descends to the level below on a ramp where it is decorated and again fired in the same kiln but within the chamber below; another ramp links that level with the ground floor where the ceramics are coated and packed ready for shipment. The work-spaces are disposed along balconies overlooking a quadruple-high void where a gigantic translucent funnel-shaped skylight brings natural light into every level of the production hall. The balconies and the skylight are supported by a forest of concrete trees that reference the original naturally wooded site. Both his experience in Taliesin West and the construction of his first house in the desert of Arizona, increased Soleri's awareness of viable environmental strategies to naturally cool the spaces he designed. This is why, even without technical annotation, the system of balconies and the large inverted and translucent parasol of the Solimene Factory are shaped to improve natural light and cross-ventilation of the building,

both for drying out the ceramics and for achieving internal comfort. The funnel-shaped skylight has the additional purpose of collecting rainwater within the central void of the production hall thus reducing consumption necessary for washing the clay and other general purposes.

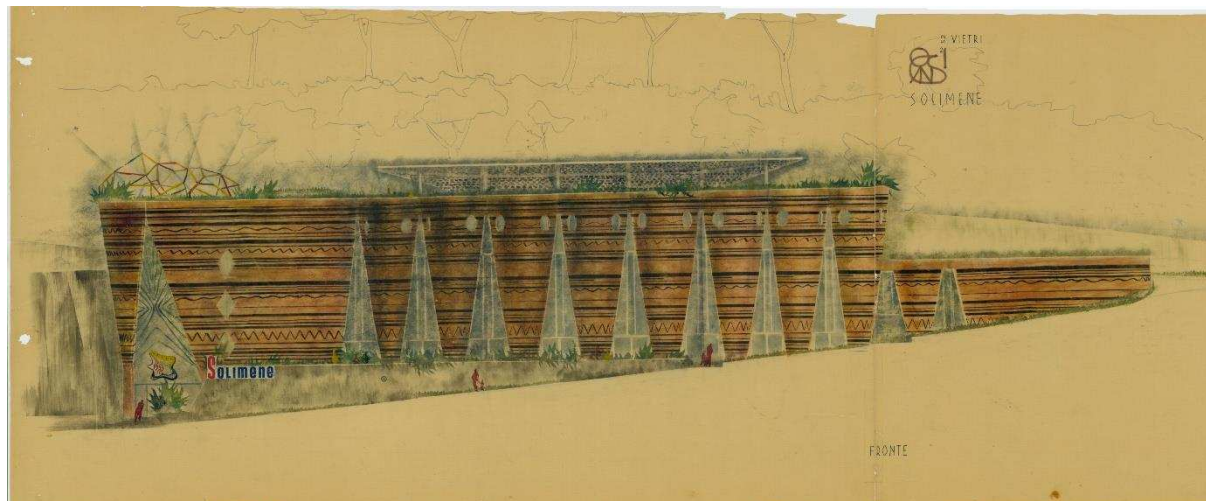


Figure 1. Solimene Ceramic Factory, Vietri sul Mare, 1956, Architect Paolo Soleri. Front elevation, 1952, pencil and black and coloured china ink on velum paper (Drawing: Cosanti Foundation. Soleri Archives collection at Arcosanti.)

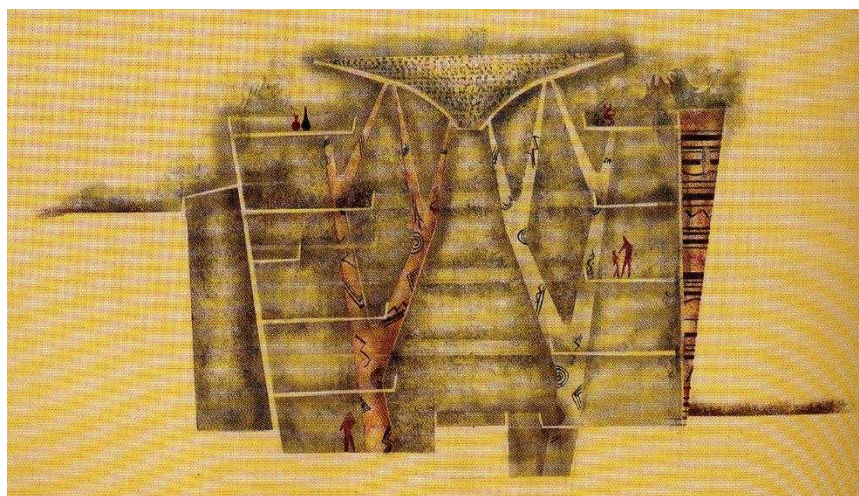


Figure 2. Solimene Ceramic Factory, Vietri sul Mare, 1956, Architect Paolo Soleri. Cross section, Paolo Soleri original drawing 1952, pencil and black and coloured china ink on velum paper. (Drawing: Cosanti Foundation. Soleri Archives collection.)

Many architectural historians have highlighted the strong link between the descending continuous production-path of the Solimene Factory with the ramp of the Guggenheim Museum in New York, developed by Frank Lloyd Wright precisely at the time when Soleri was an apprentice at Taliesin West<sup>10</sup>. However, we must note how the vertical layout of the old ceramic factories in Vietri was also an important design reference: in one interview in 1995 Soleri



described how he attempted, with the Solimene Factory, to regularise in one designed space what was already found in the old vertical factories at la Marina<sup>11</sup>.

Although the site was quite narrow and served by a street constricted between the building and a retaining wall, Soleri solved the issue of vehicle accessibility by designing a one-way internal street running within the gap between mountain and building for the whole length of the factory.



Figure 3. Solimene Ceramic Factory, Vietri sul Mare, 1956, Architect Paolo Soleri. Perspective from the state road Via Madonna degli Angeli, Paolo Soleri original drawing 1952, pencil and black and coloured china ink on velum paper. (Drawing: Cosanti Foundation. Soleri Archives collection.)

The entrance to the internal street was through the west wing, with the exit on the east side. The internal street and the small road tangential to the site allowed for continuous vehicle circulation around the building, necessary for unloading the wood for the pot-kiln and for loading up the final products.

The original drawings of the production hall are framed by wings to the west and east, each of them serving two different purposes. The west wing enclosed the retailing space for the exhibition of the ceramics and a continuous ramp which connected all the different levels of the factory; the east wing, much shorter than the rest of the building, was where the administration office and the clay-tank were located. The tripartition of the factory is not evident in the elevation where a sequence of leaning cones and transparent panels form the only façade of the scheme.

