The construction of Ghent’s textile industry warehouses

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**ABSTRACT:** This paper examines the wide variety of warehouses belonging to the textile industry in Ghent, an important historical harbour city in Belgium, once called the “Manchester of the mainland”. Different types of warehouses were built depending on the characteristics of the materials stored, the location of the warehouse and whether the goods stored would be used in manufacturing or were finished products. The specific architecture, construction and organisation of these warehouses are analysed, with special attention to the reasons for the prevalence of one construction material or another.

**KEYWORDS:** 19th-20th centuries, Ghent Warehouses, Selection Criteria For Construction Materials, Industrial Heritage

1 INTRODUCTION

As essential buildings in national and international trade and industry, urban warehouses were functional buildings able to support very high loads. Previous comparative research has shown the complexity and richness of the warehouses in the historical harbour cities of Antwerp and Brussels in the nineteenth and beginning of the twentieth centuries (De Fossé, Bertels, Wouters 2017). The specific nature of the harbour and trade in these cities gave rise to both identical and different warehouse types. The kind of trade and the nature of the traded products influenced not only the architecture, location, organisation and construction of the warehouses, but also the choice of construction materials. In the nineteenth and twentieth centuries, timber, iron, steel and reinforced concrete were used to construct the warehouses. However, the reasons for the prevalence of one construction material or another has received little attention.

In this paper, the architecture, construction and organisation of warehouses belonging to the textile industry in Ghent are analysed, with special attention to the materials used in their construction. Ghent, which already was a textile centre in the twelfth century (Boone 1992, 57), became at the end of the eighteenth century one of the first industrial cities on the European continent. Because of its cotton industry, it was called the “Manchester of the mainland”. The industrial activities in the city flourished, and from the beginning of the nineteenth century onwards, a great number of warehouses belonging to the cotton and flax industries were constructed. This wide variety of warehouses offers a relevant perspective on the differences and similarities in their architecture and construction. How and to what extent did the nature of the stored goods and specifics of their trade influence the architecture of Ghent’s textile industry warehouses?

For the purpose of this research, a database of existing and demolished warehouses belonging to the textile industry in Ghent was created, based on archival and literature research. Additional information was found in the inventory of immovable heritage of the Flemish Region and the master thesis on nineteenth- and twentieth-century textile warehouses in Ghent by Sarah Ooghe at the Vrije Universiteit Brussel. Historical images and drawings of the warehouses, the textile industry and the harbour were found in the archives of the Museum for Industry, Labour and Textile (MIAT), as well as in the Atlas Goetghebuer in the City Archives of Ghent. The latter is a collection of engravings, drawings and other documents about the history of Ghent by architect Pierre-Jacques Goetghebuer (1788-1866), which was further developed by the City Archives of Ghent. Finally, aerial imagery analysis was used to find still existing...
warehouses and in situ investigations were carried out for the key buildings.

The database includes 74 warehouses, for which over 100 building permits, dating from the 1850s to the early 1930s, were consulted. Only 16 of these are known with certainty to still exist. This paper focuses on the warehouses associated with the city’s two biggest textile products, cotton and flax, and not on the few warehouses of the jute and wool processing companies.

2 GHENT’S TEXTILE INDUSTRY WAREHOUSES

Ghent has a very rich history as a transfer harbour for flax coming from the Flemish hinterland and for cotton coming from America, India, Egypt and other countries. The city was also known for its large number of cotton, flax and – to a far lesser extent – jute and wool processing companies: it was a city of spinning and weaving mills. In total, some 40 textile factories were constructed, owned by over 70 companies, some active until the end of the twentieth century (Baele and De Herdt 1983, 170; Debo 2014, 58). Many were named after their founders, their locations or the harbours where the raw goods were shipped from, like Filature Jules de Hemptinne (1853-1920), Filature du Rabot (1899-1999), N.V. La Nouvelle Orléans (1896-1957) and N.V. Galveston (1910-19).

