

## Harbour infrastructures from different pasts

### The case of the double abandoned Silos in Livorno, Italy

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#### Abstract

The silos in the Harbor of Livorno, central Tuscany, Italy, represent an industrial memory, they have a complex story behind, the first one was built for the storage of cereals at the beginning of the XX century. It is a typical example of industrial food storage operated in those years (Vaquera Pineiro, 2010). On October 28th, 1918 the Municipality of Livorno signed the concession authorizing the *Società Silos Livornesi*, from Genoa, to the construction of a first silo. The courtyard began in May 1921 and ended in 1924, the silo started its functioning in the same year. The design of the building was optimized for a certain number of “automatic” operations, with a high level of technology for that time, like mechanical storage and unloading, possible remote handling (cleaning, aeration, mixing). It gave the possibility to store cereals, seeds, legumes and other types of goods. This first building, made in reinforced concrete, was structured in two adjacent and communicating parts: one for the storage cells and one for the accessory services, in which there were some offices, the stairs and the vertical connections of most of the mechanisms for handling grains. The part destined to storage itself has a square plant with a side of about 27 metres, beveled on the South corner, and is about 35 metres high. The cells collecting the wheat have a height of about 23.50 metres and are divided, into four main types with different shapes:

- 24 cylindrical cells, with a diameter of about five metres and with a capacity of 488 cubic metres each (11.712 total cubic metres).
- 15 quadrangular cells, formed by the resulting interstices between the cylindrical cells, with a capacity of 188 cubic metres each and 2820 total cubic metres.
- 13 perimeter triangle cells, with a capacity of 52 cubic metres each and a total of 676 cubic metres and one special perimeter cell, with a capacity of 263 cubic metres.

Essential parts for the functional operations of the silos were the mechanical systems. The silo was equipped with an articulated group of machines allowing the movement of the cereals from and to the cells and designed for the scope of preserving at the best this basic food component. One of the main machineries consisted of two large elevators that could slide along a metal structure extending to the southwestern end of the quay. On the elevators there were a series of conveyor belts, capable of handling one hundred tons of grain per hour, taking it directly from the holds of the ships alongside the quay.

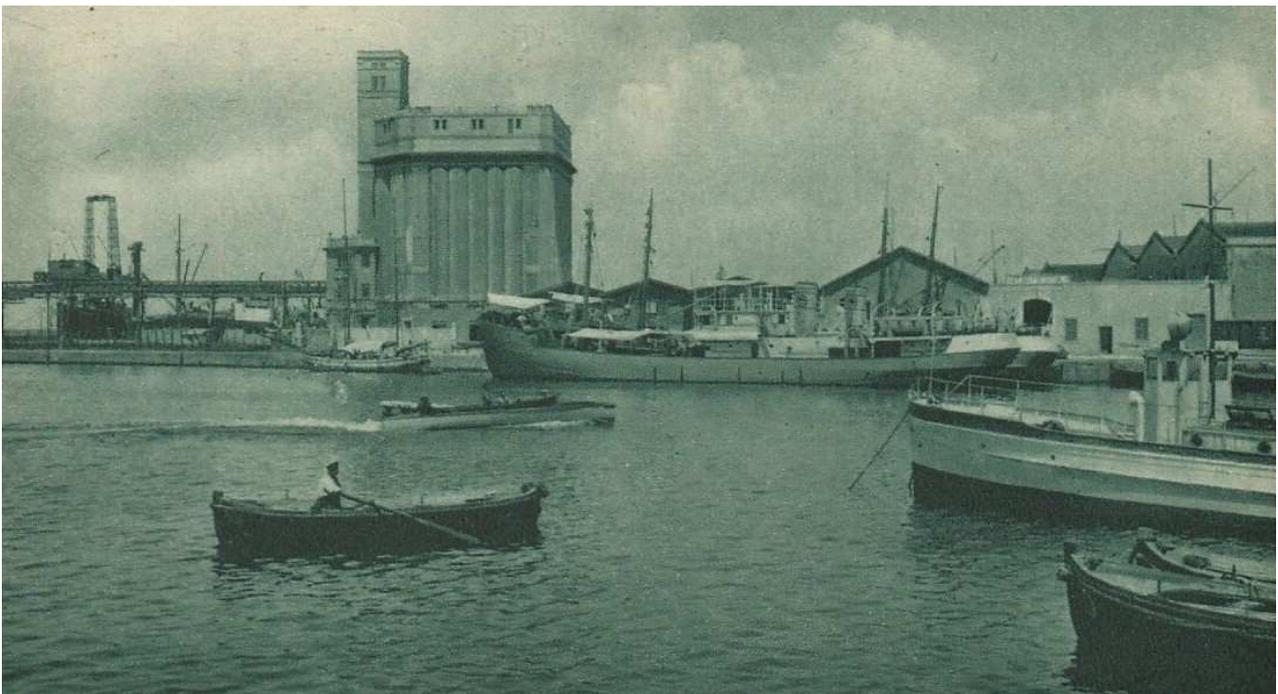
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Despite its massive industrial presence, this building is characterized by rich details, like for the pillars, realized with almost mannerist solutions, using a “gigantic order” design. The overall impression is the one of a monumental building, with a strong and massive personality.