On the 20 March 1952 drawings were submitted to the local authority together with a technical report by Francesco Immormino, Soleri's brother in law. While Solimene was waiting for the approval of the new project, Soleri asked Aldo Brini, an old friend from the Polytechnic of Turin (where Soleri had studied), to proceed with the structural calculations in order to shape and size up the load-bearing structure of the factory. Brini, whose office was based in Milan, completed the calculation of the production hall of the factory between April and June of the same year. Solimene finally obtained a new planning permission on the 9 of January 1953; and he resumed rock-blasting to complete the levelling of the site. However, a few months later the City Council obliged Solimene to stop the construction again: on the 25 of May of the same year the Regional Authority for the Architecture, Landscape and Environment (Soprintendenza ai Monumenti di Napoli) notified Solimene that the whole site had a legal restriction that obliged the client to obtain a specific authorization to certify the environmental viability of the project<sup>12</sup>.

In order to lift this environmental restriction, Solimene and Soleri travelled several times to Naples and Rome to meet face to face, both the regional and national authorities and convince them about the feasibility of the project. Soleri explained that the design approach for the factory was fully respectful of the environment and that it was from the environment that he derived his inspiration; to recreate with this building as an artificial landscape to mend the slope of the mountain. It took almost two years to receive full authorization: the new project was approved by the Planning Permission Authority of Vietri sul Mare the 5 February 1954.

The inexperience of the young Soleri and probably his reluctance with any form of bureaucracy or paper-work added to these project delays. The project delays became the main reason for Solimene to consider substantial alterations of the original layout, asking for a building that was quicker to erect, but not consistent with the one originally envisioned by Soleri. The inconsistency between the project as constructed and its original design derives from the ending of the fruitful debate between client and architect before the completion of the building. Following a catastrophic flood along the whole Amalfi coast on the 25 October 1954, when hundreds of people died in Vietri sul Mare, Paolo Soleri decided to leave Italy for good and to join his wife Colly and his daughter Kristine who were in America at the time for the wedding of his sister-in-law. The flood destroyed all the ceramic factories at the Marina di Vietri.

Following years of waiting for planning permission and with the old factory destroyed by the flood, Solimene needed to resume the manufacturing of ceramics in the new building as soon as possible. Therefore, the client asked Immormino, (who became the construction manager after the departure of the architect) to continue the original project and start constructing the central part of the building, postponing the construction of the two wings. The central core of the scheme is the multi-story production hall, whereas the east and west wings were designed to allocate administration offices, the water tank to wash the clay and the retailing space to exhibit the final product. The client needed the productive heart of the factory first in order to start manufacturing even before the final completion of the building. Vincenzo Solimene officially started production in the new factory on 9 January 1956<sup>13</sup>. The construction of the east and west wings started two years later, in 1958. As I will describe later in this paper, in completing the factory, Solimene ignored the original designs and asked local practitioners to design two different wings that aimed to make more profitable use of the narrow plot.

### **The development of the project**

After World War II, the industrial development of the Italian construction sector was distinguished by poor technical progress that precluded any extensive use of prefabrication of building components. The building process in Italy did not evolve for over three decades, from the 1930s until the 1960s: over this period, construction sites were generally recognisable by non-skilled workers using elementary machinery<sup>14</sup>. Although precast technologies and off-site construction systems were identified as the only way to rebuild the country after the war, their development was slowed by political decisions like the Fanfani Plan (1948) named after the Minister of Labour Amintore Fanfani. Also called the Ina-Casa Plan, the legislation was approved to enable “Provisions to increase workers’ employment, by facilitating the construction of workers housing”<sup>15</sup>. The idea was to increase the employment rate and the number of housing being built at the same time. The workers intended to benefit from the plan were defined as factory workers, manual labourers and clerical workers. These type of workers were requalified as non-specialised builders which was the typical type of labour available in Italy until the 1970s. Given this environment, efforts were made by Soleri, Brini and Immormino to engineer this non-standard architectural project with affordable construction techniques buildable by non-skilled workers. Brini decided with Soleri where to locate the rest of the vertical supports not included in the inked panels, where only the tree-shaped columns of the production hall are visible. To speed up the construction process Brini adopted a system

common in Italy at that time of: cast in situ concrete skeleton with a hollow-clay-tile flooring system.

With poor levels of industrialisation, the delays in the planning application process and a client in need of a new factory as soon as possible, Brini and Immormino discussed with Soleri how to adapt his visionary concept, managing both the shortage of skilled-workers and the lack of prefabricated solutions. Despite the complexity of the building pictured in the nine panels the load-bearing structure is quite simple: in fact the skeleton of the factory can be compared to a five-story concrete-frame building with the exception of some non-standard elements. These custom structural elements are the V-shaped columns design to support the southern façade, the tree-shaped columns to support the roof over the free span production hall, and the double-curved skylight above. There are two kinds of tree-shaped columns: the ones that are located each side of the nave of the production hall and the columns located at each end along the long symmetrical axis. The first ones, that we will call type A, have an asymmetrical elevation leaning over the central void; the second ones, that we will call type B, have a symmetrical elevation and frame the production hall between the east and west sides. Both types of tree-shaped column are 16 metres high (Fig.4).

Among the non-standard elements, the most drastic change in the development of the project was the simplification of the skylight form in order to speed its construction and reduce its cost. The original roof designed by Soleri was a double-curved surface; a reverse-umbrella form elliptical in plan with a funnel-shaped silhouette. Soleri designed this reverse-umbrella to be made from an irregular pattern of cylindrical glass bricks held in a matrix of reinforced concrete, with this organic thin form designed to diffuse natural light over the production hall and collect the rain-water for use inside the building. In regards to the skylight, Brini and Immormino were concerned about two factors: the economic feasibility of the double-curved formwork in timber and safe accessibility for the workers to position the bricks-glass. Major changes were made to the roof design, which simplified its construction and improved the lateral stability of the concrete trees in the short direction. For structural and constructional purposes, the outcome of these changes was a simpler geometry of the skylight and an increased slab depth.

In accordance with Soleri and Solimene, Brini regularised the shape of the roof using eight flat surfaces achievable by a simpler formwork. The geometry of the skylight became a faceted funnel-shaped described on plan by lengthened octagon and in section by a V-shaped edge.





Figure 4. Solimene Ceramic Factory, Vietri sul Mare, 1956, Architect Paolo Soleri. The production hall with the two types of tree-shaped columns. (Photo: Cosanti Foundation – Colly Soleri, Soleri Archives collection.)

Brini and Soleri also abandoned the use of irregular glass cylindrical bricks choosing a standard product with pieces chosen from a catalogue. The skylight was built with a slab made out of hollow-clay-tile and reinforced concrete with the insertion of standard precast concrete square well-rings covered by flat glass-panels: chosen to replace the glass cylinders. In regards to the load-path from the roof to the foundation, the double-curved skylight was originally conceived by Soleri with its edges cantilevering outward supported by three branches of each ‘type A’ column.

