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## The Old Port of Trieste: Characteristics and Specificities of the Hydrodynamic Power Station and the Warehouse District

### Introduction

In Trieste, the historical and architectural heritage of the Old Port has been at the heart of several political debates for about forty years and has been seen as an occasion for ephemeral projects, which have not resulted in either the rehabilitation or the redevelopment of the area yet. The time seems to be ripe for making a more efficient use of the site. Fortunately, the restoration of Warehouse 26, that is currently hosting the “Biennale diffusa” art exhibition, of the Hangar 1 on Pier IV, and the restoration of the hydrodynamic plant have been completed.

Actions by Italia Nostra, the Italian cultural association and non-profit organization for the protection of the national historical and architectural heritage, my studies conducted on the historical archives of the city and of the northern ports, in collaboration with the Speicherstadtmuseum, Hamburg’s Hafencity and Professor Dirk Schubert, initiated and sped up the rehabilitation of the Old Port. Study and research activities have not only resulted in the implementation of protection measures but also lead the way to raise funds for the restoration and redevelopment of the site.

In October 2010, an international scientific committee gathered in Trieste, consisting of leading international experts on historic ports and waterfront districts. This tech-

Figure 1: Trieste, Old Port, Alexander von Schroeder, 1874 map of Trieste port

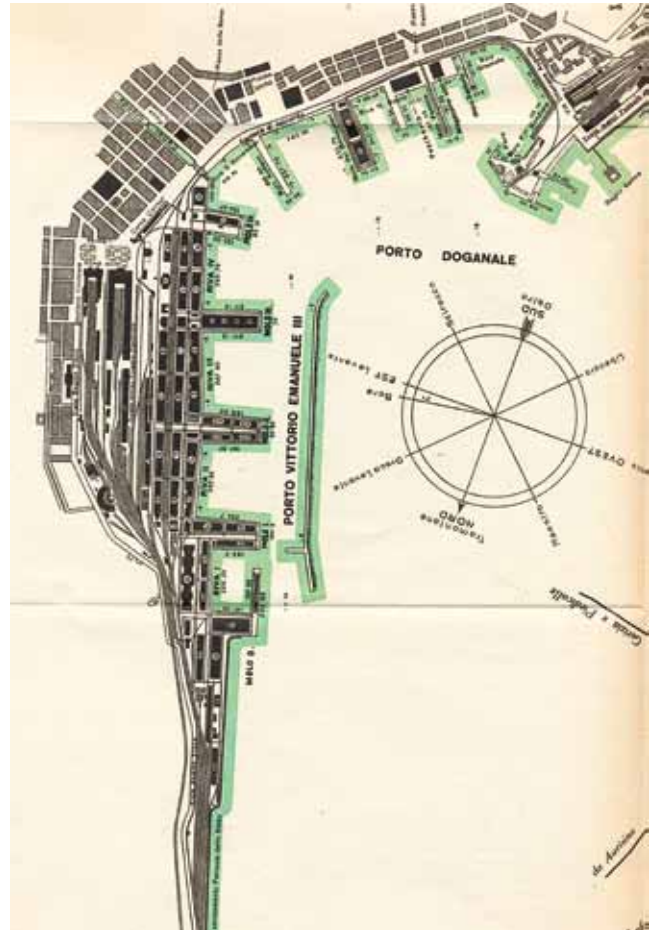
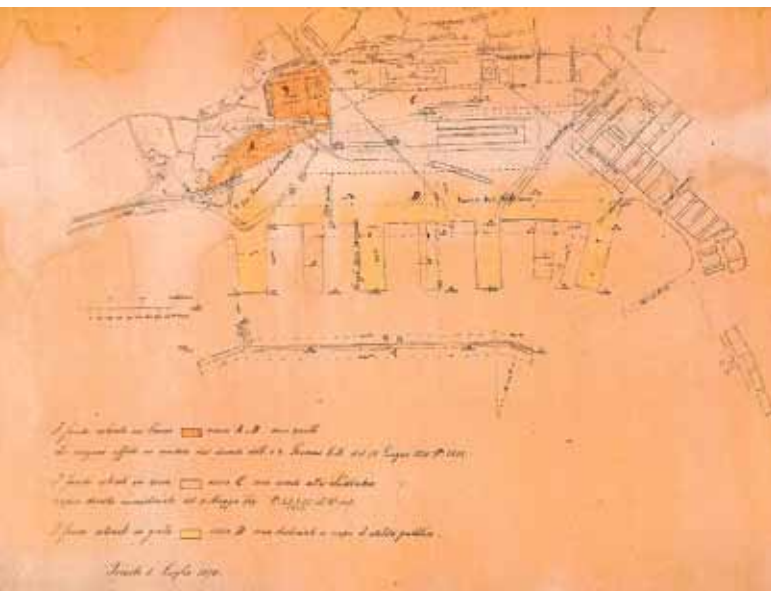


