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Methodology for the Evaluation and Protection of Industrial Heritage from the Perspective of Heritage Management

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Methodology for the Evaluation and Protection of Industrial Heritage from the Perspective of Heritage Management

Miloš Matěj – Michaela Ryšková

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The primary aim of this methodological publication is to answer a number of fundamental questions: What is industrial heritage? Why is it worth protecting? How can we enhance our knowledge of industrial heritage, and how can we assess and evaluate industrial heritage? How can we approach the challenge of protecting industrial heritage and finding new uses for industrial heritage sites? The publication thus offers a basic guide to issues of industrial heritage, including its definition, evaluation, documentation, and options for (approaches to) its protection and management. The methodology is targeted at heritage management experts, museum staff, administrative authorities, investors, architects and owners, as well as the general public.

Reviewers:
prof. PhDr. Jana Geršlová, CSc., Univerzita Palackého v Olomouci, Filozofická fakulta
PaedDr. Josef Velfl, Hornické muzeum Příbram

Consultants:
Ing. arch. Eva Dvořáková
prof. Ing. arch. Tomáš Šenberger
Axel Föhl
Dipl. Ing. Rolf Höhmann

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Front cover: Vinařice u Kladna, Mayrau mine. Photograph Viktor Mácha, 2017.
Rear cover: Poděbrady, hydroelectric power plant. Photograph Viktor Mácha, 2018.

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01. Starting points

01.01. Aims and applications of the methodology

Industrial heritage is a very broad topic encompassing many different aspects, and the perspective of heritage management is one possible angle from which this topic can be viewed. The primary aim of the methodology presented in this volume is to answer a number of fundamental questions: what industrial heritage is, why it is worth protecting, how to enhance our knowledge of industrial heritage, how to assess and evaluate industrial heritage, and how to approach the challenge of protecting or finding new uses for industrial heritage sites. The individual theses in this publication are illustrated by a range of examples from both the Czech Republic and abroad.

Fundamentally, industrial heritage comprises a vast number of physical remnants from practically all types of human activity in the fields of production (manufacturing, extraction of natural resources), transport (including communications) and storage, spanning over a long period of time. The mission of heritage management is to investigate these physical remnants (recording, documenting and evaluating them) and subsequently to protect selected examples of machinery and equipment, buildings, sites, linear structures (such as railways) or entire territories. If research of industrial heritage (i.e. the above-mentioned recording, documenting and evaluation) and subsequent protection (preservation, conservation) activities are to be effective, it is essential to select examples of physical remnants that are of genuine importance and value, and to ensure that their heritage values are not destroyed or suppressed.

As has been mentioned above, the research and protection (preservation, conservation) of industrial heritage can be viewed from the perspective of several different disciplines. Heritage protection can be approached and institutionalized using tools from heritage management, museology and archeology.[1)] This fact is reflected in the overall methodological concept of this series of publications, which consists of three general methodologies (from the perspectives of heritage management, museology and archeology), each of which informs field-specific methodologies reflecting the specific features of selected industries that have been of key importance for the development of industry as a whole and that are also closely connected with the territory that is now the Czech Republic (industries such as coal mining, iron production and metallurgy, railway transport, power engineering and generation, textile production, sugar refining and brewing). The structure of these field-specific methodologies will (like the general methodologies) focus on explaining what the subject of study is and why, as well as how important examples of this type of heritage can be effectively protected and preserved. As in the general methodologies, the theses of these field-specific methodologies will be illustrated with examples of industrial heritage from the Czech Republic as well as some inspirational examples from other countries.

These methodological publications aim to serve as a guide and a tool for heritage management experts, museum staff, administrative authorities, investors, architects and owners – because managing our cultural heritage is not merely a task for heritage professionals; it is the responsibility of everybody involved with cultural heritage, including those decision-makers who determine its future.

1) Act no. 20/1987 Sb., on state heritage management; Act no. 122/2000 Sb., on the protection of museum collections and amendments to other acts.

01.02. Description of the methodology

The methodology presented in this publication draws on long-term research and many years of experience with documenting and assessing industrial heritage from the perspective of heritage management; this research base has been expanded throughout the duration of the project. The preparatory phase for this publication involved wide-ranging research of available sources – published and unpublished sources, archive materials, collections, as well as extensive field research. The authors have also monitored developments in other countries on a long-term basis, focusing on how experts have approached the task of protecting important examples of industrial heritage, restoring former industrial buildings, sites and complexes in Europe and the USA and adapting them for new uses. An extensive comparison of relevant documentation and publications provided a high-quality basis for selecting the illustrative examples which accompany the individual theses presented in this publication. Individual consultations with experts from both the Czech Republic and abroad formed an important component of this preparatory phase.