Brini changed the original structural diagram extending the external branches of the concrete trees to directly support the edge of the reverse-umbrella. In this way Brini could hide (in the depth of the skylight) the necessary beams to strengthen the top of the portal frames. These beams connect the six top ends of the concrete branches to avoid their spreading apart under gravity load and to improve the overall lateral stability of the structural skeleton in the short section. The latter was achieved by Brini linking the structural trees on the two sides of the production hall with  $\Pi$ -shaped concrete elements placed at the extrados of the umbrella and for this reason invisible from the inside (Fig.5). The  $\Pi$ -shaped connection was designed to by-pass the long glazing strip at the bottom of the funnel, instead of dividing it with beams crossing the roof from east to west. Together with the  $\Pi$ -shaped elements only four other elements are visible from the extrados of the skylight: they are the four beams diagonally connecting the end section of the columns type A and type B to strengthen the lateral stability in the long section.

After the redesign, the depth of the skylight was 340 mm, quite far from the thin silhouette prefigured by Soleri. The funnel-shaped roof was originally conceived to collect the rainwater for use inside of the building through the long void at its base. With the development of the project, the long void became a glazed skylight and therefore a new system for collecting the rainwater was designed. This required imbedding PVC ducts inside the cast concrete of most internal branches of the load-bearing trees from the ground floor to the skylight. The drains were located where the ducts of each branch meet the bottom of the funnel, close to where the  $\Pi$ -shaped concrete connections protrude from the roof.

Although this solution did not visually affect the architectural quality of the quadruple-high production hall, this system caused many water leaks over subsequent years. An evaluation of the current decay of the factory presented in this paper will demonstrate that the rain-collecting system was dramatically undersized.

In regards to the tree-shaped support frames, the structural calculation of the skeleton led to an increase of size compared with the original architectural drawings. The columns were 1200 mm deep at the base and 200 mm at the top of each branch<sup>16</sup>. All the floors of the factory were made from hollow-clay tiles supported by joists and beams in reinforced concrete cast in-situ.

This is a common to both the flat portions of the slabs and for the two ramps that connect the ground floor with upper floors. The load-bearing support beams are shallow and hidden within the depth of the floor-slabs.



Figure 5. Solimene Ceramic Factory, Vietri sul Mare, 1956, Architect Paolo Soleri. The funnel-shaped skylight with the  $\Pi$ -shaped connections at the top of the frame. (Photo: Cosanti Foundation – Colly Soleri, Soleri Archives collection.)

Towards the east portion of the upper floors the slabs were constructed with square voids to accommodate the wood-fired kiln (Fig.6). To increase the lateral stability of the frame, a series of struts in reinforced concrete were cast to link the building with the mountain on the north side. These elements were designed in the quadruple-height cavity where Soleri prefigured the internal vehicle street for the material loading.

In order to hide the supports on the edge of the floor-slabs behind the leaning up-side-down cones of the southern façade, the external columns were inclined following a V shape: each V-shaped member frames and supports one cone. Beyond every V-shaped column the floor cantilevers towards the street with a rounded edge, tapered from the top to the bottom of the façade to accommodate the up-side-down geometry of the cone. The radius of the rounded slab-ports protruding from the building at each floor increase as you rise through the building. The edges of these cantilevered curved slabs were used to place an ingenious formwork, which would guide the workers building the cones on how to follow the correct geometry.



## The Construction

When Soleri left Vietri sul Mare to go back to the United States it was the end of 1954 and only the structural frame of the central part of the factory was completed at that time. The frame was built with timber formwork by the local construction company owned by Giovanni de Simone. The whole construction process for the factory relied on the craft approach of the labour: the hollow-clay tiles and the reinforcement bars were laid down on the timber deck without the use of a crane.



Figure 6. Solimene Ceramic Factory, Vietri sul Mare, 1956, Architect Paolo Soleri. The structural frame of the production hall by the quadruple-high space for the vertical wooden pot-kiln. (Photo: Cosanti Foundation – Colly Soleri, Soleri Archives collection.)

Analysing pictures of the construction process it is easy to identify that after building the first ramp of the factory (connecting the ground and first floors), the same ramp was used to transport the timber, tiles, steel reinforcement and concrete required to build the floor above and thus compensating for the lack of crane. The formwork for each floor was supported with timber struts on the floor below. The timber and other construction materials for the roof arrived directly from the mountain at the back of the factory as the narrow street tangential to the façade (via Madonna degli Angeli) travels up behind the building and reaches the same height as the building roof.



More ingeniously, the formwork for the skylight above the central hall was assembled without using scaffolding but simply relying on a system of timber trusses sitting between the two internal branches of the tree-shaped columns. From the pictures taken during the construction note how the inclined timber formwork relied directly on the concrete structure, without compromising the accessibility of the workers on the floors below. This clever assembly strategy is repeated every time the roof needs maintenance (Fig.7). Thanks to a temporary steel deck which sits between the concrete branches the intrados of the roof can be repaired or cleaned without disturbing the activities on the ground floor.

Although Soleri left the factory before seeing its completion, a picture taken in 1953 by his wife, Colly Soleri, demonstrates that the material and the construction system customised for the southern façade was decided mutually by Soleri and its client Vincenzo Solimene (Fig.8). The picture shows the building frame completed up to the first floor and a mock-up of the façade system: a masonry wall made out of terracotta vases. The inked-panel by Soleri did show a polychromatic elevation prefigured by a succession of opaque up-side-down cones and translucent triangles, but, again, no technical information or notes are displayed. When asked about this detail, Soleri admitted that Solimene proposed the vases as construction material for the façade to drastically cut costs using the labour that he was already paying<sup>17</sup>. Thus, the clever intuition of the client improved the economic sustainability of the construction, using his employees to fabricate more than 20,000 terracotta vases for the completion of the external wall.

Observing the façade from the outside and analysing the few vases broken over the years, each pot seems have a rounded section from its base to its neck. On the contrary, one of the pots kept in the archive of the factory reveals important information about how the external fictile wall was erected. The vase is circular in shape only at its foot and at its neck: the belly of each pot has actually a square section where the imprint of the hands of the pot-turners is still recognisable. (Fig.9) After turning the clay into cylindrical vases the pot-turner must have gently squeezed its belly in order to mould it into four flat surfaces. This was clearly an innovation to improve the adhesion between each vase (one on top of each other) in order to provide a more coherent mechanical behaviour. The pots were laid down with mortar exactly like bricks, facing the neck towards the interior and the foot towards the exterior of the factory. (Fig.10) The top of the vases were shaped with a very short neck and a narrow opening surrounded by a thin disk-shaped lip of clay.