Figure 2: Trieste, Old Port, historic map of Port Trieste, archive of Port Trieste

nical-scientific body, that held a second meeting in Hamburg in June, will support the rehabilitation and redevelopment of the Old Port of Trieste, with the collaboration of Trieste’s Port Authority, the Ministry for Cultural Heritage and Activities and “Portocittà”, the 70-year concessionaire of the area.

### The old Port of Trieste

The Old Port of Trieste represents an excellent witness of nineteenth century European industrial port architecture. It is a valuable example, unique of its kind, of a port facility built with the most advanced equipment, technology and materials of its time.



Figure 3: Trieste, Old Port, Warehouse no. 26, archive of Port Trieste

The Old Port, “Porto Vecchio” in Italian, is different from other ports of the Mediterranean area because it was built after the model of the Lagerhäuser, town districts designated as strategic areas for goods traffic in the Northern European ports, in particular the Hamburg Speicherstadt.

Built during the Habsburg period, between 1868 and 1887 after a thorough planning phase, the Old Port covers an area of about 600,000 square meters, spreading from the Ponte Rosso Channel to the suburban quarter of Barcola. It includes five piers (Pier 0, I, II, III, IV), approximately 3,100 metres of quays, twenty-three main buildings comprising hangars, warehouses and other facilities. The Old Port, protected by an offshore seawall, is directly connected to the old railway (1857).

The impact of the port construction caused some changes in the coastline after a large area was dredged and reclamation works took place.

The old port area and the nineteenth-century warehouses have lost their original function related to commercial traffic so they must open up to new opportunities. A re-visioning of the area must take place with the overall port strategy of Trieste. For a long time the cultural association “Italia Nostra”, through the constant efforts of its volunteers, has been fighting for the preservation of this important historic port site. At last, as from August 2001, most of the buildings and the urban structure of the Old Port area fall under the protection of the national cultural heritage authorities.

“Italia Nostra” remains firmly committed to the restoration of the Old Port and to the preservation of its historic warehouses. “Italia Nostra” also chose the city of Hamburg as its reference partner for a correct redevelopment of the area and has established an international committee that can be

involved in the selection of the restoration projects. In this regard it has already arranged a second international meeting “Trieste and Hamburg, port cities in comparison” which took place in June 2011 in Hamburg.

### The Lagerhäuser of Trieste

The spirit that governed the project, probably thanks to the contributions of Hamburg citizen Alexander von Schöeder, in its guidelines was the idea that the port was to be seen as a city district and, therefore, as a set of Lagerhäuser.

Figure 4: Bremen, Speicher XI





Figure 5: Hamburg, Speicherstadt



Figure 6: Trieste, Old Port, warehouse no. 7



Figure 7: Trieste, Old Port, hydraulic power plant

The term Lagerhäuser has been used since the early plan stages and refers to the urban infrastructures dedicated to the loading, handling, storage and warehousing of goods in multi-storey lagers or hangars.

In the Northern European ports, the Speicher, Lagerhäuser, the Kältespeicher warehouses, except the six-storey Kaispeicher, were built far from the large basin and over the shallow canals. In particular, the six or eight storey Lagerhausgesellschaft warehouses were large and equipped with elevators. The Hamburg port facilities, and also the port of Bremen, while displaying monumental features, successfully matched the urban construction typologies and styles, so that the Staatsspeicher and the hangars merged with the urban fabric along the Elbe river channels.

