Inhabiting the Industrial Heritage.
Rehabilitation of Industrial Areas into Collective Housing

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Introduction

Industrial heritage has acquired a meaning that exceeds the aesthetic or testimonial to become a temporal and spatial framework in the memory of place. The contemporary interpretation of the concept of "heritage" recognizes the need to define traditions and identities and makes necessary a professional and institutional system of conservation with an urban dimension (Bandarin & Van Oers, 2012, p. 15). The Italian architect and urban planner Gustavo Giovannoni (Zucconi, 1997), who in the 1930s laid the foundations for the conservation of urban heritage, by proposing the protection not only of the monument but also of its surroundings, integrating contextual needs under a global vision, is a precursor of this meaning of the term. The landscape values of the industrial traces, the urban heritage and the needs of the city and the population, join the values of each work in a continuous space, which conditions its conservation and use in a second life.

Since the 1960s there has been a growing interest in industrial archaeology, first in Great Britain and the rest of Europe, and later in countries on other continents. It is a utilitarian architecture, sometimes influenced by the dominant neoclassical trends in the first half of the nineteenth century, which determines the appearance of decorative elements. Initially they were built with the available materials, which conditioned the design, essentially affected by the energy used, and new materials were introduced, such as cast iron in structural elements. Indeed, the evolution

Fig. 0. Alliance Building at the Gasworks, Dublin, Ireland. O'Mahony Pike Architects. Housing Project, 2006 (source: O'Mahony Pike 2006, p. 71).

of industrial buildings is strongly influenced by technical progress, the availability of materials, stylistic change in architecture and the demands of production cycles, specific to each industry (Capel, 1996, p. 25).

The technological obsolescence of installations has led to a loss of the primitive function of industrial facilities, and, from the production point of view, the modern city has undergone a series of important changes in its organization. The processes of industrial reconversion and restructuring, linked to the crisis of the 1970s and the global displacement of industrial employment from traditional regions to new ones, have led to the abandonment of industrial land in strategic urban areas of European cities, leaving a large number of production spaces outdated and unused. In parallel, there has been a growing phenomenon of tertiarization of the so-called post-industrial city, which has conditioned the reuse of industrial buildings to accommodate other uses (Biel Ibáñez, 2016, p. 159).

There is a wide range of approaches and criteria that have been adopted in the reuse of industrial architecture, after its late identification as heritage to be preserved. The disappearance of unique works such as Les Halles in Paris (Victor Baltard, 1852-1870), demolished between 1971 and 1973, led to the inventorying and cataloguing of this type of architectural ensembles, which began to be recognized and protected (Hernández, 2013, pp. 29-30). Parallel to this awareness, the first interventions were carried out on this functionally obsolete architecture, which needed a new use, as a means to guarantee its survival.

This chapter focuses on industrial heritage reuse processes in which collective housing projects are carried out. They find their precedent in pioneering examples such as: The Blue Warehouse, Copenhagen, Denmark (Hertz & Ramsgaard Thomsen, 1979); Water Toren Wej, Rotterdam, The Netherlands (Wytze Patijn, 1982); Riverhead Granaries, Humberside, England (MacCormack and Jamieson, 1979); Buchanan Wharf, Bristol, England (Halliday Meecham, 1988); Bryant & May match factory, London, England (ORMS Architects, 1988); or Spillers & Bakers warehouse, Cardiff, Wales (MWT Architects, 1988).

The paper presents various contemporary European cases and experiences in the conversion of industrial heritage into residential complexes, which allow us to analyze how these actions affect the architecture and its surroundings, depending on the diversity of areas that affect each strategy: factors such as artistic value, symbolic character, municipal requirements, neighborhood initiatives, the sensitivity of the intervening agents and the possibilities offered by their reuse.
This selection of case studies has been structured according to the building typology of industrial, agricultural, and port constructions, depending on whether they are:
- Warehouses, with linear porticoed structure.
- Silos, with wall structure by aggregation of modules.
- Gasometers, with circular perimeter wall or lattice structure.

These are operations with central or peripheral locations, in which social, student or luxury housing projects are carried out, but in any case, they are archetypes of regions with remarkable traces of the industrial revolution, which serve to illustrate the limits and possibilities of their reconversion into urban residential complexes.

Warehouses

Jernstøberiet, Roskilde, Denmark. Jan Gudmand-Høyer and Jes Edvars Architects. Co-housing Project, 1980

Jernstøberiet in Roskilde, Denmark, is a cohousing community designed by Jan Gudmand-Høyer and Jes Edvars in 1980, in a former iron foundry. Located in the Himmelev neighborhood, in an environment of traditional single-family houses, the factory was reconverted, after a long process of rehabilitation, into a housing complex with common uses that favored the social interaction of the residents. According to Jan V. Hansen, this is the Third Generation community with the most radical and innovative approach so far (Gudmand-Høyer & Edvars 1984, p. 234).
The factory consisted of a large production nave with a gable roof and a maximum height of 8 m., and adjoining naves with a pitched roof and side skylights. Jernstøberiet took up a project from 1968, structured