Much has been written about the rise, evolution, organisation and locations of these companies (Debo 2014; Van den Branden 2016; De Wilde 2007). Johan Baele wrote a concise overview of the construction of the textile mills based on drawings. He mentions that they were “English models in a Ghent interpretation” (1983, 168). A more detailed comparison of factory construction methods in England, and particularly Manchester, and in Ghent – for the latter, these were almost exclusively spinning mills – was written by Guido Deseyn in 1989. He states that, compared with the knowledge and experience that England gained from developing their textile mills between ca. 1780 and the 1840s, the Ghent cotton industry was rather of the “consuming” type: they did not invest in developing new types of factories, but took inspiration from the English models. Ghent companies built their spinning mills using traditional building methods. Deseyn defined four generations of spinning mills, of which the third generation was built from 1875 up to the end of the nineteenth century. In the latter period, there was a general spread of giant spinning mills with a standardised construction, a typology that had long since been introduced in England (Deseyn 1989, 92). It is also during this period that nearly all warehouses were built. However, the warehouses built by Ghent’s textile companies and by trading companies have not previously been analysed.

2.1 A wide variety of warehouses

Of the 74 warehouses identified, six were built by the city, 61 by textile companies involved in the production of yarn and textiles, and seven by companies involved in the trade of cotton and waste materials. Four were built between 1850 and 1875, 11 between 1885 and 1900, and the other 63 between 1900 and the early 1930s. Three building permits were found for warehouses built between 1800 and 1850, though no plans were included. The peak in construction of textile industry warehouses, around the 1900s, corresponds with the vertical expansion of the textile industry during the last quarter of the nineteenth century. Companies integrated more and more stages of production into their operations and therefore the need for separate storage facilities rose (Nijhof 1991, 179). The warehouses were mostly located at large factory sites in the north of Ghent, next to the waterways and the harbour. This was an ideal location for the textile industry since the water could be used in production processes and the waterways for the transportation of the raw materials and finished products. It was in the 1860s, after the demolition of the city walls and the abolition of the octroi – tax payed on goods when bringing them inside the city walls –, that the textile industry moved to the north, in search of land to build new factories, with enough space for storage and better accessibility for national and international trade than the older factories had in the inner city (Debo 2014, 121). Also trading companies located their warehouses in the north.

Different types of warehouses may be distinguished, depending on the kinds of materials stored, whether the goods were raw materials or finished products, and the location of the warehouse itself. Although many textile industry warehouses were found in Ghent, Manchester had far more. Already in the early 1800s, Manchester dominated in its stock of large and small warehouses (McNeil and George 1997). The latter city had a more diverse collection of warehouses, of which only some types were also found in Ghent.

Warehouse types will be discussed in the order they were used in successive phases in textile manufacturing: from storage of raw cotton and flax when it arrived in Ghent, until the storage of the finished products.

2.2 Characteristics of the stored goods

The storage requirements for raw cotton, flax, yarn and textiles are very different. All had to be protected from theft, the weather and direct sunlight to avoid discoloration, and because these materials were very flammable, special attention was required regarding the fire safety of the warehouses. Yarn and textiles were stored in bins, on racks or on timber pallets to keep them dry and well organised, and it was im-
portant to provide enough light to evaluate and select the manufactured goods.

Raw cotton and flax, on the other hand, had more specific and delicate storage requirements. Two sources were found that specify the requirements for the storage of raw cotton, both concerning a cotton-shipping warehouse in Antwerp built in the early 1870s, Les Magasins Argentins. This warehouse is exceptionally well adapted to store this valuable commodity. It is mentioned that the discoloration of the cotton is a concern, as well as the relative humidity of the storage place. Since this raw material was shipped from very humid countries and was sold by the kilo, it should not lose weight while being stored in the warehouse. It was mandatory to maintain a relative humidity of 8.5%. It is further mentioned that because Les Magasins Argentins was erected on top of the recently demolished city walls, there was still much groundwater left, which made the floor a little damp. The floor itself was constructed with red, porous bricks (Bakkers 1961). A second source explains that when the cotton was too dry, open water vats were placed in between the cotton bales. When the cotton was too wet, vats with chalk were provided to absorb the humidity in the air, to avoid rot (Eeckelaert 2013, 60).