The structure of this publication reflects its key aims, which are to address and respond to the following fundamental questions:

- What is industrial heritage?
  Chapter 02 defines key terms and concepts, focusing on technical monuments and industrial heritage. It characterizes the discipline of industrial archeology and briefly outlines how opinions on the discipline's subject of study have evolved. It presents TICCIH's Nizhny Tagil Charter, a fundamental document which addresses the definition, documentation, values and protection of industrial heritage. The final part of this chapter outlines the broad range and variability of technical monuments and industrial heritage assets.
- Why is industrial heritage worth protecting?
  Chapter 03 focuses primarily on heritage values which can be considered specific features of industrial heritage and which should form the basis of any evaluation of heritage value:
  - historical value,
  - typological value (including the value of emblems, symbols, precursors, models and modules),
  - the value of the "technological flow" (and the role of individual components within the overall flow, i.e. as part of the complete production cycle and related technological processes),
  - the value of systemic and technological interconnections (viewing the monument in the broader context of mutually interacting and interconnected flows of raw materials, products and related transport systems),
  - the technical value of individual pieces of machinery and technological complexes,
  - the value of authenticity in relation to industrial heritage (including the definition of authenticity in terms of the "last working day" principle),
  - the value of the "genius loci" (the specific atmosphere of the location).
- How can we enhance our knowledge of industrial heritage, and how can we assess and evaluate industrial heritage?
  Chapter 04 focuses on recording and documenting examples of industrial heritage, i.e. the tools used in the selection of monuments for heritage protection. This chapter outlines how awareness of industrial heritage has evolved in the Czech Republic, leading to systematic research. It formulates the methodology of this research, which runs along two distinct lines: territorial research (seeking complete and comprehensive knowledge of the evolution of technical monuments and industrial heritage within a specific defined area) and field-specific research (tracing the development of particular industries or sub-industries by investigating the physical remains of these activities). The authors also emphasize the importance of interdisciplinary research, which offers new insights into industrial heritage by incorporating perspectives from fine arts, literature, ethnography, etc.
- How can we approach the challenge of protecting industrial heritage?
  Chapter 05 summarizes the heritage protection tools that are available at the national and international levels (cultural monuments, national cultural monuments, territorial protection, UNESCO World Heritage Sites, the European Heritage Label). Chapter 06 defines the main options available with regard to industrial heritage – retaining original functions (an ideal solution); retaining authentic operational processes by musealization (an extreme and selective approach); transferring a monument (or part of it) to a new location, if it cannot be preserved at its original location (most commonly relocation to museum-type facilities); and finally the option of converting the monument to new use (if its original function has been lost).

The individual chapters are accompanied by illustrative examples.

01.03. Justification for the methodology

Industrial heritage comprises a large yet highly specific set of cultural heritage assets. When assessing its heritage values, the traditional categories commonly used in heritage management (architectural value, urbanistic value, art-historical value and value derived from age) are not sufficient. The methodology presented here therefore incorporates new or specific evaluative categories: negative/positive historical value, typological value, the value of the "technological flow", the value of systemic and technological interconnections, technical value, the value of authenticity, and the value of the "genius loci".

The application of these categories facilitates a comprehensive assessment of the value of individual monuments (structures, buildings, machinery, technical equipment) and complexes (industrial complexes, agglomerations, linear structures such as railways, etc.) and the objective selection of the most important representative examples from individual industries for purposes of heritage protection.

Industrial heritage has attracted considerable attention in recent decades. It has been the subject of long-term research projects at universities (particularly the Research Centre for Industrial Heritage at the Architecture Faculty of the Czech Technical University in Prague and the Monuments Reconstruction Studio at the Architecture Faculty of the Brno University of Technology). These institutions' focus is primarily on industrial buildings – their structural engineering, architectural and urbanistic value, and potential new uses. However, industrial architecture represents just one segment of industrial heritage as a whole. This methodological publication offers a more comprehensive view, in which each individual entity is assessed in the context of the relevant field, taking into account broader contextual factors (technological flows, systemic and technological interconnections) and evaluating each entity in terms of its authenticity.

Kladno, Poldi Ironworks, electric arc furnace. Photograph Viktor Mácha, 2016.

02. Fundamental concepts and terms – meanings and definitions

02.01. Technical monuments and industrial heritage

The term "industrial heritage" can be used to denote technical equipment, buildings and anthropogenic geomorphological features which originated in connection with the process of industrialization.

By contrast, the term "technical monument" can be defined in a much broader and more general way, as *"unique or typical physical remains which demonstrate the development of technology and science and the level of their development in various historical conditions"*.[2] With a certain degree of simplification (and imprecision), technical monuments can be described as monuments associated with mining, manufacturing industry, transport or storage.

The use of the term "industrial monument" generally indicates an effort to use a more precise denotation in view of a monument's date of origin, purpose and size; however, such cases are always simultaneously examples of the more general concept of "technical monument".

The term "technical monument" is also sometimes used to denote entities that are protected by heritage legislation. However, the term "technical monument" (in Czech "technická památka") does not denote any legal status in the Czech system of heritage management, and current legislation (Act no. 20/1987 Sb. on state heritage management) operates solely with the category of "cultural monument" (in Czech "kulturní památka"); cultural monuments include those monuments that belong to the technical domain (for more details see chapter 05. Heritage protection).

02.02. Industrial archeology

Both concepts defined above – industrial heritage and technical monuments – are the focus of a field of research that is termed (though not entirely appropriately) industrial archeology. The field emerged gradually during the second half of the 20th century. Its origins can be traced to the 1950s, and the term "industrial archeology" appears to have been first used in the United Kingdom in connection with heritage experts' attempts to record the vanishing material legacy of the Industrial Revolution and (if possible) to rescue them from destruction. Given the wide spectrum of various disciplines that contributed to this new field of study (including archeologists, engineers and museologists), it took a relatively long time before a basic definition of industrial archeology became established. In the initial stages, the main goal of industrial archeology was viewed as the investigation of the physical remnants of the industrialization process; it was only later that these physical remnants began also to be seen as a material source enabling researchers to study processes of economic and social development.