The warehouses and the deposits were divided into four main categories: the hangars (100–400 metres long, with an height of 12 metres), the Staatsspeicher, the Kaispeicher (A and B) and the Lagerhausgesellschaft warehouses, which served mainly as depots for coffee, tobacco, wine and manufactured products.

The first project of Warehouse 26 of the port of Trieste recalled the stylistic features of the Speicherstadt warehouses.

The similarities of Warehouse 26 with Bremen’s Speicher XI (now restored and dedicated to cultural activities and a museum) and Hamburg’s Kesselhaus, a restored hydrodynamic plant and now used as an Info-centre.

In Trieste, each hangar was equipped on both sides with railway tracks which were used to load goods directly from wagons into the cargo ships. The hydraulic cranes, both portal or cranes of the “lame goat” type, were located on the edge of the quays and were steam-driven. Also on the land, a system of cranes and hoists facilitated the load-ing and unloading of heavy goods. Of all this electromechanical equipment, the hydraulic crane in front of Warehouse 6 of the old port and the floating pontoon “Ursus” are the only ones which are still in existence; the latter has been put under ministerial protection and will soon be restored.

### The four main groups of port buildings

The warehouses and the hangars were placed on three roads, which were parallel to one another: a wider road in the middle and two narrower ones on both sides, one of which is adjacent to the railroad tracks.

- 1) one-storey buildings, above the ground level
- 2) two- or three-storey buildings with basement, attic, and balconies, located between the foreparts and supported by cast iron columns
- 3) four-storey buildings with basement, ground floor and four upper floors with balconies.
- 4) special buildings, such as the hydrodynamic plant and power conversion substations.

In addition, the “customs stands” are also worth noticing, which are symmetrical to the piers, together with isolated buildings, such as the “battery charger”, the “lathe room”, the inns and the additional buildings, leaning on the front lines, dedicated to various activities. The main road, which passes in front of the central administration building of the General Stores, is 1450 m long and over 30 m wide; the sec-

ond road is 1000 m long and 30 m wide; and the third road, that is adjacent to the railway tracks, is 800 m long.

The port included a total number of 20 warehouses, 18 hangars and 17 other buildings. The warehouses were lent to traders, who had duty-free deposits and offices.

The hangars were built in nine months; the warehouses, according to their size, took 12 to 28 months for their construction. The delivery deadlines, that had been set on July 1st, 1891 (date of termination of the Free Port), was not met due to the difficulties of the foundational works.

The construction of these warehouses took on great importance not only for the adoption of new construction methods and the use of new materials, such as concrete, but also for the particular hydraulic and consolidation works carried out to overcome the difficulties posed by the underground conditions.

At that time, the foundations were thought to be the more inflexible and rigid, the safer, even when the soft ground received stress more easily. The trapezoidal configurations of some hangar plans near the shore are worth noticing, as they depend on the soil characteristics.

### Stylistic remarks regarding the late 19<sup>th</sup> century power station architecture

A study of the industrial buildings of that period, especially the hydrodynamic and electrical power stations, built in Germany during the same period, such as Hamburg's Kesselhaus, reveals the diverse nature of those special buildings and facilities, which were intended to enhance the performance of factories and ports. An analysis of the buildings of that period shows that the stylistic and construction techniques were intended to camouflage bulky and modern pieces of machinery (visually somewhat aggressive) which would then result in one of the mainstream technological trends. At the time of construction (1890) of the hydrodynamic plant, only a few years after the 1881 Paris Universal Exhibition and the creation of the first electric engine designed by Galileo Ferraris in 1885, the ports of Hamburg, Buenos Aires, Calcutta and Genoa alone adopted this kind of equipment.

The work was unexpectedly important at the time of its construction, especially because it was connected to new production and industrial port activities. Indeed no detailed documentation about it is available in the port archive.

### The hydrodynamic plant building

The hydrodynamic plant consists of three buildings, located and organized according to their functions: the first section of the building, that is on the left when looking coastward, is the former electrical conversion plant; the central building hosts the boiler room; while the building that is symmetrical to the gable, on the right side of the building, hosts the engine room and two water accumulator towers.

The distribution of geometric spaces, also on the plans, recalls the elements of Hamburg's Kesselhaus, that today serves as an information centre for the Speicherstadt.