No sources were found concerning the storage of flax; however, based on the architecture of the warehouses, as will be mentioned later, it is assumed that it needed to be protected from rotting and had to be stored in dry places, but still with a relative humidity of 12% (Dijkmeijer 1944, 58).

3 CLOSED COTTON HARBOUR WAREHOUSES

On arrival in the harbour, the cotton was unloaded from the ships, inspected, weighed and sorted by quality before being stored temporarily under shed warehouses on the docks. These sheds offered protection against the weather, dirt and theft. Shortly after, the cotton was transported by steam trains or by inland vessels over Ghent’s waterways to the cotton processing companies and to the trading companies (De Bosschere 2006, 18).

The most prominent warehouses of this type were built between 1885 and 1892 next to the recently constructed Voorhaven (1880-86) of Ghent. (Fig. 1) The Voorhaven was a new outer harbour on the Ghent-Terneuzen canal that the city of Ghent built to meet the increasing demand for cotton from the textile industry. These warehouses, commissioned by the city, were constructed by city engineer Emile Braun (1849-1927), who was also in charge of the construction of the harbour infrastructure for the Voorhaven. The shed warehouses were constructed 10 m from the canal and 20 m from each other. Five of them, sheds 20 to 25, were closed buildings of two levels and 100 m by 40 m. Three of them also had semi-basements.

The sixth hangar, shed 26, was open, had only one level and measured 230 m by 23 m. The overhanging roofs kept the cotton dry during loading and unloading, and steam trains could pass underneath the last bay. Each hangar had six lifts and two cast iron staircases.

The warehouses feature two rows of steel Polonceau trusses, each with a span of 20 m, covered by a zinc roof. These are supported by a steel structure of columns and a combination of beams and trusses. The first floor consists of corrugated steel sheets on which concrete was poured. The basement consists of brick vaults between steel beams, supported by brick walls and alternately by steel and brick columns, and has a concrete foundation. Outer walls of galvanized corrugated steel sheets were provided to protect the cotton bales from the weather. Calculations show that the first floor can support an imposed load of 1500 kg/m², which corresponds to the requirements for cotton storage (Verhaeghe 2008, 12). The J. Cockerill Company from Seraing built the metal structure of the warehouses, and to reduce costs, they salvaged construction elements from buildings they erected for the world exhibition in Antwerp in 1885 and used them in five of the six warehouses (Stad Gent 1993, 327).

In 1911-12, due to the increasing demand for cotton, the city built four new warehouses in between the existing ones. (Fig. 2) The two two-level warehouses measured some 26 by 42 m and the two three-level warehouses some 36 by 44 m. They were designed in reinforced concrete and fitted between the existing warehouses. Figure 1. Section of the Voorhaven and warehouses (1885-1892) from 1886, illustrating the Ghent’s harbour benefits: cotton was put in storage directly from ships before being transported by train (GCA, AG L158/24)

Figure 2. The warehouses from 1911-12 were designed in reinforced concrete and fitted between the existing warehouses.
reinforced concrete by city engineer Victor Compijn for an imposed load of 1500 kg/m² on the first and 800 kg/m² on the second levels. The warehouses had the same floor heights as the adjacent existing warehouses, and the columns were placed on the same grid. The two in the middle were a level higher than the existing ones. The roof was inclined towards the sides where drains were built between the warehouses. The new warehouses did not have an overhanging roof, as the overhanging part of the roofs of the existing warehouses had already been removed, probably because of the new harbour cranes. The façades were closed by means of corrugated steel sheets. The closed upper part of the façade on the ground level was executed in reinforced concrete (BAH, 076 ifa 1506/4: Building specifications n°1250, 1911 and 076 ifa 1574/3: Building specifications n°1352, 1912).