In 1972, Angus Buchanan defined industrial archeology as *"a field of study concerned with investigating, surveying, recording and, in some cases, with preserving industrial monuments. It aims, moreover, at assessing the significance of these monuments in the context of social and technological history."*[3] Buchanan noted that industrial archeology involves *"a field of study to be explored, a work of selective preservation to be undertaken, and a scholarly task of*

2) VONDRA, Jiří. Ochrana technických památek v terénu. In *Ochrana technických památek. Sborník přednášek přednesených na symposiu pořádaném v Praze ve dnech 27.–29. 9. 1967*. Rozpravy NTM v Praze 27, Praha 1967, pp. 10–21.

3) BUCHANAN, Angus. *Industrial Archaeology in Britain*, 2nd edition. Harmondsworth: Penguin, 1982, p. 20.

relating physical remains of obsolete industries to a general interpretation of the processes of industrialization to be performed".[4)]

Manfred Wehdorn's approach to industrial archeology incorporates various concepts; he states that industrial archeology is "the systematic investigation of all material sources of the entire industrial past, from the past up to the present day"; in this approach, terms such as "industrial" and "systematic" are viewed in their broadest and most comprehensive sense.[5)] An additional dimension is added to this definition by Reiner Slott, who states that the starting point for all research in industrial archeology is the investigation of physical remains, which constitute the basis of all efforts within the field and form the link between all participants. Slott notes that these remains should be investigated using all available methods and means, and that no spatial or temporal limitations are imposed on this endeavour. In his view, in order to create a complete picture, it is important to take account of the plurality of opinions originating in the various methods and approaches that come together to form an interdisciplinary field of investigation.[6)]

Marilyn Palmer and Peter Neaverson draw a narrower definition of industrial archeology, characterizing it as "the systematic study of structures and artefacts[7)] as a means of enlarging our understanding of the industrial past".[8)] In their approach, industrial archeology focuses its interest primarily on the process of industrialization, i.e. the process which marked the turning-point in the shift from small-scale home-based or craft production to industrial production. Palmer and Neaverson take the view that raw material resources, new production methods and essential transport networks for distribution are combined and interlinked with wider social changes which are reflected, for example, in the urban structure of industrial areas (factory sites and workers' housing).[9)]

02.03. The TICCIH Nizhny Nagil Charter for the Industrial Heritage

In the international context, a fundamental document focusing on the definition, documentation, values and protection of industrial heritage is the Nizhny Nagil Charter for the Industrial Heritage,[10)] formulated in 2003 by the International Committee for the Conservation of the Industrial Heritage (TICCIH).[11)] TICCIH was established in 1978, but the initial impetus for its foundation dates back to 1973, when Ironbridge hosted the first international conference on the conservation of industrial heritage – organized in response to structural changes in industry and the related issue of the inadequate protection of industrial heritage. TICCIH is a long-established expert advisory body of the International Council on Monuments and Sites (ICOMOS).[12)]

The Nizhny Nagil Charter refers to the already well-acknowledged heritage value of ground-breaking changes in production processes that have been revealed by archeological surveys. Drawing on this basis, it expands its field of interest to include more recent remnants of the Industrial Revolution, beginning in the second half of the 18th century and continuing up to the present day, arguing that this period represents a major historical turning-point which had a global impact and represented a universal value for humankind. Besides its universal value, other aspects of industrial heritage are also reflected in various spheres of life: social (evidence of the lives of ordinary people, strengthening

4) Ibid., p. 27.

5) WEHDORN, Manfred. *Die Baudenkmäler des Eisenhüttenwesens in Österreich. Ein Beitrag zur industriearchäologischen Forschung.* Düsseldorf 1977, p. 1.

6) SLOTTA, Reiner. *Einführung in die Industriearchäologie.* Darmstadt 1982.

7) In the sense of things or processes created by humans.

8) PALMER, Marilyn – NEAVERSON, Peter. *Industrial Archaeology. Principles and Practice.* New York – London 1998 (reprint 2000), p. 1.

9) Ibid., pp. 4–5.

10) *The Nizhny Tagil Charter for the Industrial Heritage* [online]. [retrieved 14. 07. 2018]. URL: https://www.icomos.org/18thapril/2006/nizhny-tagil-charter-e.pdf

11) The Charter was published at the 7th TICCIH congress in Nizhny Tagil and approved by an assembly of national TICCIH representatives in Moscow (hence its alternative designation as the Moscow Charter).

12) Materials and annual reports published by TICCIH present information on international activities and on the broad spectrum of approaches and changing opinions on the documentation, evaluation and protection of industrial heritage – see www.ticcih.org; COSSONS, Neil. Průmysl včerejška, odkaz zítřku? In *Průmyslové dědictví. Industrial heritage.* Praha 2008, p. 20.

awareness of identity), technical and scientific (the history of manufacturing, engineering and civil engineering), and aesthetic (architecture and urban planning). Of particular value are production processes which have survived from an earlier era, unique "site typologies or landscapes",[13)] and early or pioneering examples of particular processes and technologies. The Charter notes that investigations should focus not only on tangible, physical remains (including documents, human settlements, and the natural or industrial landscape), but also on intangible manifestations such as recorded memories or customs.