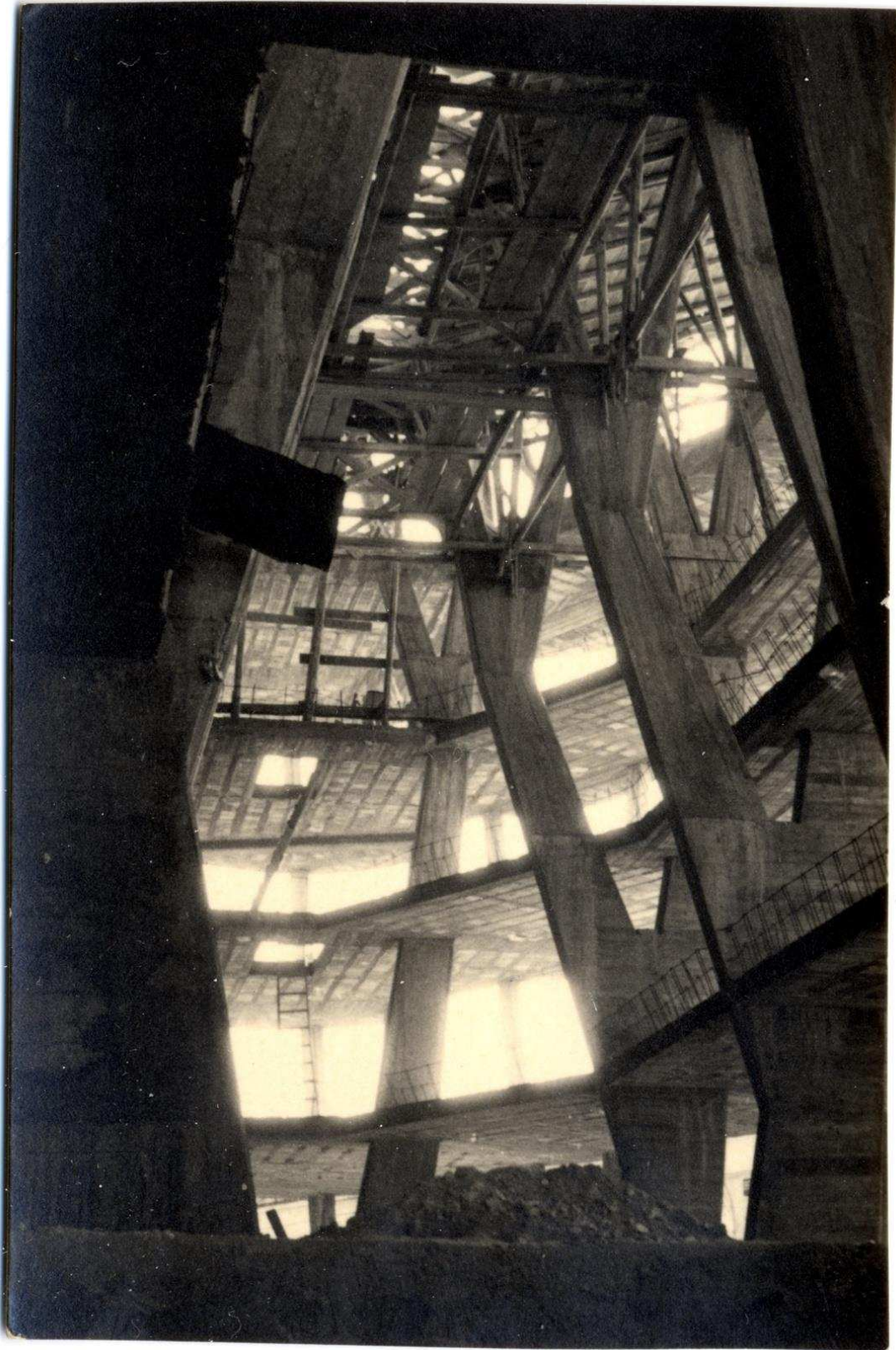


Figure 7. Solimene Ceramic Factory, Vietri sul Mare, 1956, Architect Paolo Soleri. Assembly of the roof formwork supported by the tree-shaped columns. (Photo: Cosanti Foundation – Colly Soleri, Soleri Archives collection.)



Figure 8. Solimene Ceramic Factory, Vietri sul Mare, 1956, Architect Paolo Soleri. The first mock-up of the fictile external wall in 1953. (Photo: Cosanti Foundation – Colly Soleri, Soleri Archives collection.)

The pots were cross-woven together using this peculiar type of neck to twist steel-wires around them. The wires were then covered in a thin layer of mortar and plastered for the internal finishing.

The overall thickness of the external wall is around 30 centimetres; in terms of thermal insulation, although the façade is entirely exposed to south, the air contained within the vases guarantees a good level of insulation even if the thick layers of mortar constitutes an extensive thermal bridge throughout the façade.

The way the external wall was erected is simple but extremely ingenious: it did not require any scaffolding or the transport of any prefabricated elements from beyond the site, improving the economic sustainability of the construction. The window-frames were assembled on site welding L-shaped and T-shaped iron profiles (Fig.11). The vase-layering procedure was designed to clearly indicate to the workers how to place the pots following the correct conical geometry. Each cone was built in four distinctive sections, each one relying on the floor-slab cantilevering from the V-shaped columns. The edges of these curved balconies represent the only geometrical radius available on site for building the fictile cones. These rounded flooring-edges were used to shape on site four conical timber formworks, each of those made by a ruled-



surface describing one section of the same cone. The formworks were framed by two straight horizontal timber posts (nailed to the V-shaped columns) and two vertical timber transoms curved by fixing them to the rounded edge of the flooring-slab.