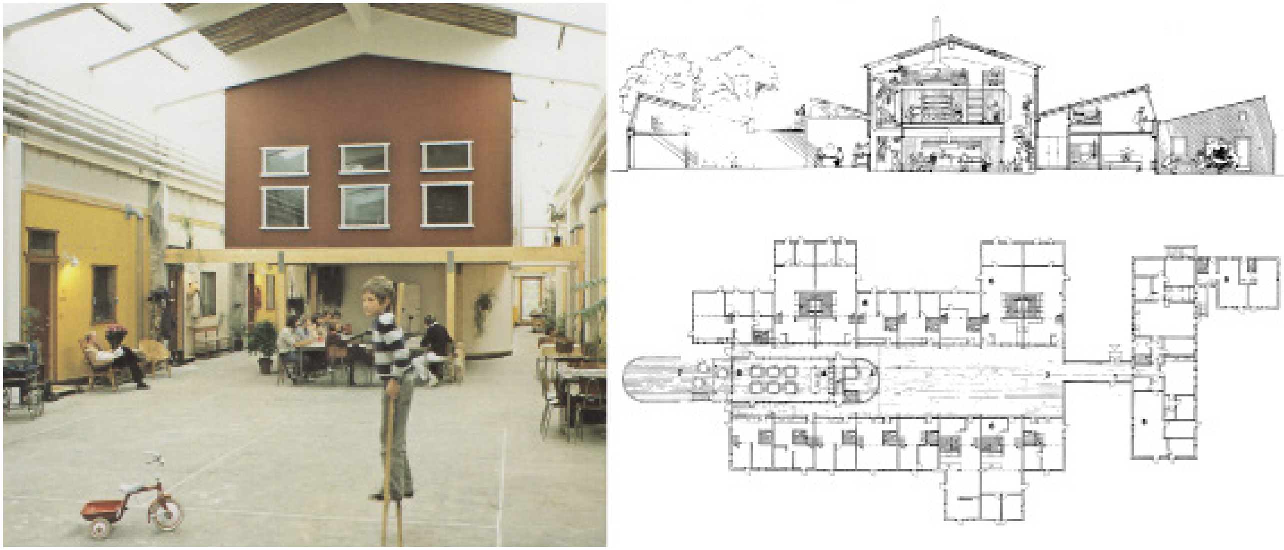

Fig. 1. Jernstøberiet, Roskilde, Denmark. Jan Gudmand-Høyer and Jes Edvars Architects. Co-housing Project, 1980 (source: Gudmand-Hoyer and Edvars 1984, pp. 236, 237).

around a glazed central street. The central nave took on the character of a covered outdoor space and an entrance hall for 20 apartments located in the side naves and in an annexed volume. This common area is the physical center of the community, providing a place for informal gatherings and children's games, and acting as a climate buffer (Fig. 1). At one extreme, a community center with shared kitchen, dining room, lounges, workshops, etc., was set up with more intensive treatment. The dwellings of between 33 and 127 square meters for singles and families, involve the segmentation of the warehouses with a single module and the use of the section with mezzanines and light entrances on the roof, which compensate for the great depth of the bays. They are open to the environment with small individual gardens, and large outdoor spaces with playgrounds, fields, and orchards. The rehabilitation of the original architecture was approached with minimal modifications and criteria of economy and self-construction by the residents, through the reuse of the roofs and the enclosure, which was covered with wood planking and corrugated iron, thus guaranteeing the viability of the project.

Torpedo Boat Workshop, Copenhagen, Denmark. Vandkunsten Architects. Housing Project, 2003

The old Torpedo Boat Workshop located in the port of Copenhagen, Denmark, currently accommodates a housing complex designed by Vandkunsten architects in 2003. The building was built in 1954 for the repair and maintenance of Navy vessels, in Holmen, the Royal Naval Shipyard, an area of important natural and architectural value, selected after its abandonment in the 1990s for the urban development of the city. In the renovation, the gigantic 160x32x15 m. structure of reinforced concrete porticoes every five meters and steel trusses was preserved, in memory of the building's unique architecture, and took on a new meaning. Under the trusses, a public passageway open to the sky runs longitudinally through the building, extending the street to provide access to the dwellings, facilitate relations between residents and, ultimately, integrate the complex into the city. One end rises up to the second floor, above a communal parking lot that facilitates vehicular access, and the other end goes into the canal, allowing access from the water. This dynamic and vibrant interior street is bordered and crossed in height by light footbridges and terraces of the dwellings, recalling the activity of the old shipyard hall (Fig. 2).

The 67 bright and flexible loft apartments of 75 to 275 square meters, on one or two floors, open with large windows and terraces to the interior street and to the surroundings, leaving the slender trusses on the penthouses visible (Keiding, 2003, pp. 234-241). Its self-supporting modular system is integrated into the fabric of the structure, set back 40 centimeters from it, to maintain its independence and prominence.

Massó i Carol - Vapor Llull Factory, Barcelona, Spain. Cristian Cirici and Carles Basó Architects. Housing Project, 1997

The Massó i Carol - Vapor Llull chemical factory located in Barcelona, Spain, was rehabilitated with a private residential project by Cristian Cirici and Carles Basó architects in 1997. The factory, inaugurated in 1902 and in service until the end of the 1990s, is located in Poble Nou, a traditionally