Figure 8: Trieste, Old Port, hydraulic power plant, machinery room



Figure 9: Trieste, Old Port, hydraulic power plant, (1890) machine Breitfeld & Danek – Karolinental – Prag



Figure 10: Trieste, Old Port, hydraulic power plant, (1890) auxiliary machine Breitfeld & Danek – Karolinental – Prag

During the construction of the hydrodynamic plant (between 1887 and 1890) setting work activities according to the destination, the size and the hierarchy of operations



Figure 11: Trieste, Old Port, hydraulic power plant (1890), particular of auxiliary machine Breitfeld & Danek – Karolinenthal – Prag



Figure 12: Trieste, Old Port, the boiler room

Figure 13: Trieste, Old Port, power plant



was necessary, providing at the same time a proper distribution of internal spaces.

Therefore, it was necessary to build an engine room, a boiler room, a chimney, a coal store-room and a repair shop. The study and construction of the foundations was just as important, as it was necessary to provide for a firm, stress-resilient floor, which was able to support the weight of the four machines produced by “Aktien Maschinenbau-Gesellschaft vormals Breitfeld Danek & Co” Prague-Karolinenthal, the Cornwall-type boilers, the accumulators, the tanks, and the huge amount of water that was required to operate the cranes.

Three of the main devices and the auxiliary one were installed in 1891, while the fourth was initiated in 1904. The Cornwall-type boiler group, equipped with two chimneys, built by St. Jaschka & Sohn – Wien, provided a 7-bar steam power.

The plant was equipped with inlet channels, water release tubes, and water overflow devices.

The roof structure was also defined according to the requirements of the equipment that had to be installed inside the building. Therefore, the plant displays two gabled symmetrical bodies, of equal height, with parallel ridge lines, corresponding to the engine room and power substation, while the roof layout of the boiler rooms is orthogonal to the ridge line of the other ones. Also the south-east towers, leaning against the factory building through an intermediate structure, were sized bearing in mind that the hydraulic accumulators were to be installed there.

Over time, the hydrodynamic plant turned out, however, to lack the required space to match its expansion. Therefore, around 1913, a new power conversion substation was built.

The water used by the system, coming from the urban piping, was drawn in by the Port’s return piping system, but also by two tanks, which supplied only enough water to cover the inevitable losses along the way.

The water pressure that was used to power the lifting equipment was distributed across the port through pipes of different diameters. The delivery and return pipes ran through underground shafts, which were wide enough to allow maintenance personnel to perform a complete and comprehensive inspection.

The high cost of this system and technical progress persuaded the port administration to replace, between 1936 and 1939, the steam engine with more suitable electric motors.

Only three of the four main engines were then electrified, as it was deemed appropriate to keep a steam reservoir in case of power failure. A perfectly preserved unit is still existing.

According to the manuals of that time, the driving power plants had to be near (preferably in adjacent rooms) a repair shop to perform minor repairs but also to rapidly manufacture spare parts.

Those buildings had to be equipped with a transport system between different rooms.

As far as users are concerned, until 1988 the station provided power to cranes, located outside the warehouses to lift goods to the upper floors, and elevators, located inside different port warehouses.

Restoration works to create the port museum centre are currently underway.

### Improvement proposal as a cultural asset – establishment of a historical port site of national and international interest

During the past years, Italia Nostra has put forward a number of proposals, such as a request for protection measures to be applied to all the warehouses of the Old Port and also the recovery of the hydrodynamic plant of Trieste, inspired by Hamburg's Kesselhaus.

The hydrodynamic plant of the Old Port of Trieste is the only example in the world of a energy generator, fully preserved in its original building.

The Italia Nostra association, in 2004, in collaboration with public institutions, started an improvement project of this important cultural asset, currently under protection measures, which is intended to fully recover the building and to expand its uses including, in terms of tourist-cultural-port activities, the creation of a permanent exhibition, an archive of historical materials and the organization of guided tours. The establishment of a "historic port site of international interest" for the whole old port district could be put forward, starting its recovery and revitalization.