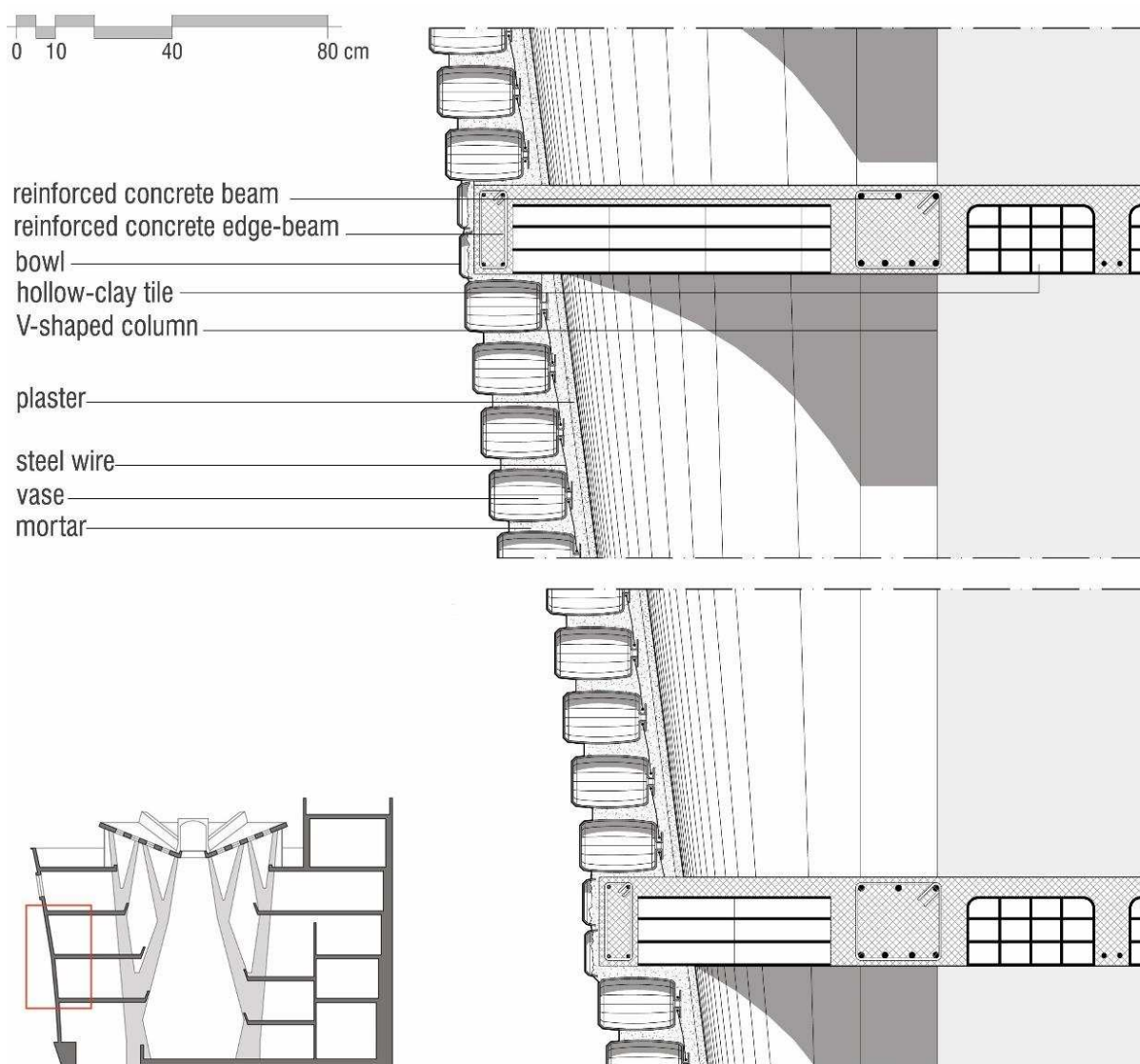


Figure 9. Solimene Ceramic Factory, Vietri sul Mare, Salerno, 1956, Architect Paolo Soleri. Construction detail of the façade with pictures of one original vase used for the façade. (Drawing and photos: Luciano Cardelicchio, the vase is kept in the Solimene Factory Archive.)

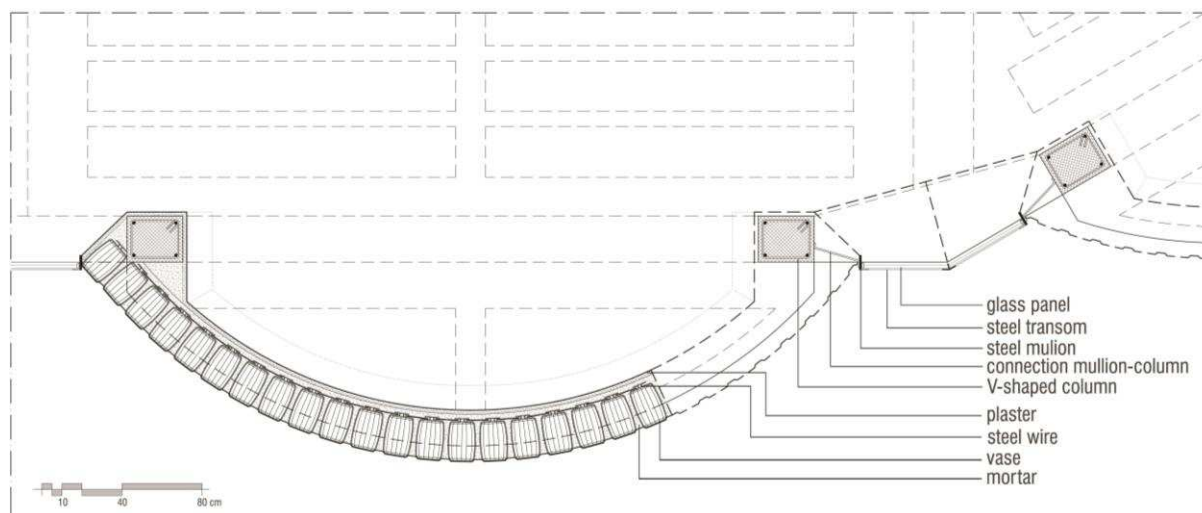


Figure 10. Solimene Ceramic Factory, Vietri sul Mare, Salerno, 1956, Architect Paolo Soleri. Construction detail (plan) of the façade. (Drawing: Luciano Cardelicchio)

The area inside of this frame was filled by vertical floor-to-ceiling timber posts secured together by smaller horizontal timbers. These four sections were assembled to create one cone.

Then from the inside of the building and without the use of scaffolding the workers laid each vase against the timber grid of the formwork, one on top of the other with layers of mortar, following the correct geometry (Fig 12). When Giancarlo Solimene, son of Vincenzo, was asked how many of these timber formworks were made, he confirmed what is visible from the pictures taken on site<sup>18</sup>: only four, one for each radius. After the first cone was erected to test the system each of the four timber surfaces was removed and reutilised as formwork for the following cones; therefore, the whole façade was built in horizontal sections and not cone by cone.

So each vertical cone was actually made of four separate vase-masonry sections each resting on the four floor slabs, but in order to hide the edge of each slab from the outside and give a uniform finish all the way up through the façade, the fictile cladding was completed with a different type of clay element shaped like bowls. These bowls feature the same shape and size of the base of the other type of vases in order to look the same from the outside and blend together the four sections of each cone whilst obscuring the thickness of the floor-slabs behind them (Fig 13).

The concrete faceted podium was designed to offer a horizontal support for the fictile cones levelling out the sloped street tangential to the site.