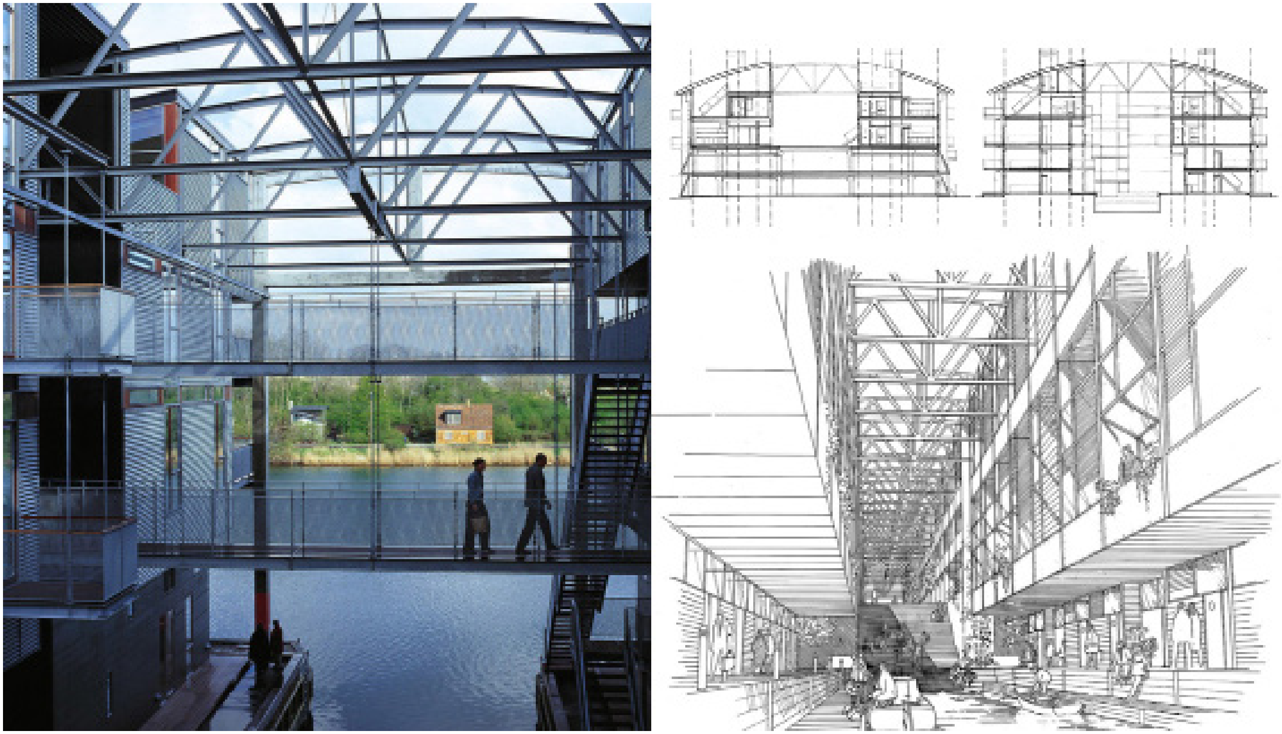

Fig. 2. Torpedo Boat Workshop, Copenhagen, Denmark. Vandkunsten Architects. Housing Project, 2003 (source: Keiding 2003, pp. 235, 237).

industrial neighborhood, which protected this type of building through a Special Plan for its progressive reconversion and integration into the city (López, 2011).

It is a complex that houses a main longitudinal nave with three floors, different auxiliary buildings, and a 32 m. high solid ceramic brick chimney, which was preserved. The building maintained its original structure with three floors, solid brick load-bearing perimeter walls, intermediate pillars and cast-iron beams, ceramic vaulting and a gabled roof with wooden trusses. In the intervention, the building was subdivided with vertical partitions of exposed brick into 18 independent and double oriented modules of about 90 square meters, intended for workshops, offices, studios, and housing (Martí et al., 2000, p. 4). The free height on the ground and second floors allowed the incorporation of an intermediate slab, and each unit was left unfinished so that users could adapt it to their preferences and needs.

Three vertical cores with stairs and elevator were added to the existing building, which were supported on the envelope, signifying the exterior with volumes of sheet metal and glass. Together with the color treatment on the façades based on silicate paint that replaced the pre-existing plaster (Broto & Mostaedi, 2006), these light volumes contributed to change the original image, signifying the accesses from a communal garden space in which a parking lot is integrated in an independent volume (Fig. 3).

Passatge del Sucre Factory, Barcelona, Spain. Garcés - De Seta-Bonet Architects. Housing Project, 2009

Located in the same neighborhood of Poble Nou in Barcelona, Spain, Passatge del Sucre is a former alcohol distillery rehabilitated with a collective housing project by Garcés - De Seta - Bonet architects in 2009. It was covered by a new typology of municipal ordinances, called “unconventional housing” which, as happened in the 1960s in New York, allowed transforming industrial buildings with architectural, historical or artistic interest into “lofts” (Dot Jutgla & Pallares-Barbera, 2015).

This old industrial complex of 1916 consisted of three warehouses with a gable roof and two blocks in height, arranged in an L-shape and structured by a central access passage (Garcés et al., 2015). The three naves had load-bearing façades of facing brick, cast iron pillars and beams, intermediate slab of ceramic vault and gable roof, with metal and wood trusses. Given the limited natural ventilation surface and the difficult access to the two naves perpendicular to the passageway, a corridor was opened with the partial demolition of one of them, maintaining the metal trusses that recall the original volume (Fig. 4). Taking advantage of the clear heights, in one of the bays the original floor slab was replaced by two new ones, and in the others, it was maintained, with occasional interventions and mezzanines on the upper level. In the blocks, the cast iron pillar structure was preserved or reinforced with concrete pillars, incorporating an

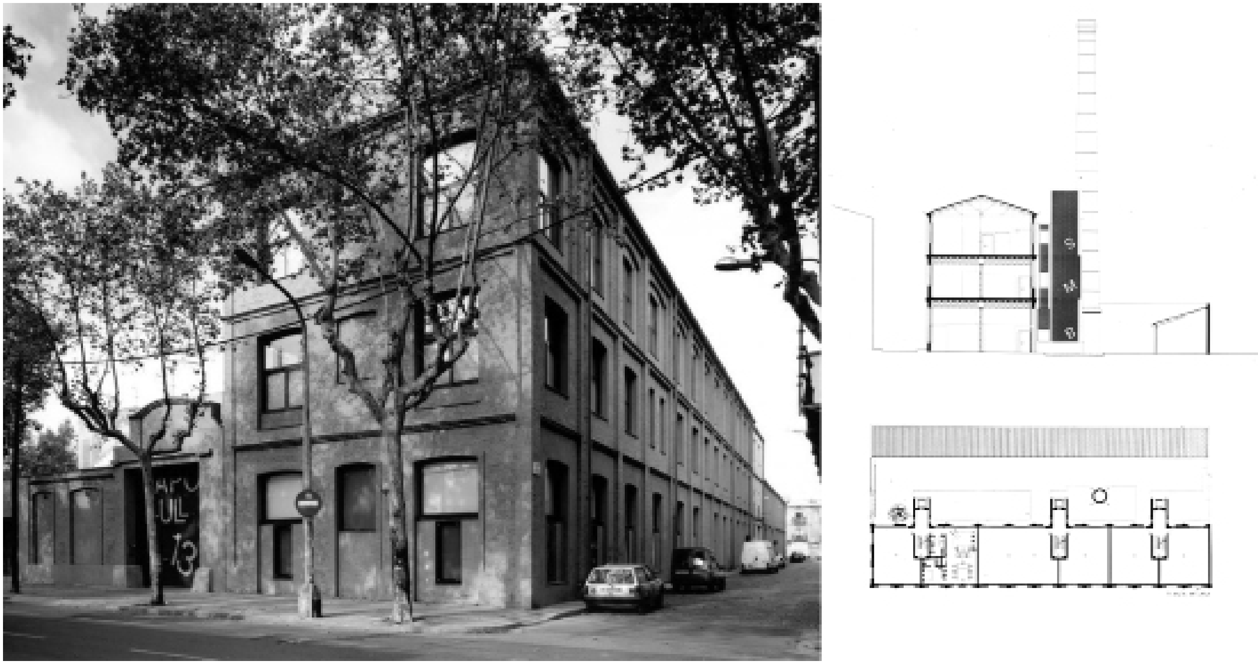

Fig. 3. Massó i Carol - Vapor Llull Factory, Barcelona, Spain. Cristian Cirici and Carles Basó Architects. Housing Project, 1997 (source: Broto and Mostaedi 2006, p. 45).

intermediate slab and favoring the connection with the street by emptying the ground floor. The complex houses 29 dwellings with very different typologies and surfaces, which, due to the characteristics of the building, are unique and exclusive (Laudy, 2011, pp. 27-29).
The project included important variations in the façade, maintaining some windows and opening others with metal lintels. The differentiation of the facings, completed with a new type of brick, allows us to guess the original composition, in a collage of overlappings.

