BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
FACULTY OF ARCHITECTURE
DEPARTMENT OF ARCHITECTURAL HISTORY AND LANDMARK CONSERVATION

MARTIN PILSITZ
DIPL.-ING./ARCHITECT

THE ARCHITECTURAL DEVELOPMENT OF HISTORICAL FACTORY BUILDINGS – SPECIFICALLY BREWERIES – IN THE AREA OF PRESENT-DAY BUDAPEST BETWEEN 1815 AND 1915

THESES
INAUGURAL PhD Dissertation

SUPERVISOR: MIKLÓS KALMÁR PhD

BUDAPEST, 2015
I. Starting point of the investigation

During the period under investigation, production places in Budapest developed from the traditional workshops of the initial stage to the modern industrial plants of the early 20th century. The investigation period represents merely an interval in a broader, long-term process of development, which is still in progress and will result, at some time in the future, in emission-free factories. It should be noted that until now historical factory buildings in Budapest have never been the subject of systematic academic research with respect to their architecture and their architectural history. Yet these buildings are comparable with churches and mansions as integral parts of the cultural heritage of the city.

I.1. Scope of the PhD dissertation

The research topic is extensive, and this justified a focus on the architectural development of a single industrial sector. The rationale for this decision is that the dominance of agriculture in the Hungarian economy, coupled with the location advantages of Pest-Buda, led, in the first place, to the emergence of a food and beverage industry. Within the food and beverage industry, brewing was the first industry to switch from craft production to industrial modes of production. This explains why the transformation from non-specific workshop to highly specific brewery production began earlier than in other sectors, whereby brewery buildings served as a model for other industries.

The period under investigation (1815-1915) was not chosen arbitrarily. The start of the process was characterized by the establishment of city centre breweries, which, from 1815 onwards, gradually replaced the architecturally non-specific buildings of the household breweries, thereby setting in motion a process of ongoing structural change. The dynamic architectural development culminated, in the late 19th century, in the construction of the major industrial breweries. The end of this period of undisturbed development came with the outbreak of World War I and the resulting shortage economy, which is to be the subject of a separate investigation. In the late 19th and early 20th centuries, Budapest became Hungary’s most important industrial centre. This means the development of historical buildings and factory buildings can be explored within the context of the development of an industrial city in a defined geographical area.

II. Objectives

To establish an explanatory model for the genesis of historical brewery production, doing so from the perspective of an architectural historian and based on temporal distance and with the aim of categorising industrial development in the city. This type of building is difficult to classify on the basis of purely visual observations. Therefore, it was necessary to explore a large number of factors impacting on the evolution of spatial use. These were primarily social, cultural, technical and organizational factors. The investigation therefore amounts to more than retrospective analysis and can be viewed as an analysis of building types with relevance for today.
III. Sources and Research Methods

III.1. Sources

The initial idea was that the historical factories could themselves serve as sources for the research. In the course of the research, however, it became apparent that the vast majority of production buildings no longer exist. Moreover, even the building plans or other written documents are unavailable or inaccessible. The extant planning documents thus constitute the main sources for the investigation. In addition, written documents (contracts, price quotes, buildings surveys, correspondence, notices in newspapers and legal texts) contain information about the construction process. The literature (Hungarian and international) does not offer conclusive scientific results concerning the topic of investigation.

III.2. Research methods

As a prerequisite for the systematic research, the plans belonging to the Dreher company and documents available at the Budapest City Archives were used to compile a catalogue of designs relating to the historical breweries and malt houses. Over a period of six months, the basis for a scientific investigation of the structural developments and architectural trends was created. The design archive is also available on DVD and can be used as a basis for further research. In dealing with the sources, the following considerations were made:

The work presented:
- is not exclusively retrospective but is also analytical
- is not exclusively descriptive but also explores causal relationships
- gathers together, orders, analyses and interprets the factors influencing construction development
- makes use of synergies with other fields of study for the purpose of interdisciplinary cooperation (e.g. industrial anthropology, ergonomics)
- promotes a perception of architecture that goes beyond the purely visual.

IV. Structure of the dissertation

The emergence of this type of building cannot be explained by a single cause. That would be a gross simplification. The investigation was therefore divided into relevant specific topics, from which a hierarchy of considerations (production space, individual buildings, ensembles, site development, and industrial urban development) can be derived.