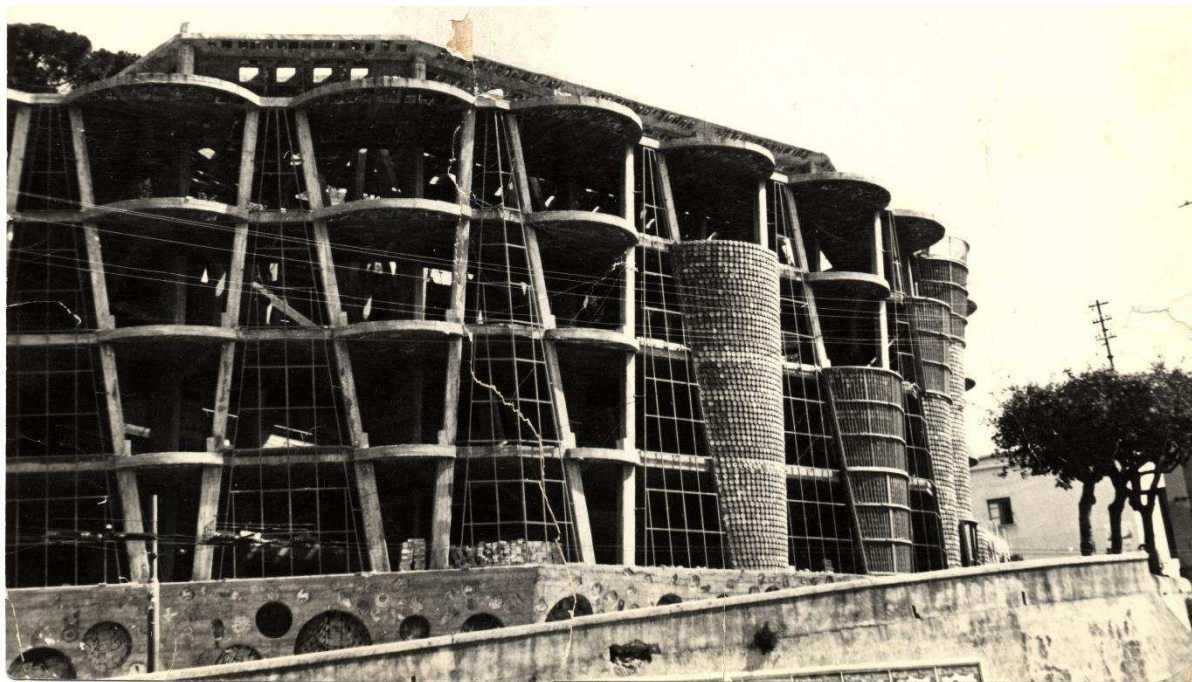


Figure 11. Solimene Ceramic Factory, Vietri sul Mare, Salerno, 1956, Architect Paolo Soleri. The construction of the façade. (Photo: Cosanti Foundation – Colly Soleri, Soleri Archives collection.)

This was meant to be decorated with both broken pieces of ceramics and irregular pieces of stone from the rock-blasting of the mountain with the slab of the ground floor of the factory originally designed to reach the podium continuously along its length. However, during the construction Soleri and Solimene decided to create a space behind the podium setting back the ground floor slab of the production hall and creating big circular windows to let in natural light inside of what became an unplanned lateral east-to-west hallway, perhaps with the intention of directly connecting the retail area on the still unbuilt west wing with the administration office on the east side. The central production hall of the factory was finished in 1956. It is the only part of the original scheme that was built following the drawings of Soleri. The west wing, with its spiral ramp enclosed by the monumental apse at the entrance, and the east wing, with its shallow volume for containing the water tank used to wash the clay were not built. Instead, Solimene asked local practitioners to design new extensions with a more speculative use of the plot. Towards the west end a new simplified concrete frame structure was erected, extending the long fictile façade with three more cones up to the western boundary of the site where the building terminates with a series of wide windows. Nothing in the perspective drawn by Soleri was built: not the apse, nor the small square in front of it or the ramp that was supposed to quickly connect the different level of the factory. Inside of this extension a major exhibition space has been created.