Fabra & Coats, Barcelona, Spain. Roldán and Berengué Architects. Social Housing for Young People Project, 2005

Fabra & Coats is a former textile industrial site of about five hectares, founded in 1837 in the district of Sant Andreu in Barcelona, Spain, which after its closure in 2005 was acquired and protected by the City Council to

Fig. 4. Passatge del Sucre Factory, Barcelona, Spain. Garcés - De Seta - Bonet Architects. Housing Project, 2009 (source: Garcés 2015, pp. 233, 235).

reconvert it into facilities for the city. One of the yarn storage warehouses, built in 1905, was converted by Roldán and Berengué architects into social housing for young people under municipal management.

The building measures 100x15x11m. with a solid brick façade and 25 bays with steel structure and trusses on the roof, and an intermediate concrete slab. With the intervention, the longitudinal dimension is emphasized, by making a central emptying of the building, where the access and the itineraries are concentrated by double diagonal ascending stairs. This cascading community space functions as an interior plaza, which physically and visually communicates all levels (Fig. 5). The 46 housing modules of about 60 square meters, built with timber framing, are inserted into the original structure, which makes it possible to generate two intermediate floors, increasing from two to four, without the need for reinforcements, given the lightness of the material. They are separated from the roof and both façades with intermediate spaces that, in addition to functioning as

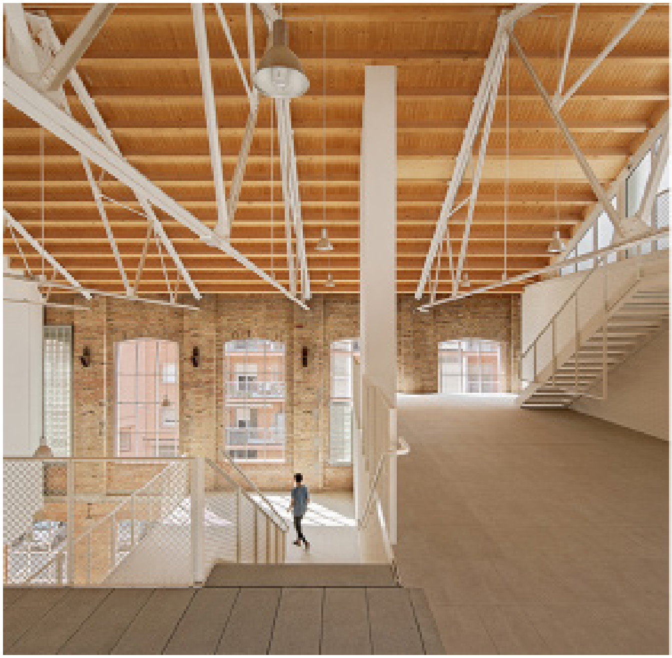

Fig. 5. Fabra & Coats, Barcelona, Spain. Roldán and Berengué Architects. Social Housing for Young People Project, 2005 (source: Roldán and Berengué 2020a, pp. 162, 165).

a thermal buffer, optimized by the inertia of the original construction, allow the organization of accesses and terraces.

The new construction, by its nature and assembly, can be mounted and dismounted, so it is "reversible", allowing the nave to be returned to its original state if necessary. The project is based on "activating all the elements of the original building for the new program", as well as reusing its physical, spatial, and historical qualities, to make the new construction more efficient and reinforce the nature of the original building (Roldán & Berengué, 2020a, 2020b).

Silos

Grain Silo in Grünerløkka, Oslo, Norway. HRTB Architects. Student Housing Project, 2002

In the Grünerløkka district of Oslo, Norway, a grain silo next to the

Aker River was transformed into a student residence by Ola Mowé, Ketil Moe, Kjell Beite and Harald Lone architects (HRTB) in 2002 as part of a larger-scale urban regeneration program. The riverbed, an engine of the city's industrial development since the 18th century, was declared a nature park in the 1990s, with rezoning of the industrial buildings to residential, university and artistic use (HRTB 2002, 2003, 2004).

The grain deposit, erected in 1953, was the first Norwegian building constructed in reinforced concrete with sliding formwork, which formed 21 cylindrical hoppers. The adaptation to the new use follows the criterion of reducing the construction effort and preserving the singular character of the building, respecting its rounded geometry. Slabs are inserted on 16 floors and a distribution corridor is generated by perforating the central hoppers. The 226 units occupy segments of a circle, circular main spaces and interstices between the hoppers, where the bathrooms are located (Fig. 6). On the upper floor, there are common spaces and services and a rooftop viewpoint.

The structure is perforated with more than a thousand vertically proportioned openings. Inside, the concrete is exposed and dialogues with a color code designed by Lykke Frydenlund, which extends to the glass sills of the balcony windows and the furniture adapted to the curvatures. To the exterior, a layer of thermal insulation is projected, protected by a crude rendering, to maintain the original roughness. The transformed building stands as a monument and icon of the urban landscape and of the surrounding redevelopment (Burnham, 2018, pp. 71-73).

Frøsilo, Copenhagen, Denmark. MVRDV Architects. Housing Project, 2005

The Frøsilo is a radical housing project for the conversion of two identical cylindrical silos, almost next to each other, located in the old harbor of Copenhagen, Denmark, realized by Winy Maas, Jacob van Rijs and Nathalie de Vries architects (MVRDV) in 2005. The intervention in these old silos of bare reinforced concrete and incomplete appearance was based on their main limitation, the difficulty of drilling their continuous structure.