The early use of both steel and reinforced concrete for this type of shed warehouse is probably the result of the importance the city attached to strengthening its position as an international, progressive cotton harbour. Using the latest materials, in well-developed facilities for handling cotton, put the city in the forefront. As will be seen further on, this contrasted with the textile industry of Ghent, which continued to use traditional construction methods for its buildings. The reinforced concrete warehouses and two steel warehouses have been demolished.

4 COTTON-SHIPPING WAREHOUSES: AGENCE MARITIME MINNE WAREHOUSE

After cotton was unloaded in the shed warehouses, it was transported from the harbour to shipping warehouses of trading companies and to warehouses of processing companies. In Ghent, one surviving example of the first type was found: the cotton-shipping warehouse of the Agence Maritime Minne, located at the Port Arthurlaan in an industrial neighbourhood next to the canal (GCA, G12/1914/B/30). (Fig. 3) This warehouse was constructed in 1914 by Albert (1881-?) & Oscar Van de Voorde (1871-1938) and commissioned by Maurice De Smet de Naeyer (1862-1941). The latter was the founder of the Agence Maritime Minne (1874), a famous shipping agency. He advocated the necessity of harbour expansions and was, together with Emile Braun, the driving force behind the construction of the Voorhaven. Both had already worked together to bring the World Exhibition to Ghent in 1913, for which Oscar Van de Voorde was the chief architect and Maurice De Smet de Naeyer one of the directors (D’hondt 2014).

The warehouse is a typical example of a shipping warehouse, which was used to store imported cotton prior to its distribution in Ghent or transport by train or boat to the hinterland. The building, with 9 by 6 bays, has five floors, including a semi-basement, and had a loading dock to facilitate loading and unloading from lorries. The staircases and lifts were grouped in two towers, one at each end of the warehouse. The towers have big gates on each level with hoists at the top of their façades. Each level was divided into three compartments by brick walls, to prevent the spread of fire. The warehouse has a simple brick façade with a tight layout of coupled shuttered windows and loading docks. To protect the cotton from direct sunlight, the windows were often closed. (Fig. 4) The load-bearing structure consists of reinforced concrete columns, beams in one direction and vaulted concrete floors. This new construction material had already been used for the construction of similar warehouses in Belgium ten years earlier (Dewaide 2017). Reinforced concrete only began to be used widely in Ghent after the First World War, and then for industrial constructions (Deseyn 1989, 178), so this early use of reinforced concrete for an entire large warehouse was rather exceptional. It is probably because of the progressiveness and the pragmatic approach of Maurice De Smet de Naeyer, his international connections and the know-how of the accomplished architects, that reinforced concrete was chosen. Meanwhile, the cotton and flax processing companies continued to use traditional construction methods for their warehouses.

Figure 3. The shipping warehouse of the Agence Maritime Minne was the first Ghent warehouse of this size built in reinforced concrete © Zeno Dewaide
5 RAW COTTON AND FLAX WAREHOUSES OF THE GHENT’S SPINNING COMPANIES

In addition to being transported from the harbour to the warehouses of the trading companies, cotton was also transported to warehouses of the processing companies. Flax, which was directly imported from the hinterland by waterways, went directly to factories. Both raw materials were stored in the same type of warehouse, located next to the spinning mills, before being processed. Although most of these warehouses were located at the factory site, one was found in the city centre and will be discussed separately.

5.1 At the factory site

In total, 16 warehouses were found next to spinning mills for storing raw cotton and flax bales: six for cotton and ten for flax. They were constructed between 1864 and 1924. Before this, the raw cotton was stored in the basement of the spinning mills, probably to ensure the right humidity level (Deseyn 1989, 86). Possibly the spinning companies continued to store the cotton both in the basements and in the additional warehouses. These warehouses are long, closed, one-level buildings with big gates. They could be up to 7 m high, 72 m long and they have roof spans of up to 10 m. Because of the abundance of space on and around the factory sites, it was easier and cheaper to build large one-level warehouses than construct warehouses of several floors requiring robust, high load-bearing structures. To avoid discoloration of the cotton and the flax, the warehouses had no windows or small windows placed high in the walls or in the top of the roof, preferably orientated to the north.