Thus, no matter the fascination coming from this very specific architecture, the existence of the building itself was put at risk by the events of the World War Two. In fact, in 1944, the Port of Livorno was bombed. The silo building was heavily damaged, but not destroyed. The front building loses one of its sides, while the silo suffered damage only in the upper floor. The top part of the stair tower was demolished, as well as a part of the building's gables. Despite the bombings suffered by the port of Livorno, which was considered a strategic target, the Silo miraculously saved itself in its most significant parts.

In the second half of the XXth century, the Silo was restored and expanded in the '60 with a new massive structure, duplicating the volume of the storage area. From this transformation -nowadays still a strong sign in the city skyline- the silos have been in operation for about 20 years, around the 80s the use of this structure was quitted. A progressive degradation of the two buildings began with the newer parts suffering even worse decay than the original building.



*Fig. 1. Silos in 1941.*



Fig. 2. Silos in 2019.

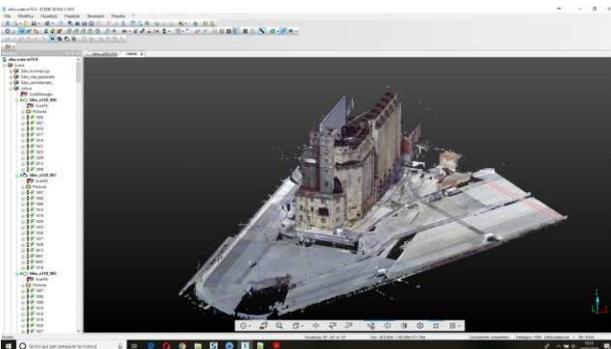


Fig. 3. Digital Survey of the Silos in 2019.

This ruined architecture keeps on fascinating the visitors and the people from the large ferries arriving all around the quay of the Silos from Corsica, Sardinia and other island and/or countries of the Mediterranean. The buildings capture the attention, and in time, they have been the subject of various studies, thesis, hypothesis about including them in an extended functional recovery of the port (Marchetta, 2004).

The place, taking a central position in the Harbor of Livorno, represents the heart of economy for the city, and the building shows important structural damage and deteriorations; a first intervention should assume their correction as a priority. The proximity to the Fortress of Livorno increases its value as a tourist

attraction: the guidelines for a project proposal should try to valorize the building, giving new life without altering its “industrial” aspect and exploiting such strength to confer new image to the city.

In 2019 a complete digital survey of the whole structure was operated using both 3D laser scanner and photogrammetry, creating the first accurate and updated survey of the building since its construction. The survey work was commissioned by the port authority and operated by and a team from the Team Area3D Srl; Livorno and a team from the Dipartimento di Architettura, University of Florence, coordinated by Prof. Giorgio Verdiani. The resulting 3D models and all its derived drawings are the base for a possible reasoning about recovery and regeneration. The contents of the poster proposed here will analyze this important industrial heritage, describing the specific workflow, the techniques and the procedures used to bring to the end the complex task of documenting a large and massive industrial building without losing a proper level of details on its machineries, decorative details, materials and signs of decay. A complete process from documentation to the challenge of urban regeneration will be presented to share and discuss the best practice in the approach to these kind of buildings/areas (Giugni et al. 1982; Stratton 2000; Soriani, 2002; Kiib 2007).

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