The Charter concludes that *"the buildings and structures built for industrial activities, the processes and tools used within them and the towns and landscapes in which they are located, along with all their other tangible and intangible manifestations, are of fundamental importance. They should be studied, their history should be taught, their meaning and significance should be probed and made clear for everyone, and the most significant and characteristic examples should be identified, protected and maintained, in accordance with the spirit of the Venice Charter, for the use and benefit of today and of the future."*[14)]

The pre-industrial era

Horní Blatná, remnants of ore mining

The history of ore mining in the Ore Mountains (Krušné hory, Erzgebirge) dates back to the Middle Ages. Surviving remnants of this activity include a number of mine workings and traces left in the landscape. One of the most valuable locations – combining typological, technical and historical values – is the area around Horní Blatná, where there are several remnants of tin and iron ore mining. These include the 13 kilometre-long Blatná water channel (built in 1540–1544); a subsidence basin caused by tin mining in the 16th–18th centuries known as Vlčí jámy ("The Wolves' Pits"), now a legally protected natural monument, located on the south-western slope of the Blatenský vrch hill; and several remnants of mine workings at ground level, such as the Drahá kožešina open-pit mine, a subsidence basin at the site of the Zuzana mine at Sněžná hůrka, or spoil-tips and subsidence basins at Jelení vrch. Photograph Ondřej Malina, 2015, 2018 (the Drahá kožešina open-pit mine, top, and the Blatná water channel).

13) The Charter uses the term "site" to cover a broad range of meanings – landscapes, complexes, buildings, structures, machinery.

14) Ibid., Introduction; The Venice Charter for the Conservation and Restoration of Monuments and Sites), formulated by the Second International Congress of Architects and Technicians of Historical Monuments, Venice 1964. The Venice Charter focuses on the fundamental principles of heritage management, and it is associated with the foundation of the International Council on Monuments and Sites (ICOMOS). It discusses the definition of monuments and the principles for their documentation, conservation and restoration, as well as focusing on heritage sites and archeological surveys.

The pre-industrial era

Dobřív, hammer mill

Iron production at Dobřív is documented as far back as 1505. In 1614 a charcoal blast furnace was built. Pig iron was refined at hammer mills; one such mill (known as Horní hamr, meaning the "upper" hammer mill) has been preserved. When the ironworks closed, the mill was used to make heavy forged agricultural equipment and tools. In 1910 the mill was refitted with new equipment. Production was suspended in 1949, and the mill was closed definitively in 1956. Today there are four water wheels (instead of the original five) driving two heavy drop hammers, a lighter tail hammer, shears, a grinder and bellows. Much of the original 18th and 19th-century tools have been preserved. The "upper" hammer mill at Dobřív is the largest surviving hammer mill from the pre-industrial era in the Czech Republic, and one of the largest in Europe. The mill's current appearance dates back to the 1820s. Photograph Eva Dvořáková, 2016.

02.04. Technical monuments, industrial heritage and brownfields

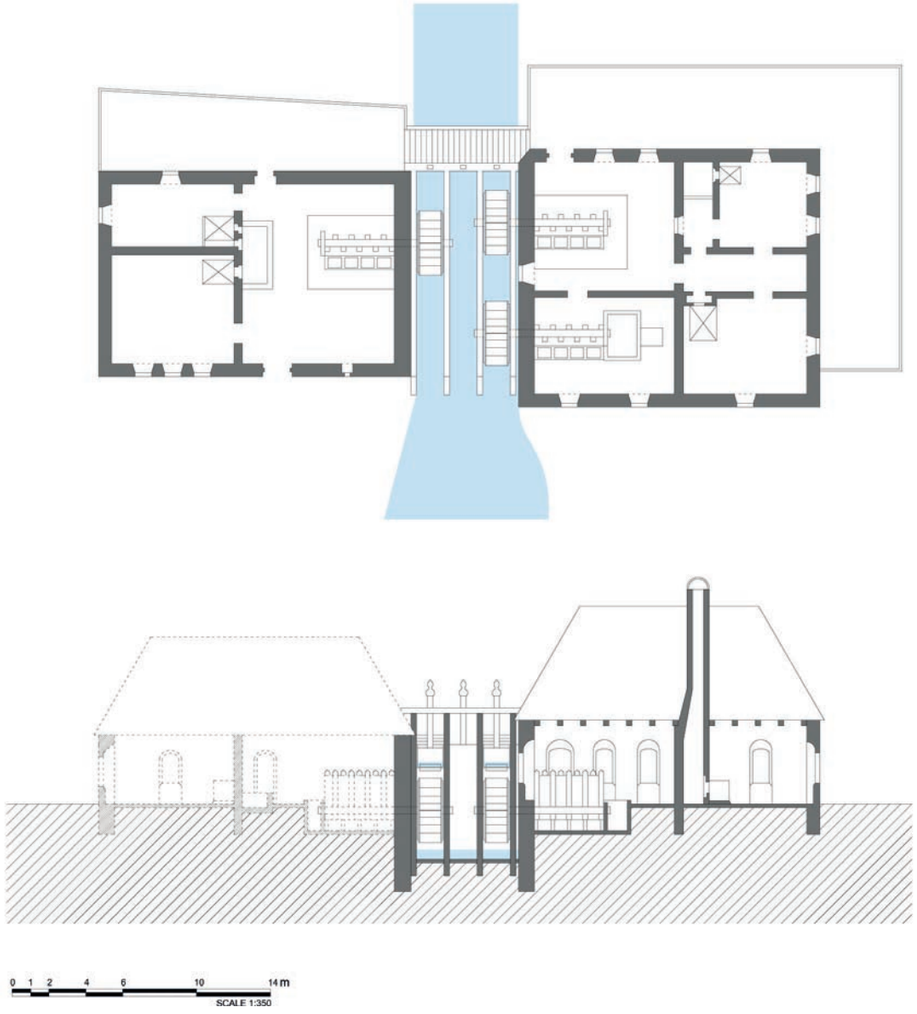
Technical monuments exist in the material world that surrounds us. Identifying, investigating, describing and assessing the importance of technical monuments is a systematic and never-ending process. Technical monuments constitute a widely varied range of buildings and examples of machinery and equipment.