A. Main body of text

The individual chapters describe developments pertaining to the various architectural innovation phases, doing so in chronological order:
1. Household breweries (until 1815), Chapter 1.
2. City centre brewery plants (1815-1845), Chapter 2.
3. Early industrial breweries (1845-1870), Chapter 3.
4. Major industrial breweries (from 1870), Chapter 4.
In addition, the main part also covers the following broad topics:

**Spatial construction processes** (Chapter 5)
The spatial construction processes for production halls in mechanical engineering and the brewing industry are compared and contrasted. Despite shared design principles, the results are very different.

**Industrial urban development** (Chapter 6)
Chapter 6 deals with the following topics:
- Spatial and structural requirements as the basis for the development of industrial sites in Pest
- Axes of urban development in Pest
- Movement of industry from the inner city to the periphery
- External effects of industrial construction as a function of location and design
- Building structures on industrial premises
- The relationship between natural landscapes, cultural landscapes, industrial landscapes and renatured landscapes
- Transformation of agricultural land into an industrial landscape, based on the example of the mono-industrial area of Köbánya

**Architectural transfer** (Chapter 7)
Chapter 7 analyses the process of architectural transfer between Germany and Hungary. The result was the mutual exchange of building culture.

**Landmark conservation** (Chapter 8)
This chapter examines, among other things, the role of historical factory buildings as bearers of identity.

**Historical industrial buildings as precursors of 20th century architecture** (Chapter 9)
Around the turn of the century, industrial construction succeeded in creating a unity out of the factors of function, construction and form. The resultant forms of architectural expression were so convincing that they were transferred to other areas of construction.

**B. Appendix**
First, the economic and social conditions are explored (Chapter 10). With a view to revealing the specific functions of breweries and malt houses, the main features of the brewing process are first noted (Chapter 11). The findings are then transmitted to the spatial mapping in the production facilities (malt houses, mash houses, cellars) (Chapter 12). There follow the case studies on the individual phases of innovation (Chapter 13, Chapter 14, Chapter 15).

**C. Annex**
Using definitions of the terminology related to historical production facilities, a series of communicative term are established (Chapter 16). There follows a discussion of the construction of a
design archive (Chapter 17). This is followed by a documentary section (Chapters 17 and 18). The documentary section consists of two design catalogues.

V. Scientific findings of the dissertation

1. Thesis. For the façades of historical plant buildings, a change in the potential function from identity carrier for a company to an identity carrier for today's society can be seen [2, 6, 13]

1.1. Thesis. Based on my investigation, I have found that the facades of historical factories, through the application of aestheticising design principles, went beyond the commercial and technical function of a building even during the productive phase of the production site. Facades tended to be used by companies as a means to relay to the outside world the semantic message of tradition, trustworthiness and solidity, whereby they became identity carriers of the company

Although the facades of historical factories were determined initially on the basis of a largely aesthetic design (Mayerffy, 1815), over time the form came to be determined by technical factors (Haggenmacher, 1914). This process was triggered by the introduction of new production techniques and the continuous increase in mechanization, as well as the introduction of decentralized energy (steam engines) and new forms of business organization. As a result of these developments, technical constructions and elements increasingly determined facade design. Parallel to this objectification, the – mostly middle-class – entrepreneurs usually wanted the main façade to be a show façade, whereby an historicist design was linked with such confidence-building attributes as tradition and soundness, also with reference to the manufactured product (For example: the Carl Rohrbacher Brewery. Kőbánya, designed by Anton Diescher, 1845)

1.2. Thesis. Based on my investigation, I have found that the facades of disused factories can function as historical monuments (landmarks) today, and as such they will be identity carriers for society, as long as the following criteria are met:

When, over and beyond the object of the facade of an industrial building as a pure shell, the design principles (type, rank, centering) are transformed into an aesthetic effect and then extended by way of contemplation, the building takes on a significance that exceeds its creation in the past, whereby the landmark function of the production facilities should be recognised.

Historical factory buildings can take on the role of a bridge between the past and the present, thereby underlining societal continuity, which forms a substantial part of cultural identification. The object and purpose of preservation and conservation is rooted in the need to preserve cultural identification. Individual factory facades can serve as orientation points in a city or a city district. This does not mean orientation solely in a geographical sense, but rather it can also refer to historical and social contexts. As a first step, there must be a change in people’s awareness and visual perception of the building. In practical terms, such a shift in consciousness can be set in motion by a discussion of these old production facilities and through their systematic documentation using scientific methods. It can be assumed that the facade of an industrial building will function as a bearer of identity in a special way, because, even after the factory has been closed, it continues to influence the public image of the urban area. In this way, the facade of an industrial building can be attributed to its own aesthetic value. From these contexts, a possible definition can be formulated concerning the
circumstances in which the facade of an industrial building should be recognised as a landmark.