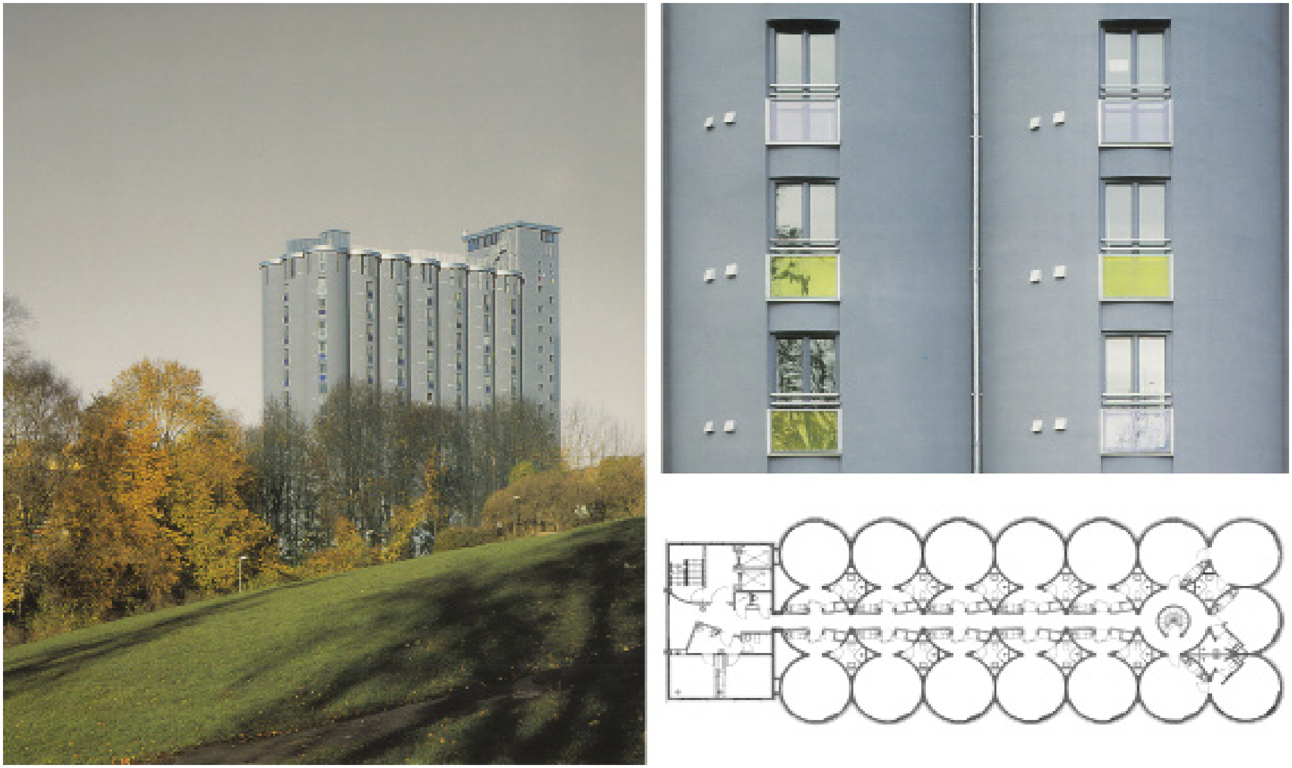

Fig. 6. Grain Silo, Grünerløkka, Oslo, Norway. HRTB Architects. Student Housing Project, 2002 (source: HRTB 2002, pp. 111, 113).

Given their nature, in the concrete cylinders it was only possible to make restricted openings of complicated execution, which was an excessive constraint to locate the dwellings inside. On the other hand, it would mean losing the most attractive aspect of their original state, the quality of emptiness. Thus, the silos literally form the new cores of the project, with perimeter distribution rings on each floor, which allow access to the apartments through punctual holes in the structure, stairs in flight, which go into the void, and elevators and ducts, which turn them into server shafts. Both cores are covered and protected with a transparent plastic membrane roof that allows a glimpse of the sky, giving rise to a futuristic lobby that shows the movement of the users (Fig. 7).

To the outside of the silos, 8 floors are suspended with 84 apartments made up of continuous curved spaces, which make it possible to dispense with intermediate walls, providing maximum flexibility. The cylinders are enveloped in a light and transparent glass skin, bordered by wide continuous terraces, which allow to enjoy the privileged panoramic views over the port and achieve a total transformation of the original infrastructures (MVRDV, 2005).

Grain Silo, Copenhagen, Denmark. COBE Architects. Urban Facilities and Housing Project, 2017

The Silo in Copenhagen, Denmark is a former port grain container redeveloped by COBE architects with a luxury urban facilities and housing project of private initiative in 2017. It is located in the Nordhavn district, where the 19th century docks have been immersed since 2009 in a process of transition to a modern residential neighborhood for 40,000 people, with the preservation of its identity and industrial heritage (Lindhardt Weiss, 2018).

The silo, built at the end of 1950 with rigorous criteria of functionality and economy, was a slender block formed by 27 concrete square-shaped tubes, which constituted a focal point in the port due to its great visibility. It had a structural mismatch, as it was slightly twisted, so it had to be calibrated with a careful process. To open up and articulate its thick exterior walls, a façade was designed to relate to the original structure. Galvanized steel caissons were attached, enveloping the building with a new faceted shell. The shape of these high-precision prefabricated modules allows balconies to be sheltered and drafts to be deflected to make the ground floor habitable, and they form an efficient sculptural "cladding" that flickers and shimmers in the light (Fig. 8).