02.04.01. The pre-industrial era

The pre-industrial era is very broad in scope, stretching from the oldest archeological discoveries of primitive tools to the onset of the Industrial Revolution in the second half of the 18th century. Remnants of this period comprise primarily archeological finds, traces of former mining or manufacturing activities still present in the landscape, and numerous buildings and other structures (or their remains) – most frequently associated with metalworking and iron production (former ironworks, hammer mills, and charcoal-fuelled blast furnaces), food and drink production (breweries, mills, drying kilns, etc.), or textile production (textile workshops). Technical structures include sites related to transport infrastructure (bridges, structures built for horse-drawn railways, roads) or water management (mill-streams, water pipes and conduits, reservoirs, fountains).

Water wheels were the most important source of power in the pre-industrial era, and they were used to drive a wide range of mechanical systems such as mills, sawmills, hammer mills, and fulling mills (which were used in the craft production of woollen goods).[15] Water wheels were also used as a power source for water pumping mechanisms, such as pumps which drained underground mines. Traces of the watercourses (e.g. mill-streams) that were an essential part of this technology are still clearly visible in the landscape today, and in some cases they are still in existence, as

15) The term "mill" (Czech "mlýn", German "Mühle"), originally used to designate a milling site or milling machinery powered by a water wheel, later became a common designation for sites or machinery that were not used for milling. The beginnings of mechanization – associated with water power – saw the term "mill" transferred to sites and machinery such as spinning mills and weaving mills.



The pre-industrial era

Brno-Husovice, fulling mill, diagram

The fulling mill in Husovice was owned by Brno's first cloth manufactory, which operated under the name "Imperial-Royal Privileged Cloth Factory" and had originally been located in Kladruby. It had three separate hammer mechanisms, each driven by its own water wheel. It is one of Brno's oldest textile manufacturing sites; the fulling mill gradually evolved into a factory producing woollen cloth (including a finishing shop), which remained operational until the 1990s. The original fulling mill ceased to function, but the mill-stream was retained and the power was harnessed to drive a water turbine. Reconstruction based on a plan published in FREUDENBERGER, Herman. The Industrialization of a Central European City. Brno and the Fine Woollen Industry in the 18th Century. Edington, 1977. Scale 1 : 350; diagram Radek Míšanec, 2018.

The pre-industrial era

Kovářská, coal-house

Circumstantial evidence indicates that iron production in Kovářská dated back to the 15th century. A charcoal blast furnace built in 1597 was only the second blast furnace in what is now the Czech Republic. Auxiliary facilities included hammer mills, a grinding shop and a forge (documented in 1728). Production ceased in 1869. The last remnants of iron production are a pair of lime kilns which remained operational until the 1920s and the ruins of a former charcoal store known as the coal-house. This monumental three-floor building was built entirely of stone in order to prevent fires spreading from one storage chamber to the adjacent chambers. Photographs Ondřej Malina, 2013 (coal-house) and Michaela Ryšková, 2012 (lime kiln).

The pre-industrial era

Brno, Karel Příza's wool manufactory

The design of manufacturing buildings from the pre-industrial era was based on contemporary models and customs. Karel Příza's wool manufactory in Brno was established on the south side of Cejl St. in 1810. The street-facing part of the site apparently contained accommodation and various technical premises, while the manufacturing itself took place in the perpendicular wing. A similar layout was used in a state-owned cloth manufactory established in Brno in 1764 (the building no longer exists). Photograph Viktor Mácha, 2018.

The pre-industrial era

Nymburk, water tower

Water management in the pre-industrial era is represented primarily by structures and sites connected with water supply systems, mill-streams and ponds. The most prominently visible parts of water supply systems are water towers and fountains. The Renaissance-era hexagonal water tower in Nymburk (known as the "Turkish" tower), built at the end of the 16th century, took water from the Labe River to supply the town's fountain. It remained operational until the second half of the 19th century. The technical equipment has not survived. Photograph Michaela Ryšková, 2017.

even after the onset of industrialization they were sometimes used as a source of power (to drive turbines) or for other technological processes (such as the finishing processes used in textile production).