2. Thesis. The historical breweries provided an impetus for industrial urban development [7, 15]

2.1. At the beginning of period under investigation (1815), the locations of the two breweries Mayerffy and Petz constituted the diametrical endpoints of the expansion area of the breweries in Pest, becoming, in the course of time, the geographical starting points for industrial development along the industrial axes of Vaci Road and Soroksári Road.

The locations of the Mayerffy and Petz breweries, both founded in 1815, became over time the geographical starting points for future industrial development along two axes – Váci Road and Soroksári Road. Both streets run parallel to the Danube and constitute northern and southern supply routes between the city of Pest and the provincial areas of the country. Access to hops and malt was thus ensured.

2.2. Around 1845, there was a shift in the location of the early industrial breweries from central Pest to what was then the periphery of the urban area, whereby the brewing industry provided, for a second time, an impetus for the city's subsequent industrial development.

From around 1845, the breweries began shifting their locations from central Pest to Kőbánya, and thus to the periphery of the urban area. A trigger for this development was technical progress in drilling deep wells, which meant the industry was no longer reliant on water from the Danube. Moreover, Kőbánya, with its system of cellars, was an ideal location for fermentation and storage. It was only several decades later, from 1870 onwards, that the other major industries, including the metal processing industry, moved from the centre of the city to its periphery.

3. Thesis. The establishment of breweries in Kőbánya transformed what had been an agrarian cultural landscape into an industrial landscape [7, 9, 11. 15]

With the relocation of the brewery industry to the suburb of Kőbánya, buildings were constructed in what had been a traditional wine-growing area. An agrarian cultural landscape was thus transformed into an industrial landscape. Land use was now intensive rather than extensive as it had been before.

The shift in location to the periphery entailed the take-over of a landscape by industry. As part of this process, the brewery industry penetrated into a wine-growing area, thereby transforming an agrarian cultural landscape into an industrial landscape. Human impact meant that land use was now intensive rather than extensive as before. The visual elements of industrialisation (factory buildings and infrastructure) became formative and determining features of the landscape. Kőbánya, with its old brewery plants, represents an "architectural archive" in a formerly mono-industrial area. It offers an opportunity to study and document regional industrialization patterns. The insights gained can be used to establish correlations...
and relationships that may prove useful for future regional planning. This applies in particular to the sustainable utilisation of unused urban areas.

4. Thesis. As regards the construction of the major industrial breweries, there is an observable shift from static-linear spatial systems to more flexible systems of construction [7, 15]

In place of breweries in single buildings with process areas arranged statically-linearly according to the workflow, we observe the development of large structural buildings, offering a great deal of flexibility in terms of arrangement.

In the case of the major industrial breweries, the former designs, with their strictly linear arrangements (malting kiln, mash house, cellar), proved to be insufficiently adaptable. The individual production areas assumed structural dimensions that no longer made it sensible to insist on functional links between the various parts of the building in a single compact building. In addition to the functional aspects, safety and stability issues served as further triggers for changes in architectural design. With the increase in the size of production buildings, the building load became too great for the area, which was weakened by the extensive cellar system under Kőbánya. As a consequence, the spatial relationships that had taken the form of a block system were gradually transformed into linked production buildings placed in a free arrangement. As a result of this fundamental change, the brewery plants switched from being structurally closed and all-encompassing systems to flexible systems.

5. Thesis. The increase in the structural complexity of the breweries led, in the course of time, to the development of urban structures on the brewery premises [7, 9, 11, 15]

In addition to the large number of production facilities, the period saw the expansion of transport infrastructure (industrial rail tracks as well as streets and roads), social facilities (residential buildings, cafeterias, locker rooms), as well as buildings pertaining to the power supply (engine and boiler rooms). In this way, the brewery premises assumed development patterns with high complexity, reminiscent of urban structures.