Inside, the concrete remained exposed, even showing its cross-section in the openings between rooms. It contains 39 exclusive apartments of one or more levels and 73 to 305 square meters, which were adapted to the heights of the existing floors up to 8 m. Both the first floor and the upper level are publicly accessible, with a gallery that generates activity

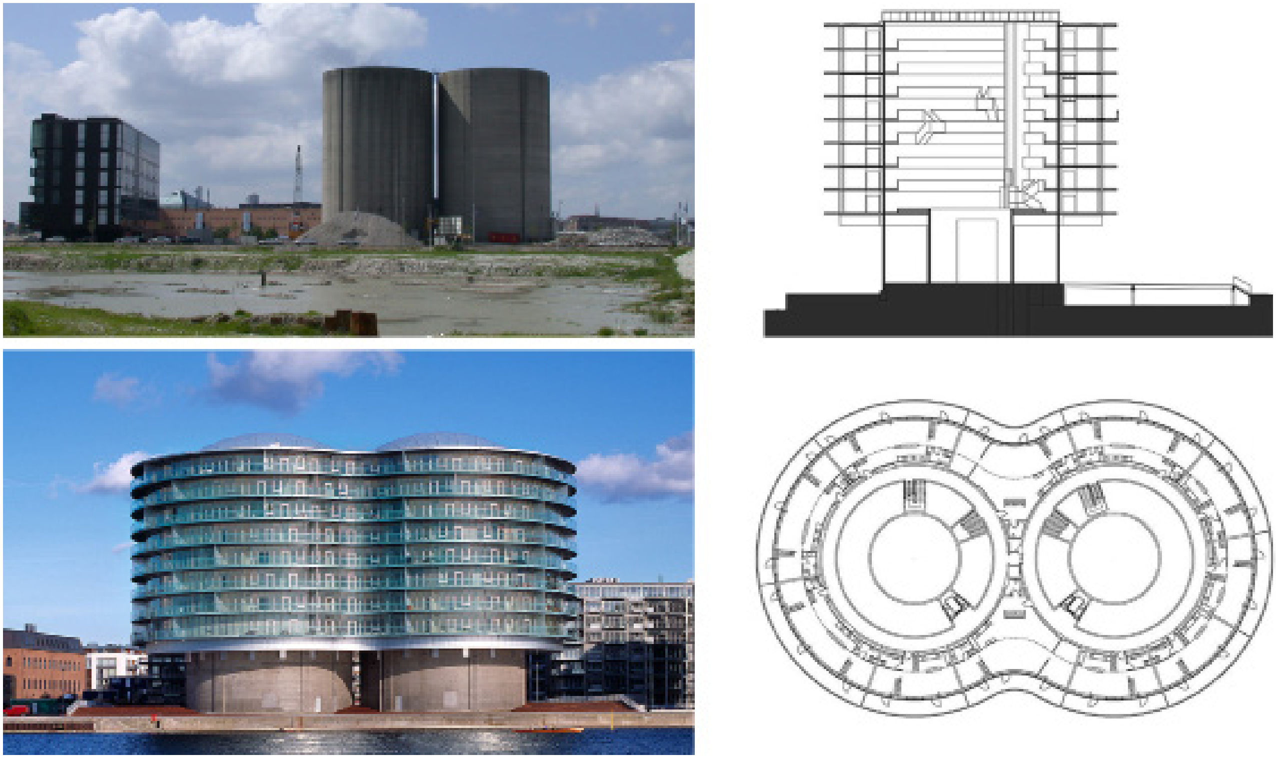

Fig. 7. Frøsilo, Copenhagen, Denmark. MVRDV Architects. Housing Project, 2005 (source: MVRDV 2005, p. 14).

towards the street and a restaurant wrapped in a glass skin, which finishes the silo with a luminous halo. The Silo aims to preserve the monolithic spirit of the old building, derived from the materiality and tactility of its construction, by simply covering it with a new cladding (COBE 2017, 2019).

Gasometers

Gasometers in Simmering, Viena, Austria. Jean Nouvel, Coop Himmelb(l)au, Manfred Wedhorn and Wilhelm Holzbauer Architects. Urban Facilities and Housing Project, 2001

The transformation of four gasometers located in the industrial district of Simmering in Vienna, Austria, responds to the initiative in 1995

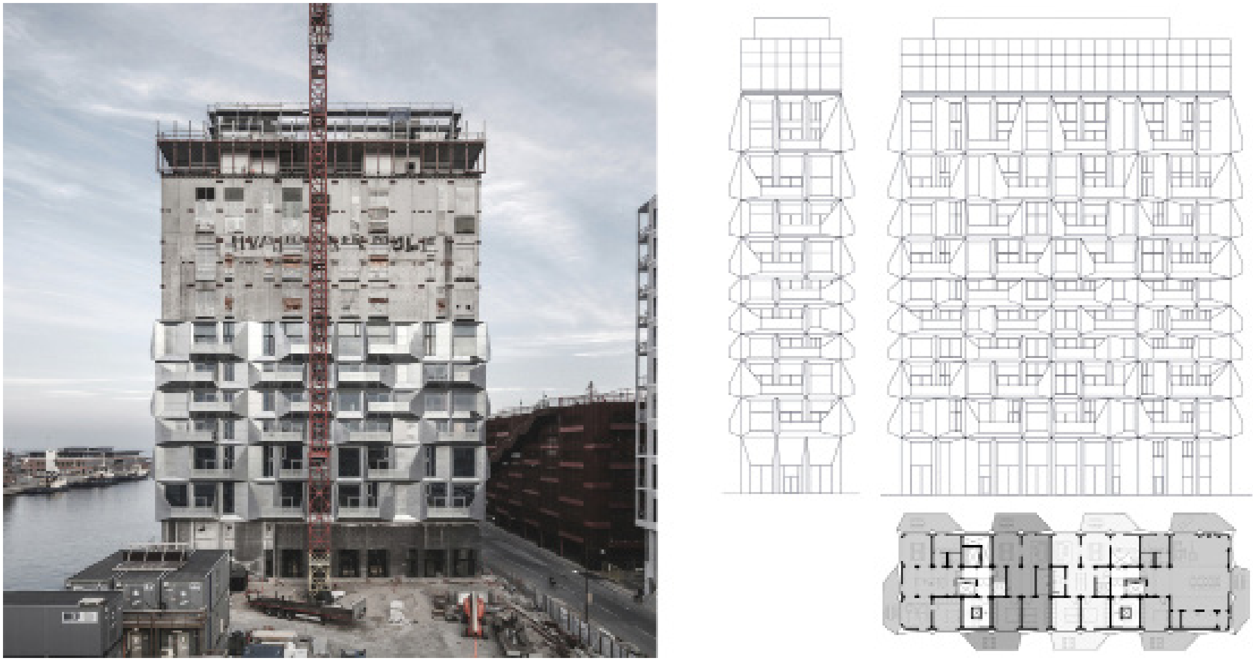

Fig. 8. Grain Silo, Copenhagen, Denmark. COBE Architects. Urban Facilities and Housing Project, 2017 (source: Lindhardt Weiss 2018, pp. 152, 158).

to preserve their heritage value by holding a competition for a mixed program. In 2001, the project by Jean Nouvel, Coop Himmelb(l)au, Manfred Wedhorn and Wilhelm Holzbauer architects for the conversion of the deposits into housing and offices was completed with a common base with a shopping center, cinemas, and concert hall, designed by Rudiger Lainer, which facilitated their integration into the surroundings (Wehdorn, 2002, pp. 86-89).