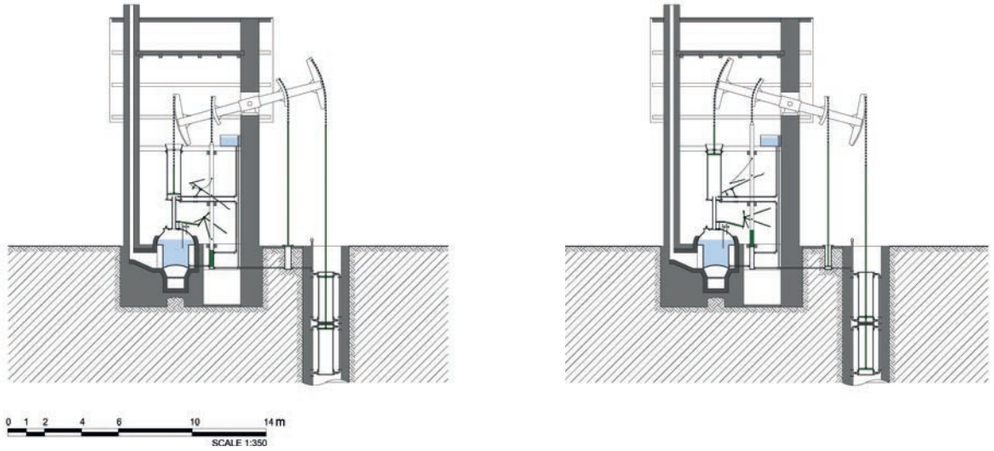
02.04.02. The industrial era

Industrialization can be characterized in simplified terms as the shift from home-based or craft production to industrial production; it was based on the exploitation of new energy resources, new production methods, and new methods for organizing labour. Industrialization proceeded at different speeds in different countries and in different industries. The key milestones in the process of industrialization are generally acknowledged to have been the introduction of the steam engine, the use of coal and coke to produce pig iron in blast furnaces, and the mechanization of textile production. The rapid development of different industries (which was enabled by the equally rapid development of engineering) was supported by major changes in transport systems, especially the development of rail transport.

The process of industrialization is manifested in a wide spectrum of tangible, material remains – machinery, equipment and buildings – whose importance can only be determined on an individual basis and in the context of wider developments in each particular industry.[16] The development of the mining industry can thus be traced through the development of mining machinery or the structural designs of pit-head winding towers; the history of the energy industry can be traced by studying the evolution of various technologies used for power generation and distribution; metalworking and iron production can be viewed in the context of the development of iron production and refining technologies; the development of the textile industry is reflected in the gradual evolution of spinning machines and weaving looms – and so on. Each industry has its own milestones, its own inventions which guided the course of its historical development.

Technological processes, configurations of machinery, and sources of power were the key determinants for the development of new types of industrial buildings. These factors affected the scale and layout of these buildings, as well as influencing their external appearance. A universal type of factory building emerged in the textile industry. The configuration of this type of building was not determined by specific types of technologies and technological flows, but rather by the multiple use of identical or similar machines. The process was also accompanied by the development of building materials and structural systems. New materials emerged alongside traditional materials: in the late 18th century the first cast iron and other metal structures were used (wrought iron, carbon steel, rolled steel sections), and a century later civil engineers began to use reinforced concrete (ferro-concrete). The oldest factory building with a metal structural skeleton is generally accepted as being the Marshall, Benyon and Bage flax mill in Ditherington, now a suburb of Shrewsbury (1797). The first reinforced concrete structure was a spinning mill in Tourcoing, built in 1895 to a design by François Hennebique.

16) Developmental typologies will be discussed in subsequent (industry-specific) methodological publications.



The industrial era

The Newcomen atmospheric engine

One of the turning-points in the history of industrial technology came with Thomas Newcomen's atmospheric engine – the first atmospheric engine which was suitable for practical use as a source of power for machinery. It was used for pumping water out of mines, and its first application was in 1712, at a coal mine in Dudley Castle. Diagram Radek Míšanec, 2018; photograph Michaela Ryšková, 2008 (an atmospheric engine at the Black Country Living Museum in Dudley).