In the case of the breweries in the suburb of Kőbánya, the production areas became architecturally more visible after the demise of the closed systems of single buildings. At the same time, the functional links between the production buildings were retained. Parallel to this development, the brewery premises were the scene of ongoing construction and alteration work, giving rise to buildings that were reminiscent of urban structures in terms of their diversity and complexity.
6. Thesis. Compared with the breweries, the machinery plants show different trends with regard to the choice of location, the construction history of the sites, and spatial development [4, 5, 10, 11]

6.1. Unlike in the case of the breweries, the choice of location for machinery factories was related to the level of development of infrastructure in the city.

In the second third of the 19th century, a close integration arose between living and working. Owing to the production processes, the operations of the metallurgy industry necessarily caused environmental pollution – noise and emissions. In view of the limited size of the sites, local businesses – mostly small businesses – were unable to expand into industrial plants. The construction of a mass transit system meant that factories could be built at some distance from the homes of workers. In consequence, industrial sites – particularly in the metalworking and mechanical engineering sectors – arose at the edge of the city. Accordingly, the locations of the industrial areas (particularly along the development axes of Váci Road and Soroksári Road) were directly linked with the development of mass transportation in the city. Unlike the breweries, which had 30-50 employees, the major engineering factories had large numbers of workers (100-4000), who commuted between home and work. Transport speed and mobility costs were the two main determinants of the mode of transport and, relatedly, the expansion of the area of human settlement. To minimize the time required for the supply and delivery of energy, raw materials and finished products, an industrial railway system was established in Budapest. Overall, the outsourcing of production from the city centre to industrial zones on the periphery resulted in an increase in the concentration of infrastructure within the city. At the same time, a positive mutual interaction arose between industrial and infrastructure development. Such development led, almost inevitably, to further cumulative effects, as locomotives, rail wagons and rail track were manufactured by factories in the city, which could then use the new transport means for the supply and delivery of raw materials and finished products. The resulting synergies further strengthened industrial development in the city. As a consequence, factories were established which, by virtue of their structural dimensions and characteristic facades, exerted a lasting impact on the visual urban environment.

6.2. Owing to the specific development pattern of the metal processing workshops and their transformation into engineering factories, supplementary building structures were erected on commercial premises

In Budapest the owners of machinery workshops in the metalworking sector often worked in the workshops, using their private capital to gradually expand operations. This model of development was reflected in the construction of supplementary buildings and the expansion of existing buildings on the sites. The breweries underwent a different mode of development: the establishment of a brewery required a large initial capital investment, as buildings of significant size were needed for each stage of production from the very beginning. Moreover, most of the required production technology had to be imported from abroad and was thus extremely expensive.
6.3. The spatial development process for the historical breweries differed from that pertaining to machinery factories. This was the result of the specific production processes in the two sectors and the need to optimize such processes. Indeed, the spatial development process of a particular branch of industry is manifested in its architecture.

The manufacturing process and the specific technology, acting in combination with the operational organization, define the functional sequences that were then reflected in the three-dimensional building structures of the factories. As a consequence, the production of individual industries was reflected in different building types, despite the use of the same planning principles with regard to their spatial development. While the spatial development processes pertaining to breweries and malt houses in Budapest led, in the period 1815-1915, to the establishment of highly specific production areas with predominantly vertical production processes, an opposite trend may be observed in the machinery sector.

In the case of machinery factories, the trend was for the construction of single-storey buildings (horizontal production), while there was an ongoing expansion of the support spacing and thus the roof span. The result was the development of non-specific production facilities that could be easily expanded. These "general" one-storey facilities guaranteed maximum spatial flexibility. In the machinery sector, the flexibility of the production areas was of fundamental importance, as the development and replacement intervals of the production machinery (their usage cycle) was much shorter than that of the buildings in which the machinery was placed. At the same time, the machinery could be easily replaced and adapted to the manufacture of a different product.

7. Thesis. In the case of brewery architecture, the architectural transfer between Germany and Hungary should be viewed as a mutual exchange mechanism [5, 9, 13, 14, 17]

7.1. The new building of the First Hungarian Brewery Company (Első Magyar Rézsvény Sörződe) in Kőbánya served as a prototype for breweries in the style of Bavarian neo-baroque castle architecture. Breweries in this style were subsequently built by the Bavarian designers Ganzenmüller and Rank in large numbers.