The gas factory, built between 1896 and 1899, was the largest complex in Europe, responsible for supplying the city until 1970. The four preserved tanks, 72 m. high and 64 m. in diameter, are of telescopic type and brick masonry with classic style openings, stiffened on the outside with large pilasters. The introduction of apartments and offices in each of these structures was based on the existing geometric order, with the premise of preserving them, reinforced with concrete pillars and rings, integrating

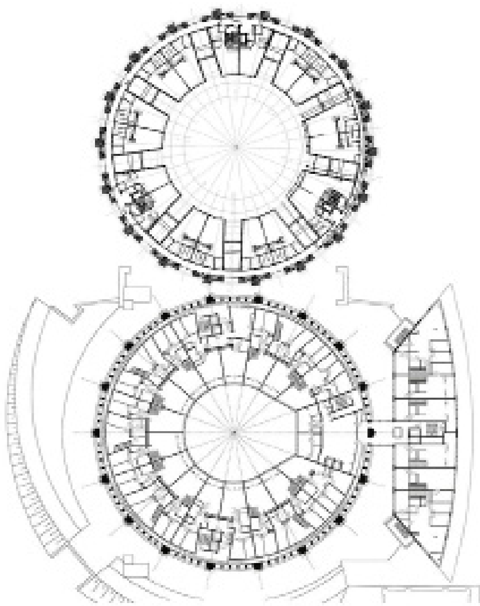

Fig. 9. Gasometers in Simmering, Viena, Austria. Jean Nouvel and Coop. Himmelb(l)au Architects. Urban Facilities and Housing Project, 2001(source: Nouvel, 2001, p. 48; Wehdorn 2002, p. 86).

new materials and styles. Jean Nouvel divided the gasometer A into nine segments located on the perimeter with 200 housing units, separated from each other and independent of the envelope by an exterior corridor. These volumes, clad in stainless steel, allow a view of the ceramic wall and reflect light, contributing to the luminosity of the central courtyard (Nouvel, 2001, pp. 48-51) (Fig. 9).

Coop Himmelb(l)au incorporated in Gasometer B two light-finished volumes with a total of 330 apartments and student residence: an interior one independent of the pre-existing ceramic structure with radial distribution and central courtyard, and an exterior one with sinuous forms and punctual connections (Fig. 9).

Manfred Wedhorn housed in the gasometer C a volume with 92 apartments staggered and white towards the central courtyard. Finally, in gasometer D, Wilhelm Holzbauer occupied the center with a core and three housing volumes, which delimited three courtyards with the preserved brick envelope (Wehdorn, 2002, pp. 90-111; CoopHimmerb(l) au, et al. 2002, pp. 71-79).

Alliance Building at the Gasworks, Dublin, Ireland. O'Mahony Pike Architects. Housing Project, 2006

The Alliance Building is a former gas deposit, located in Dublin, Ireland, rehabilitated with a housing project carried out by O'Mahony Pike architects in 2006. It is located in the port area of the city center, an industrial site since the 1870s, which in recent years has undergone a rapid and intense process of urban regeneration with the introduction of residential, commercial and office uses.

It is the only gasometer with a cast iron lattice structure preserved in the area and considered after its cataloguing and protection an important industrial archaeological monument. The 62 m. diameter frame, manufactured in London in 1885 by S. Cutler and Sons, is made up of 24 masts joined on two levels with metal frames and braced with tie rods. Fully restored, its interior houses an independent glazed structure with 240 apartments distributed over nine floors, a circular landscaped courtyard in the center and four vertical cores around it (Figg. 0, 10). The transparency of its façade makes it a privileged observation point and its location and entity, an icon and landmark in the landscape (O'Mahony Pike, 2006).

Fig. 10. Alliance Building at the Gasworks, Dublin, Ireland. O'Mahony Pike Architects. Housing Project, 2006 (source: O'Mahony Pike 2006, p. 71).

Gasometer in Stade, Germany. Gerhard Buttge Architect. Housing Project, 2015

The project to transform a gasometer located in the harbor of the city of Stade, Germany, into a residential building by architect Gerhard Buttge in 2015 furthered the regeneration of the urban area Harschenflether Vorstadt, formally designated in 2013 with a Master Plan to develop a mixed-use neighborhood.

The 29 m. diameter gasometer, built in 1955, consists of a cast-iron framework made up of 12 lightweight pillars joined on three levels and braced with triangulations. Its rehabilitation entails the incorporation of

Fig. 11. Gasometer in Stade, Germany. Gerhard Buttge Architect. Housing Project, 2015 (source: Buttge Architects website).

this structure to a unitary base of sheet metal with parking on several levels, and its union through intermediate slabs, which contain 36 dwellings distributed over six floors with a central core and a transparent aluminum and glass façade, which provides wide views and different orientations (Fig. 11). The project, in accordance with the status of protected monument, ease of use and affordability, results in a unitary building, in which the historical framework shapes the façade, adding a new order (Buttge Architects website).