The cotton bales were compressed in the country of origin, wrapped in jute bags and, later in the twentieth century, clamped with iron to make them as compact as possible (De Sonnaville et al. 1948, 163). Flax too was compressed in tight bales. Hence, it was possible to pile them meters high, as can be seen in pictures of that period from Ghent, Antwerp and Manchester, which explains the great heights of the warehouses (McNeil 1997, 5). In Manchester, lifting was done with lifting equipment, while in Antwerp, it was done by manual labour. (Fig. 5) So far, it is unknown whether lifting equipment was used in Ghent. Two building permits show rail tracks for wagons running through two warehouses, one for flax, the other for cotton (GCA, G12/1910/Q/9; G12/1911/R/13).

There was one big difference between the cotton and flax warehouses. To ensure a correct degree of humidity, cotton bales were stored directly on the cobblestones, as is shown in photographs of stored cotton bales from, for example, Ghent, Antwerp and Manchester. Several one-level warehouses for cotton even had a floor some 90 cm below the street level. However, flax required dry conditions. For at least three flax warehouses, it is known that the bales were stored on a timber floor made of beams and planks built on top of the ground floor. This was done to ensure that the flax remained dry and to avoid rotting (CGA, G12/1909/A/55). (Fig. 6)

As both cotton and flax were very flammable materials, the fire safety of warehouses was of the utmost importance. Warehouses had brick walls, and if the buildings were very long or if they were positioned next to each other, additional brick walls were built in between the warehouses to divide the spaces and avoid the spread of fire. These firewalls occasionally were extended through the roof. The brick external walls supported timber or metal roof spans. So far, no reason could be found for the prevalence of one construction material or another, giving the impression that the choice was determined by the personal preferences and budgets of the companies and the architects-constructors.

It is worth noting that at least four warehouses for the storage of cotton had a special kind of openings in
their outer brick walls. From a height of about 3 m, timber lattices or perforated claustra-masonry were provided, ensuring a constant air circulation.

Of the raw cotton and flax warehouses, eight still exist today, located on three different sites: four for cotton (1896-1910) and four for flax, the latter constructed one next to the other (1864-1913).

5.2 In the city centre: flax warehouse La Lys

There is one known case of a flax spinning factory that built a warehouse in a newly rehabilitated neighbourhood in the centre of Ghent. The neighbourhood was characterised by a mix of functions, typical for the nineteenth century (Onroerend Erfgoed 1998). La Société Linière La Lys (1838-1960) may have opted for this location because of the nearby Flax Market and for its good accessibility for the flax merchants coming from the Flemish hinterland by boat and cart. In any case, in this prominent location, the company could put its wealth on display.

Structurally, the building is a typical warehouse for the storage of raw materials: a hangar of 12.5 m by 21 m. Its brick walls support timber roof spans with metal rods connected to the king post. However, the façade features a Flemish Renaissance style and windows on two levels so it would fit into the street-scene. In the building permit, the city requests that the façade be raised to 10.7 m, probably to maintain a more uniform street wall (GCA, G12/1895/N/1). To keep the flax as dry as possible, the warehouse had a central corridor flanked on both sides by floors raised several centimetres, built of timber beams and planks. (Fig. 7)