The Association of Bavarian Engineers and Architects, which formed around the designers Ganzenmüller and Rank, was commissioned to design a new building for the First Hungarian Brewery Company. The design was elaborated in 1908/09, with construction work beginning in 1910. In the German literature it is claimed that the brewery Gräflich Ernst Moy’sche in Freising was the first joint project of the Association. In fact, however, a design for the brewery in Freising was drafted in 1911/12 – after the construction of the brewery in Kőbánya. This shows that the brewery building of the First Hungarian Brewery Company in Kőbánya (and not the brewery in Freising) served as the prototype for breweries built in Bavaria in the neo-baroque castle style favoured by the designers Ganzenmüller and Rank.

Thus, regarding the neo-baroque breweries designed by Theodor Ganzenmüller and Franz Rank, the following chronology can be established for the period under investigation:

<table>
<thead>
<tr>
<th>Year</th>
<th>Brewery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1908/09</td>
<td>Brewery building of the First Hungarian Brewery Company in Kőbánya</td>
</tr>
<tr>
<td>1911/12</td>
<td>Brewery building of the Gräflich Ernst von Moy’sche Brewery in Freising</td>
</tr>
<tr>
<td>1912/13</td>
<td>Brewery building in Schweinfurt</td>
</tr>
<tr>
<td>1912/13</td>
<td>Castle Brewery Hacklberg in Passau</td>
</tr>
</tbody>
</table>
7.2. The architectural transfer pertaining to the brewery building of the First Hungarian Brewery Company is evidence of a complex mutual exchange of knowledge and expertise between Germany and Hungary

Ganzenmüller and Rank were commissioned to design the brewery, which was their first joint project. The professional knowledge of the architects Dezső Hütlt, István Puscher and Emil Schimanek influenced the final design and realisation of the project in Kőbánya. It can be supposed that the experience and knowledge gained during the project were put to use in subsequent brewery construction projects in Bavaria. Rather than being a one-way street, the process amounted to architectural transfer in the form of the mutual exchange of knowledge and expertise between Germany and Hungary. This type of co-operation between German and Hungarian architects is indicative of the basic requirements for architectural transfer: both source and target areas (town-region, in this case: Budapest and Bavaria) must dispose of developed structures in commerce and industry for the practical realisation of the designs. A further prerequisite for quality construction and design in both areas was the availability of well-trained engineers, architects and skilled workers in both countries.

8. Thesis. Historical factory buildings should be regarded as an intellectual resource. [5, 9, 11]

The buildings can be viewed as representing an archive of building functions and construction techniques relating to the period, whereby the architecture and construction history of such requires research and documentation. The lessons learned may serve, at a later date, as an intellectual resource, particular in societies facing possible future shortages in fossil fuels.

1. Malt houses (Topic: process bionics)
The applied biosciences are relevant for this subject, including research on the links between construction techniques and the living world. The research results can lead to a cross-linking between the biological and engineering sciences. In bionics, biological principles are transferred to (building) technology. The construction and physical forms of the design of historical malt houses constitute an early example of sustainable architectural design.

2. The cellar system in Kőbánya (Topic: energy-efficient buildings for cold storage)
These low-tech buildings were formed in a reciprocal construction process (erosion) and were used by the breweries for, among other things, cold storage. Natural ice was the exclusive cooling medium. By understanding and engaging with the mindset that led to the design of these buildings, contemporary architects and engineers could actively contribute to current efforts to tackle environmental and energy problems. Viewed from this vantage-point, these historical buildings with their simple technical equipment are very topical buildings.

9. Thesis. The development of the historical breweries in Budapest can be divided into several phases of structural innovation [8, 9, 10, 12, 15]

On the basis of the distinct floor plans, spatial and building types, the overall development of the breweries in Budapest can be divided into the following phases of structural innovation:
1. Household breweries (until 1815)
2. City centre brewery plants (1815-1845)
3. Early industrial breweries (1845-1870)
4. Major industrial breweries (1870-1915)

**Household breweries (until 1815)**
The early breweries, which were initially housed in residential buildings, monasteries and castles, comprised undifferentiated architectural spaces. From the 14th century onwards, community breweries with low spatial diversity emerged in villages and towns.

**City centre brewery plants (1815-1845)**
The brewery buildings belonging to the Mayerffy and Petz breweries in the city centre had significant spatial diversity, and the individual production units were based on functional and mutual workflows. This led to the development of a new floor plan type. The construction and structural solutions and the architectural façade design were based on traditional models, as a consequence of which a new building type did not arise. In view of the city centre location, the small structural dimensions and the fact that design was subordinated to the surrounding urban space, the city centre breweries constitute precursors but not models for subsequent development and the establishment of mechanized breweries in Kőbánya and Budafok in the mid-19th century.