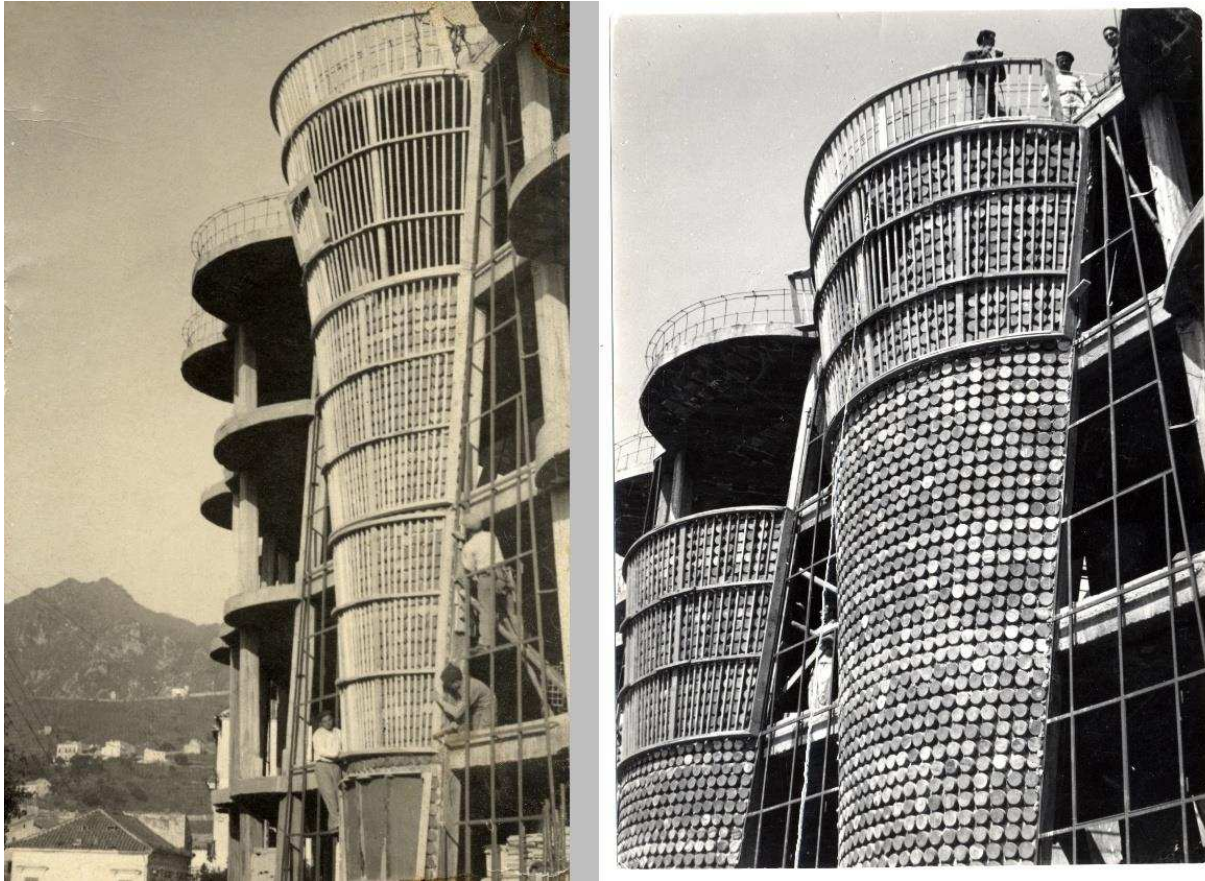


Figure 12. Solimene Ceramic Factory, Vietri sul Mare, 1956, Architect Paolo Soleri. The formwork system used to lay down the vases following the conical shape for the external wall. (Photo: Cosanti Foundation – Colly Soleri, Soleri Archives collection.)

The vehicle entrance imagined (and cleverly hidden) by Soleri between the apse and the side of the mountain was instead located on the elevation of the extension framed between the edge of the mountain and the last fictile cone. This appalling solution erected in the 1960s was modified in 2002 when the vehicle entrance was demolished and replaced by a glass-box aiming to provide a larger shop window for the retail space behind.

Although the cladding solution for this extension reused the terracotta vase-masonry system in order to blend the appearance of the new with the original, it is interesting to note that a clear separation line is still noticeable. The long and massive podium was not extended towards the west substantially compromising the proportion of the new façade. The faceted concrete band stops drastically to remind us where the original portion by Soleri ends. Secondly, the different firing times of the ceramic vases has created an alteration of their colour. This difference marks a vertical line on the elevation where one can appreciate on the right the darker original vases and on the left the newer lighter ones.

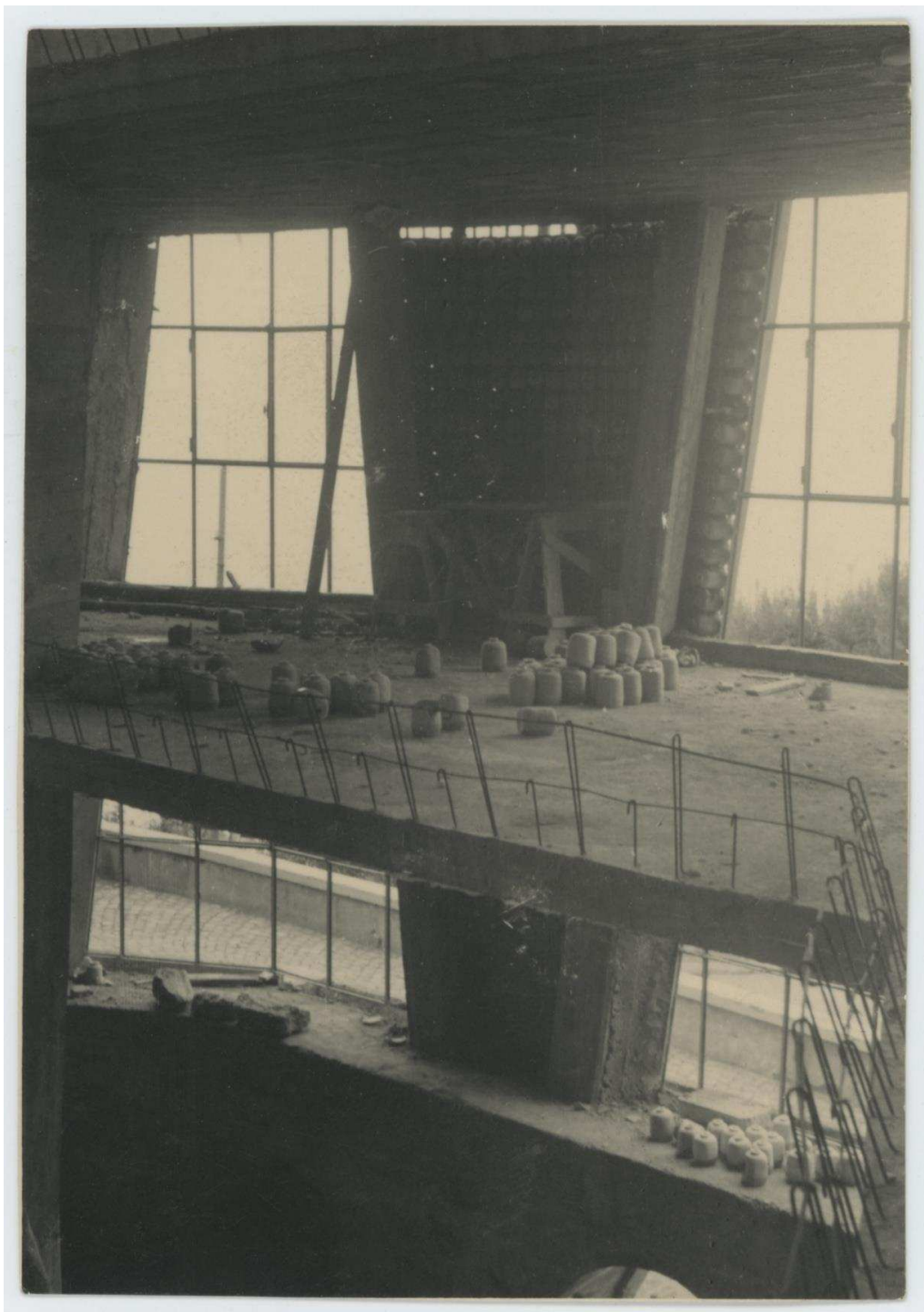


Figure 13. Solimene Ceramic Factory, Vietri sul Mare, Salerno, 1956, Architect Paolo Soleri. One of the conical portion of the façade with the vases photographed from the inside before the plaster finish. (Photo: Cosanti Foundation – Colly Soleri, Soleri Archives collection.)

The east wing was also completed without respecting the original design: above a one-storey podium that echoes the original volume as conceived by Soleri a three-storey residential building was constructed to allocate the family of the client.