The industrial era

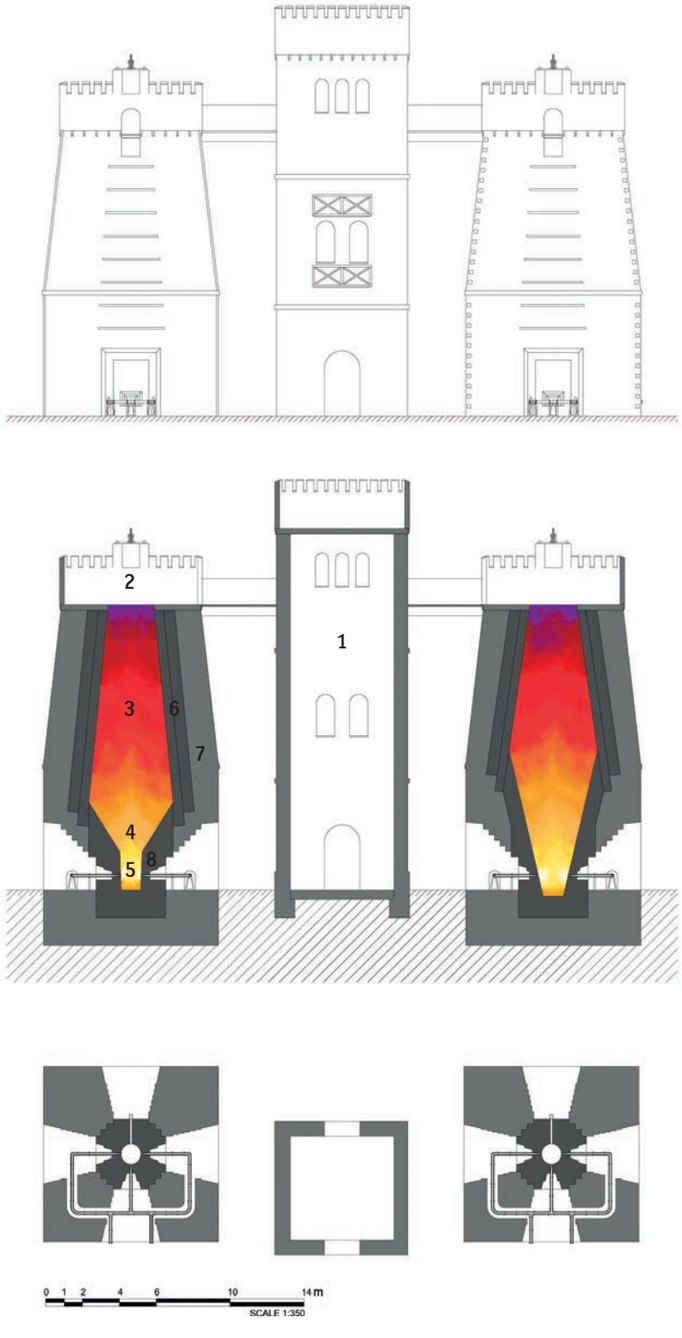
Coalbrookdale (England), remnants of the first coal-fuelled blast furnace

One of the key milestones in the Industrial Revolution and the process of industrialization was the use of coal and coke to produce pig iron. Coal was first used for this purpose in 1709 at Abraham Darby's blast furnace in Coalbrookdale. In 1713 the first iron was produced by using a mixture of coal and coke, but it was only when Abraham Darby Jr. replaced this mixture with pure coke that the results became comparable to those produced with charcoal-fuelled blast furnaces. The remnants of the original furnace were unveiled in 1959 to mark 250 years since its first use. Now sheltered by a roof, it an exhibit at a museum. Along with other remnants of the early Industrial Revolution in the Severn Gorge, it forms part of a UNESCO World Heritage Site. Photograph Miloš Matěj, 2011.

The industrial era

Ironbridge (England), cast iron bridge

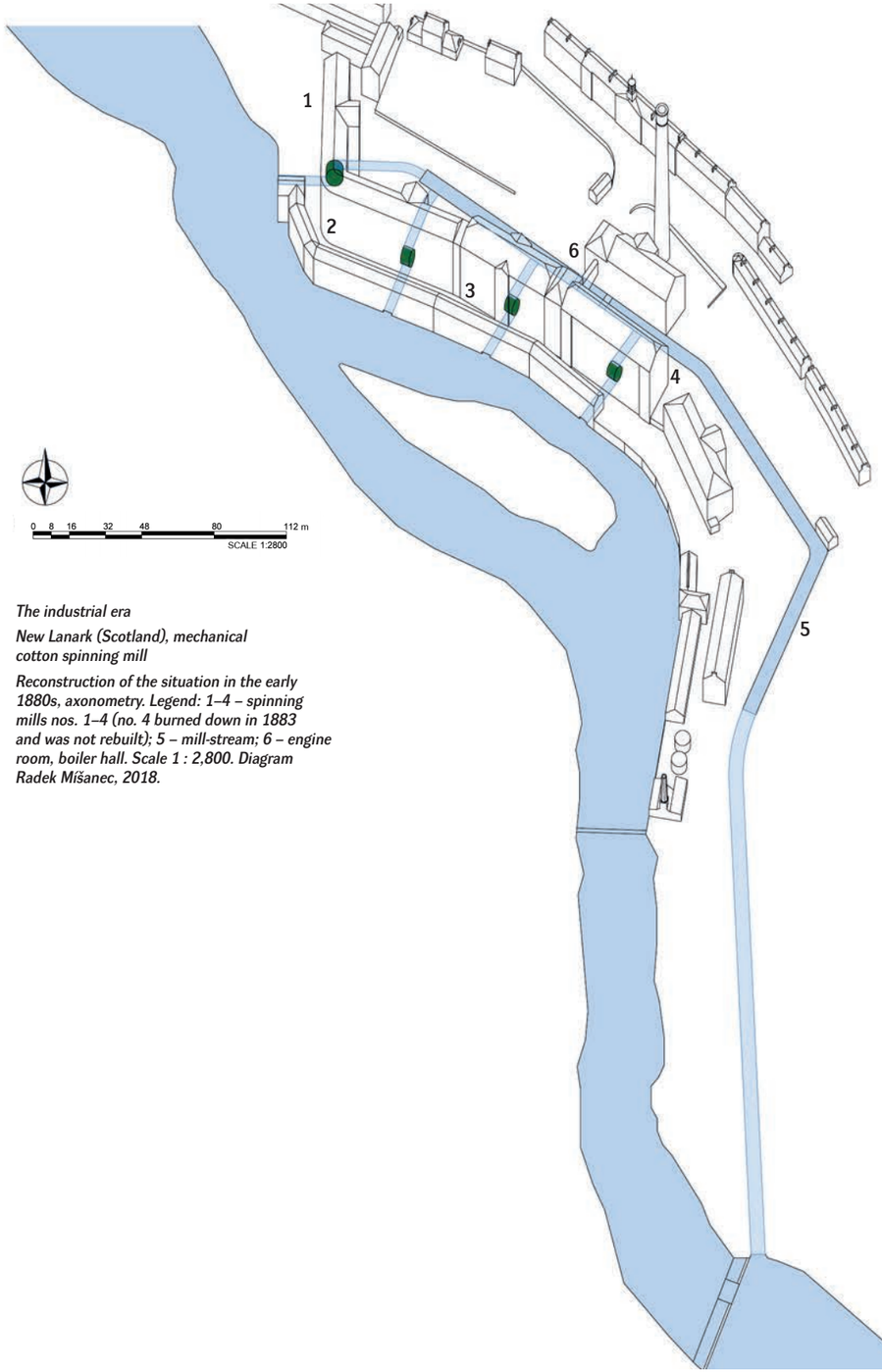
Technical progress in ironmaking was reflected in the use of iron in bridge construction. The world's first cast iron bridge was built over the Severn Gorge in 1779 by Abraham Darby and John Wilkinson, to a design by Thomas Farnolls Pritchard. It forms part of UNESCO's Ironbridge Gorge World Heritage Site. Photograph Miloš Matěj, 2011.