**Early industrial breweries (1845-1870)**
In this phase of innovation, the design of brewery buildings began to emphasise functional factors. Indeed, the influence of such factors grew constantly, impacting greatly on the architecture of the breweries. In effect, a new type of building was created – the early industrial brewery. The triggers for this transformation were the switch from top-fermented to bottom-fermented beer (which entailed a high technical manufacturing outlay and longer storage periods), the gradual mechanization of the production process, and the organization of the work process according to rational criteria. Parallel to this development, breweries began to be relocated away from the city centre of Pest to Kőbánya. A notable example: the Carl Rohrbacher Brewery in Kőbánya, designed by Anton Diescher (1843).

**Major industrial breweries (1870-1915)**
Parallel to the expansion of the buildings and structures on the premises, the production buildings saw the ongoing compression of technology and equipment – a process exerting an increasing impact on both the use of space and the design. With the introduction of reinforced concrete, the structure of breweries and the design of the production halls changed. In consequence of the novel construction techniques, there was a re-evaluation of function, which resulted in the emergence of new designs. At the same time, brewing became concentrated in a few large and powerful companies. This led, in turn, to the emergence of the major industrial breweries. An example is the First Hungarian Brewery Company in Kőbánya.
9.1. In the course of the innovation phase of the early industrial breweries, the Barber-Klusemann Brewery (1854) built highly specialized production facilities and opted for a functional exterior which, in terms of architectural development, established the brewery as the first industrial brewery in Budapest. Subsequent brewery buildings retained this structural concept until the end of the period under investigation. Thus, the Barber-Klusemann Brewery marks the starting point of the transformation of the early industrial breweries into major industrial breweries in Pest-Buda. Accordingly, the Barber Klusemann Brewery is a genotype, while subsequent breweries are pheotypes.

The Barber-Klusemann was the first brewery in Pest-Buda to switch from craft beer production to a mechanical mode of brewing. With the mechanization of production, various items of machinery and equipment came to determine the dimensions and structures of the working spaces. In view of the degree of mechanization in the production process, the Barber-Klusemann Brewery became the first industrial brewery in Budapest, having introduced the steam engine for power generation as well as a design concept with highly specialized production facilities and a functional exterior. The replacement of human labour by machinery rendered it necessary to completely reorganise the production process and, consequently, to reorient the overall design of the building. The design concept was retained in the construction of brewery buildings until the end of the period under investigation. Thus, the Barber Klusemann Brewery may be regarded as the starting point for the shift from the early industrial breweries to the major industrial breweries in Pest-Buda. Consequently, the Barber Klusemann Brewery may be regarded as a genotype.

9.2. In the innovation phase of the major industrial breweries, the Darre may be considered a structural hybrid

In the case of the Darre, the unity between the construction hull and the equipment installed therein was difficult to dispel. It was hard to differentiate between the building and the “machinery”. The Darre became effectively a built machine or a mechanised building. The usage cycle of the individual components was usually very similar in terms of the time interval.

10. Thesis. Creating a design catalogue of the historical breweries in Budapest contributes to the safeguarding of the city’s cultural heritage. The design catalogue, which was compiled by me on the basis of hundreds of original plans of historical breweries preserved at the Dreher Breweries in Budapest, represents a source for the city’s industrial production buildings and thus an integral part of the cultural heritage of the city. [8, 13]

The most important source for research on the historical breweries in Budapest is the place of production itself. However, in the course of my work, I concluded that a majority of the historical factories had already been demolished. Further, many original designs and other written records were no longer available or were inaccessible. Fortunately, I discovered that a large number of plans and designs had been preserved at the Dreher Breweries in Kőbánya (1106 Budapest, Jászberényi út 7-11.). The available documents included original plans for the construction of breweries and malt houses in Kőbánya and Budakeszi in the period 1865-1920. Both the scope and the information content of the documents rendered these plans a major source for industrial research in Budapest. I created a design catalogue, the analysis
and interpretation of which contributed to this study. I was able to analyse the functional and architectural development of the building type and its relationship with industrial urban development. The focus was on the spatial development of the historical production sites. The following new building types were identified:

- Beer halls
- Ice factories
- Logistical centres
- Design documents for taverns and restaurants stemming from the 1930s and 1940s.