The roof of the factory became the terrace of the penthouse losing its original aim of exhibition area and public roof-garden overlooking the sea. The podium is finished in plaster while the



residential volume above was ingeniously clad by the same vase-masonry which is juxtaposed between regular windows. These two extensions have altered the original proportion of the project outlined by the unique ribbon-shaped façade. Although these changes affected a proportion of the exterior scheme, the major alteration of the factory design occurred internally and affected the production cycle and therefore the way the production hall is used. A major change saw the replacement of the vertical wooden pottery kiln with an electrical one where the ceramics are fired on a belt that move them horizontally; the kiln had been located in the area that once was the internal street for the supply of the firewood. This change greatly affected the original concept of the pottery-making process embedded with the idea of the descending production path: once the clay is thrown on the wheel at the top floor, vases and plates must be now carried down to the ground floor to be bisque-fired; then from there they are carried up again to the third floor for the painting and decoration and eventually back downstairs again for the final firing in the kiln. Hence, with the adoption of the new electrical kiln the continuous production path imagined by Soleri was rendered obsolete. The new layout required the installation of an elevator to facilitate a more direct connection between the ground floor and the different levels above it. The elevator was placed within the quadruple-high spaces of the production hall towards the west end. Although this has compromised the aesthetic of the space the system used for erecting the lift is entirely demountable. The original structure has been only locally affected near the lift, where some sections of the parapets (a few meters long) were demolished and where flooring slabs were extended with steel plates to create wider landing areas. Whilst the elevator represents the fastest way to reach each level, the two ramps on the side of the production hall are now merely used as storage areas for the ceramics waiting for being fired or decorated.

### **Conclusion: the current state of decay**

Together with the alteration of the pottery-making cycle and the consequent change of functions for some internal areas, the factory is damaged today by surface deteriorations due to water ingress. In more detail, the intrados of the roof is severely affected by damaged plaster and efflorescent due to moisture penetrating around the skylights (Fig.14). The most severe damage occurred in the middle of the funnel-shaped skylight where part of the plaster and the bottom of some hollow-clay tiles cracked away and fell off due to the corrosion of the steel reinforcement and their consequent expansion. This current state of decay of the skylight follows the change of plan from harvesting rainwater from the roof without changing its shape but simply plugging the bottom of the funnel-shaped skylight and hiding drains and ducts inside

of the columns. Over the years several repair jobs have seen the replacement of the water-proof membrane, the addition of a second ridge skylight at the bottom of the roof, and new dome-skylights made in PVC replacing the glass all over the roof. Unfortunately, some of these solutions did not solve the real issue which is evidently the narrow section of the roof-drains and internal gutters encased within the concrete columns.

A different type of damage is easily visible on the fictile façade where many of the terracotta vases used for the external wall are broken. More specifically, many vases have had their bases shear off due to their porosity (Fig 15).



Figure 14. Solimene Ceramic Factory, Vietri sul Mare, Salerno, 1956, Architect Paolo Soleri. The present state of the production hall with the new elevator put in place and the plaster cracked on the roof (January 2016). (Photo: Luciano Cardelicchio)





Figure 15. Solimene Ceramic Factory, Vietri sul Mare, Salerno, 1956, Architect Paolo Soleri. The present state of the façade with the several vases damaged over the time (January 2016). (Photo: Luciano Cardellicchio)

As previously described, the client needed to speed up the construction process in order to make up for the delays that occurred for planning permission and the destruction of the old factory due to flooding. Therefore we can presume that checking the quality of over 20,000 vases thrown and fired by the employees of the Solimene Factory was simply not feasible. Some pictures from the building show that many vases were put in place despite their evident failures such as cracks or high porosity due to a rushed bisque-firing. Changes in the temperature and freezing rain increased cracks in the most porous vases, expanding and contracting the base of the pots in terracotta which have sheared off over the years in random parts of the façade.

Today the factory is owned and managed by the oldest four children of Vincenzo Solimene: Giovanna, Cinzia, Ersilia and Giancarlo. Although the business has expanded, the majority of Solimene's hand-decorated ceramics are still manufactured in the production hall designed by Soleri.

The architectural value and importance of the Solimene Factory has grown in recent years due to the increased interest of architectural historians such as Bruno Zevi who described this

building as the best example of organic architecture in Italy. In addition, the Italian Minister of Culture listed the Solimene Factory in 2005 to preserve the building and encourage its sensible conservation.

Regarding the latter, as the building is listed but still in use, any conservation policies must be tailored by a sensible approach that can increase appreciation of the building without diminishing its vocation as industrial architecture. In the last few years the debate regarding the restoration of the Solimene Factory was focused on re-purposing it as a museum for the community, and moving out all the pottery-making activities. A more sensible approach was suggested in 2012 by Marzio di Pace in his final award-winning dissertation in Architecture at the University Federico II of Naples<sup>19</sup> where he suggests increasing accessibility of the factory to welcome different type of users, and integrating a new exhibition route within the existing production cycle without changing the original purpose of the building.

Due to the departure of the architect during the construction of the building and thanks to the specific and active relationship between the client and the architect, the Solimene's factory remains a unique example in the oeuvre of Paolo Soleri. Although he designed other projects in Vietri, none of them have been built. These projects were different objects at different scales: a pedestrian bridge to link the Solimene factory with the town centre; a hotel named 'Convivium' designed in 1952 for the Fiocco family and 'Odeombra', another ceramic factory topped by an hostel designed for the Giordano brothers in 1958 when he was back in Arizona. This last project represents the strongest link between the Solimene factory and the consequent production of Soleri. The project evidently recalls the turning of the making-pottery cycle into a show while anticipates the arboreal mega-structure of Mesa City (1960).

### **The Author**

Luciano Cardellicchio is a building engineer and architectural designer. He was awarded his PhD in Architecture and Construction at the University of Rome Tor Vergata at the age of 26. Since 2012 he has been Lecturer in Technology at the Kent School of Architecture. His research interests are focused on the history and development of contemporary and modern construction techniques and on conservation methods for contemporary buildings. His book 'La nuova Bibliotheca Hertziana: l'architettura e la sua costruzione' (The new Hertziana Library: the architectural proposal and its construction) analyses the audacious construction process of Juan

Navarro Baldeweg's new Hertziana Library in Rome in order to redefine new technical guidelines for future interventions in historic environments.

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  15. S.Z. Pilat, *Reconstructing Italy*, New York: Routledge, 2016, p.19.
  16. A copy of the structural project is kept in the archive of the Factory, however some images can be found in G.Freidiani, *Paolo Soleri e Vietri*, Rome: Officina Edizioni, 2000, p. 50-53, in Italian.
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  18. The author of this paper interviewed Gaincarlo Solimene in January 2007 at the Solimene Ceramic Factory.
  19. The dissertation is consultable at [amorvacui.org/restauro-della-fabbrica-di-ceramiche-solimene/](http://amorvacui.org/restauro-della-fabbrica-di-ceramiche-solimene/)