Gasometers in King's Cross, London, England. Wilkinson Eyre Architects. Housing Project, 2018

The rehabilitation of three gasometers in King's Cross, London, England, to accommodate three residential buildings with Wilkinson Eyre's 2018 project, is part of an extensive program of urban redevelopment with

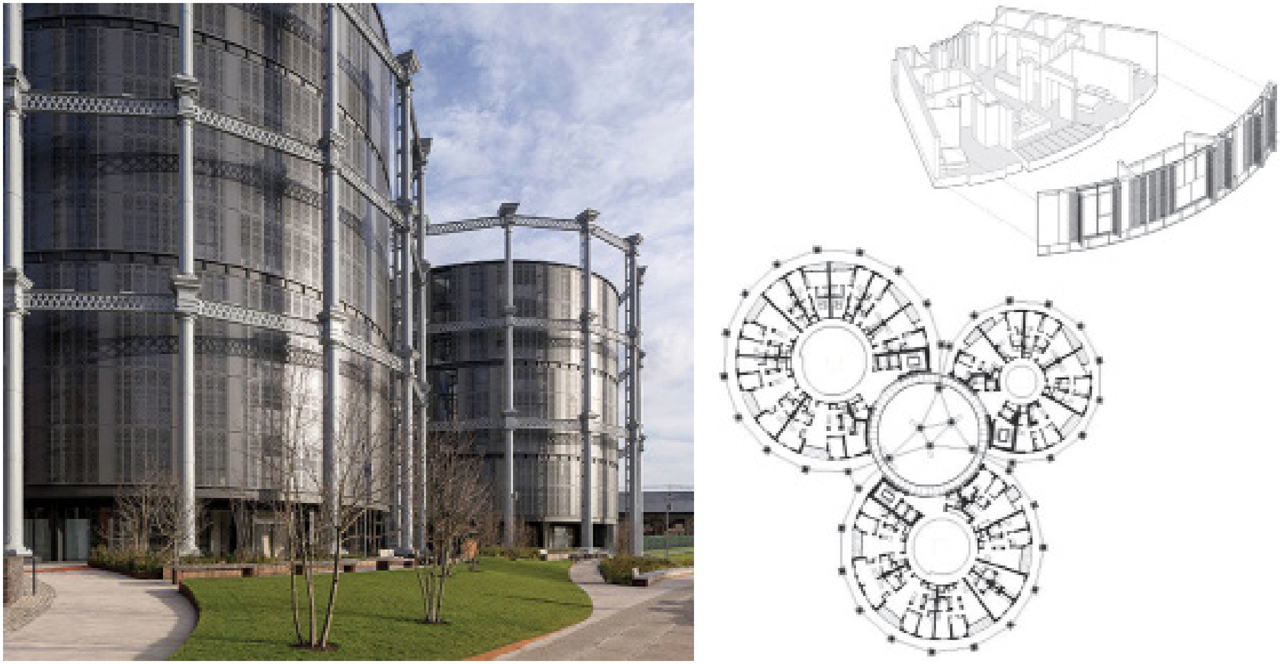

Fig. 12. Gasometers in King's Cross, London, England. Wilkinson Eyre Architects. Housing Project, 2018 (source: Wilkinson Eyre, 2018a, pp. 18-20).

preservation of industrial heritage. It consists of three cast-iron guide frames of different diameters - the largest, 45 m. - tangent to each other, built in 1867 and dismantled in 2001, which were subsequently listed for the great heritage value of their monumental columns joined on three levels. The project proposed three cylindrical housing containers separated from the cast iron trusses and of different heights, to suggest the movement of the original gasometers.

A fourth virtual drum, located in the intersection of the three structures, forms a central landscaped courtyard that concentrates the accesses (Fig. 12). The project includes 145 apartments with common facilities of gym, spa, lounges, dining rooms and bar. In each volume, access to the apartments is provided through a circular, glass-roofed central atrium, with walkways around it on each floor, where light is reflected in a water fountain. The radial configuration gives rise to diaphanous apartments, which take advantage of the natural light on the perimeter. The roofs were conceived as gardens that naturalize this re-inhabited urban landscape, and the façades as transparent planes of modular steel and glass panels protected by perforated sheet metal panels to provide shade and privacy for the occupants. All of this creates a dynamic counterpoint between the old and the new, which maintain the autonomy of heavy industrial aesthetics and the delicate refinement of new materials (Wilkinson Eyre, 2018a, 2018b, 2019).

Final Reflections

The historical industrial heritage has acquired different degrees of protection that have allowed it to be preserved, interpreted, and enhanced. In this chapter we have reviewed different strategies for the conversion of warehouses, silos, and gasometers into residential complexes. The great diversity of forms of intervention, which emphasize or conceal, preserve, or modify, link or make independent, etc. the most characteristic elements of the buildings, highlights the need to define transversal policies for safeguarding and rehabilitating these infrastructures, with universal conservation criteria.

In relation to the viability of the intervention, the regeneration of these obsolete industrial areas depends mainly on factors such as: economic considerations, which prioritize balance with the benefit to the community or the environment; urban diversity, optimizing the mix of uses; the ability to solve current problems from the indispensable historical reference; the potential to find signs of collective cultural identity, which compensate for strictly utilitarian aspects; and the richness of the urban landscape, to contribute to the complexity and cohesion of the city.

When considering the element to be preserved, in addition to the values of the building itself, it is necessary to take into account historical, cultural and educational qualities, related to the historical memory of the forms of economic activity carried out in the past, and external spatial values, linked to its urban-landscape contribution. Awareness of the physical context's importance in the process of conservation and rehabilitation of industrial heritage is a fundamental active part of the responsible management of cities in order, as indicated in the Aalborg Charter (1994, pp. 97-98), to undertake interventions in an integrated, holistic, and sustainable approach.

Hence the importance of knowing the origin and contribution of each work to architecture and the current way of life, in order to reach a global awareness that, linked to the concept of historic urban heritage, triggers a broadening of regulations capable of implementing criteria for intervention. Kevin Lynch (1960, p. 119) alluded that we need an environment, not only well organized, but also poetic and symbolic, that addresses individuals and their complex society, their aspirations and historical tradition, the natural setting and the complex movements and functions of the urban world. The city provides a basis for clustering and organizing these meanings and associations, highlighting human activity, and encouraging the formation of memory traces.

The articulation of industrial heritage with history and the city opens new lines of reflection, necessary to define its conservation principles and practices. The state of revision to which this discipline is subjected, responds to a flexible way of understanding heritage as part of a living and dynamic city, in constant need of adaptation to change, and open to new objectives with a focus more integrated and linked to the territory.

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