#### Abstract

#### Der Alte Hafen von Triest: Charakteristika und Besonderheiten des hydrodynamischen Kraftwerkes und des Lagerhausviertels

Der historische Hafen von Triest dokumentiert auf herausragende Weise die Industriehafenarchitektur des neunzehnten Jahrhunderts in Europa. Er ist ein wertvolles, ja einzigartiges Beispiel für einen Hafen, der mit den damals modernsten Geräten, der fortschrittlichsten Technik und den neuesten Materialien gebaut wurde.

Der Alte Hafen „Porto Vecchio“ in Italien unterscheidet sich von anderen Mittelmeerhäfen, weil er nach dem Vorbild der nordeuropäischen Lagerhaus-Viertel entstand: Letztere waren praktisch ausschließlich dem Warenumschatz gewidmet. Insbesondere stand die Hamburger Speicherstadt Pate bei Entwurf und Bau des „Porto Vecchio“.

Der Hafen entstand nach sorgfältiger Planung während der Habsburger Monarchie in den Jahren zwischen 1868 und 1887. Er umfasst eine Fläche von 600 000 qm und erstreckt sich vom Ponte Rosso Kanal bis zum Vorstadtviertel Barcola. Zum Hafen gehören insgesamt fünf Brücken (Pier 0, I, II, III, IV), Kais mit einer Länge von 3 100 Metern, 23 Gebäude, hierunter Hangars, Lagerhäuser sowie weitere Anlagen und Nebengebäude. Der Alte Hafen ist durch eine Außenmole gegen die offene See geschützt und direkt an die alte Eisenbahnlinie von 1857 angebunden.

Durch den Bau des Hafens veränderte sich der Küstenverlauf, da in großem Umfang ausgebaggert und Land hinzugewonnen wurde.



Figure 14: Trieste, Old Port, power plant



Figure 15: Trieste, Old Port, warehouse no. 26 after restoration (2011)



Figure 16: Trieste, Old Port, old warehouse no. 26 after restoration (2011)

Das ehemalige Hafengebiet und die Speicherstadt aus dem 19. Jahrhundert sind inzwischen vom Stadtzentrum umschlossen und haben ihre ursprüngliche Funktion für den gewerblichen Verkehr eingebüßt. Sie müssen sich deshalb für neue Nutzungen und Chancen öffnen, die im größeren



Figure 17: Trieste, Old Port, old warehouse no. 26 after restoration (2011)



Figure 18: Trieste, Old Port, hydraulic power plant, works for restoration (2011)

Zusammenhang mit der traditionellen Bedeutung von Triest als Hafenstadt stehen. Sichtbare Zeugnisse des alten Hafengeländes existieren auch ohne gegenwärtige Nutzung fort: historische Lagerhäuser, Hangars, das Kesselhaus, Kaikräne, elektromechanisches Gerät und die alten Silospeicher mit ihrer charakteristischen Architektur.

Die Lagerhäuser, Hangars und bis zu vierstöckigen Gebäude bilden Parallelachsen, von denen die landseitig innerste in direkter Nachbarschaft zum Schienenstrang verläuft.

Bei allen diesen Gebäuden, Anlagen und Ausrüstungsgegenständen handelt es sich um unersetzbare Beispiele einer Industrie- und Technikarchitektur, die die große Tradition

des Hafens von Triest bezeugen. Sogar die Auswahl der Baumaterialien, konstruktive Details sowie Zoll- und andere vertragliche Regelungen erlauben interessante Einblicke in die Hafentätigkeiten von Triest.

Der Kulturverband „Italia Nostra“ und die in ihm organisierten ehrenamtlichen Mitglieder kämpfen seit langem unermüdlich für die Erhaltung dieses wichtigen historischen Hafens. Am 23. August 2001 gelang es endlich, die meisten der Gebäude sowie die städtebauliche Struktur des Alten Hafens unter den Schutz der nationalen Denkmalschutzbehörde zu stellen.

„Italia Nostra“ engagiert sich weiterhin dezidiert für die Restaurierung des Alten Hafens und die Erhaltung der historischen Lagerhäuser. „Italia Nostra“ hat sich bewusst mit Hamburg als Referenzpartnerstadt zusammengetan, um bei der Umwidmung des Hafengeländes den richtigen Weg einzuschlagen. Es wurde ein international besetzter Ausschuss eingerichtet, der bei der Wahl der Restaurierungs-Projekte einbezogen wird.

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