The design archive thus created consists of the following types of building drawings and technical documents:

- Breweries
- Malt houses
- The cellar system in Kőbánya
- Technical ancillary buildings (machinery room, boiler house, bottling facility, cold storage buildings)
- Logistical centres in Kecskemét and Zombor
- Beer halls: e.g. Nagykanizsá
- Design documents for other building types: residential properties, villas, restaurants, building interiors
- Infrastructure: e.g. industrial railways, sewage canal to the Danube, artificial ice lake
- Technical installations: e.g. industrial lifts, installation plans for supply lines
- Building construction: e.g. ceiling construction
- Site maps

Based on the documents, I created a digital design catalogue and a written design directory, which I supplemented with design documents from the Budapest City Archives (1139 Budapest, Teve utca 3-5.) and made available on DVD. The digital design catalogue comprises the following parts:

1. **Design and construction chronology for the historical breweries and malt houses in Budapest:**
   The catalogue lists, in chronological order, the design and construction projects pertaining to the historical breweries and malting houses in Budapest.

2. **Design and construction chronology for the various breweries by building type:**
   The catalogue lists, in chronological order, the design and construction of the historical breweries and malting houses in Budapest according to their building type.
VI. Practical uses of the scientific knowledge

VI.1 Contribution to the development of emission-free factories and nature-friendly industrial areas
The shift from the workshop to complex industrial facilities will, in the future, become a mainly qualitative process, leading to the establishment of emission-free and energy-independent industrial plants. The knowledge gained from research on the city’s historical factories may contribute to the development of environmentally-friendly factories and human-friendly industrial areas.

VI.2. Findings may enhance regional planning capacities

VI.2.1. Kőbánya as a model for a mono-industrial area
With its former breweries, the district of Kőbánya in Budapest is an example of a discontinued mono-industrial area. In effect, it is an archive that can be used to study and document in a differentiated manner a particular regional industrialization pattern. The knowledge gained can be used to make correlations, which can then be applied to the human utilization of similar unused areas in an environmentally compatible manner in the future. The research findings might even form the basis for far-sighted regional planning of future commercial development, with a balance being drawn between quantity and quality. Comprehensive conceptual work on environmental protection in the city could reveal long-term problems arising from commercial and industrial activities, as well as possible means of avoiding such problems in the future.

VI.2.2. Findings related to the industrial development axes along the Danube
A further topic of regional planning pertains to the establishment of industry along a river. The industrial development axes along Váci Road and Soroksári Road, both of which run parallel to the Danube, arose as a consequence of close linkage between natural features (a river as a source of water and as a channel for the discharge of waste) and production.

VI.3. Intellectual resource

VI.3.1. The industrial building as an intellectual resource
This building type can be viewed as an archive of structural designs and functions, whereby the architecture is the manifestation of both a particular mindset and a particular method of problem-solving – which can be scientifically studied and documented. The lessons learned could, at a later stage, serve as an intellectual resource for a society facing a shortage of fossil fuels.

VI.3.2. Innovation research: process bionics
The applied biosciences are relevant for this subject, including research on the links between construction techniques and the living world. The research results can lead to cross-linkage between the biological and engineering sciences. In bionics, biological principles are transferred to (building) technology. The construction and physical forms of the design of historical malt houses constitute an early example of sustainable architectural design. The primary design capacity lay in the transfer of biological principles to the functioning of a building. Biomorphic building construction can be interpreted as an indication of the epistemic mindset of those contributing to the design, in which the building itself became an elementary part of the process facility. Through the establishment of connections between architecture and the life sciences, a historical malt house can become a futuristic building, the design of which is strictly logical and functional and serves as an impetus for architects as they address problems related to the power supply and the associated pollution.
VI.3.3. The cellar system in Kőbánya, Budapest: cold storage with sustainable energy management

These low-tech buildings can be viewed as archives of discontinued design and construction methods, providing an interface between construction and technological history and an opportunity to study these fields. Lessons may possibly be learned at a later date, when society faces a shortage of fossil fuels. By understanding and engaging with the mindset that led to the design of these buildings, contemporary architects and engineers could actively contribute to current efforts to tackle environmental and energy problems. Viewed from this vantage-point, these historical buildings with their simple technical equipment are very topical buildings.

VI.3.4. Research on historical industrial buildings will promote their preservation and conservation as objects of national cultural significance

Research on historical industrial buildings will greatly contribute to their preservation as objects defining the cityscape and their integration into municipal architectural development plans and their possible use in the future.

VII. Bibliography