6 YARN AND TEXTILE WAREHOUSES

6.1 Yarn and textile warehouses at the factories

It must be noted that many of the Ghent warehouses are not discussed in this paper, as their original role in the factory is unknown. To know for sure what was stored in these warehouses, further detailed research in the private archives of the companies is necessary. Nevertheless, it is assumed that at least some of these warehouses were used to store products of the mills: yarn and textiles. These warehouses did not display the plain architecture of the cotton and flax warehouses, but had ornamented façades, often with big windows or north-orientated shed roofs to bring in more light. In some cases, even the iron columns were ornamented (GCA, G12/1931/N/3). (Fig. 8)
In total, 13 warehouses of this type were found, mostly two-levels high, sometimes combined with a basement that was probably used to store raw cotton. They often very much resemble the upper floors of multi-storey mills, as does the still-existing, assumed textile warehouse of Florida S.A. from 1912. (Fig. 9) Indeed, for both kinds of buildings it was important to have enough indirect light to inspect the products. Photographs of stored textile rolls on timber pallets, and yarn in big racks in well-lit rooms under the roof, in textile factories tend to confirm this theory. (Fig. 10) Until the beginning of the 1930s, these buildings were constructed almost solely with traditional building materials, consisting of metal columns, metal beams, brick vaults and timber or metal roof trusses. Since in the 1910s and 20s reinforced concrete was already used on a large scale for the construction of warehouses in other Belgian cities, the use of traditional construction materials in Ghent tends to confirm again the traditional mind-set of the textile companies. Though, it is necessary to investigate how the cost-effectiveness of the different construction materials influenced the construction of these warehouses in Ghent.

6.2 Selling warehouses: textile warehouse Filature et Tissage Réunis

Two warehouses for storing and selling textiles were located, one of which still exists today. The surviving example is located next to the canal at the Groendreef (GCA, G12/1924/A/98). It represents the last of the types of warehouse connected to the textile industry in Ghent: warehouses for the display of textiles for sale. The warehouse was built in 1924 by the Filature et Tissage Réunis S.A. to store and sell the textiles produced in their different factories. Although it is the office building next to it that was given a monumental lightwell and a more elaborately ornamented façade, the warehouse still has windows nearly 3 m high on its four facades and was without doubt meant to be visited by merchants.

Figure 10. Textile stored in the well-lit factory hall of De Hemptinne © MIAT

Constructed by Ferdinand Dierkens (1856-1936) in an Art Deco style, the warehouse features three levels and a basement and has cast iron columns supporting steel beams and brick vaulted floors. Additional cast iron columns are hidden inside the outer brick walls, invisibly supporting the steel beams. The application of these construction materials for warehouses in 1924 is not exceptional, though for warehouses of this size the use of reinforced concrete had become standard in other Belgian cities, such as Antwerp and Brussels. The use of the latest architectural styles for the composition of the facades was typical for the interwar period. Again, the traditional mindset of the textile companies will certainly have played a role in the choice for these traditional construction materials. Still, the modern style and richly ornamented façade by Dierkens is exceptional. (Fig. 11)

7 CONCLUSION

This paper analyses cotton, flax, yarn and textile warehouses connected to the textile industry and trade in Ghent from the second half of the nineteenth century until the early 1930s. Ghent’s industrial activities and position in the world market gave rise to the construction of warehouses with very specific architecture and construction. Different types of warehouses have been defined, based on the stored materials, whether the goods were further processed or sold, and the location of the warehouse itself. These factors not only influenced the architecture and organisation of the warehouses, but also the construction materials used to build them.

Cotton, flax, yarn and textile warehouses located at the factory sites of the manufacturing companies each had a very different architecture, though they were constructed with traditional building materials even until the early 1930s. This preference was also seen in the construction of the spinning and weaving mills, emphasizing the traditional mindset of the textile companies. Depending on the nature of the stored
goods, the warehouses had particular characteristics: cotton was stored directly on cobblestone floors to ensure a correct degree of humidity, flax on timber floors to keep it dry, and yarn and textile warehouses needed well-lit spaces to allow for proper inspection and selection of goods.

Cotton warehouses owned by the city or by trading companies next to the docks and the waterways showed a very different, highly functional architecture and construction. The progressive and pragmatic approach of their owners and the involved architects and engineers gave rise to the early use of steel in Belgium and relatively early use of reinforced concrete in Ghent.

Elucidating the reasoning behind the architecture, organisation and selected construction materials of Ghent’s textile industry warehouses, sheds light on features that transcend place, thereby contributing to the international research on warehouses. A better understanding of these motives reveals new insights into the history of these warehouses and will further contribute to their preservation and respectful adaptive reuse.

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