The industrial era

Kladno, Vojtěch ironworks

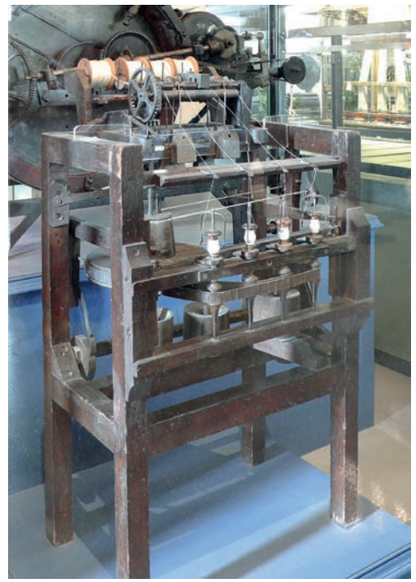
Belgian-type coke-fuelled blast furnace
The first ironworks in what is now the Czech Republic to use coke (instead of charcoal) as a fuel in blast furnaces was at Vítkovice (1836). The first coke-fuelled blast furnace in Kladno began production in 1855. The diagram shows Belgian-type blast furnaces nos. 1 and 2 built at the Vojtěch ironworks (Adalbertshütte) in 1855 and 1856. Legend: longitudinal section (1 – charging tower; 2 – furnace top; 3 – stack; 4 – bosh; 5 – hearth; 6 – refractory lining; 7 – brick and stone wall; 8 – tuyeres); scale 1 : 350; diagram Radek Míšanec, 2017.



The industrial era

New Lanark (Scotland), mechanical cotton spinning mill

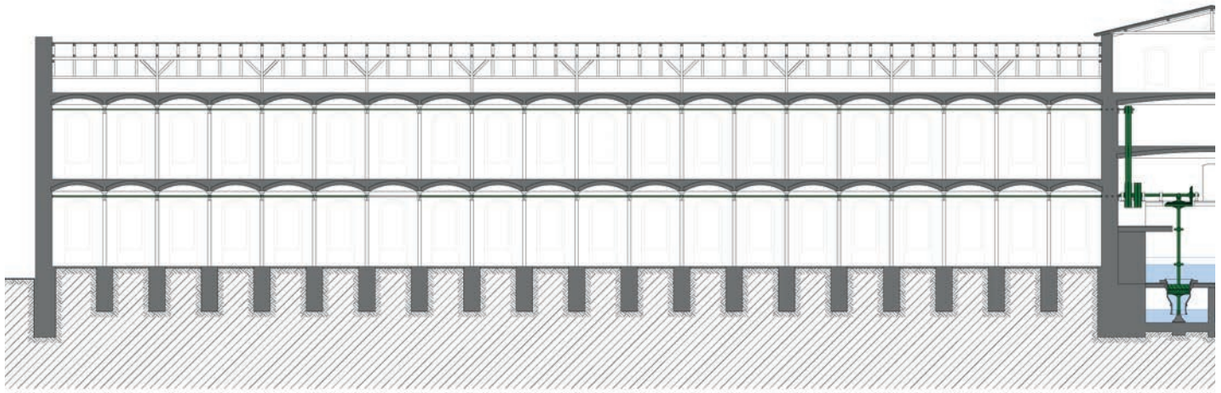
Reconstruction of the situation in the early 1880s, axonometry. Legend: 1–4 – spinning mills nos. 1–4 (no. 4 burned down in 1883 and was not rebuilt); 5 – mill-stream; 6 – engine room, boiler hall. Scale 1 : 2,800. Diagram Radek Míšanec, 2018.

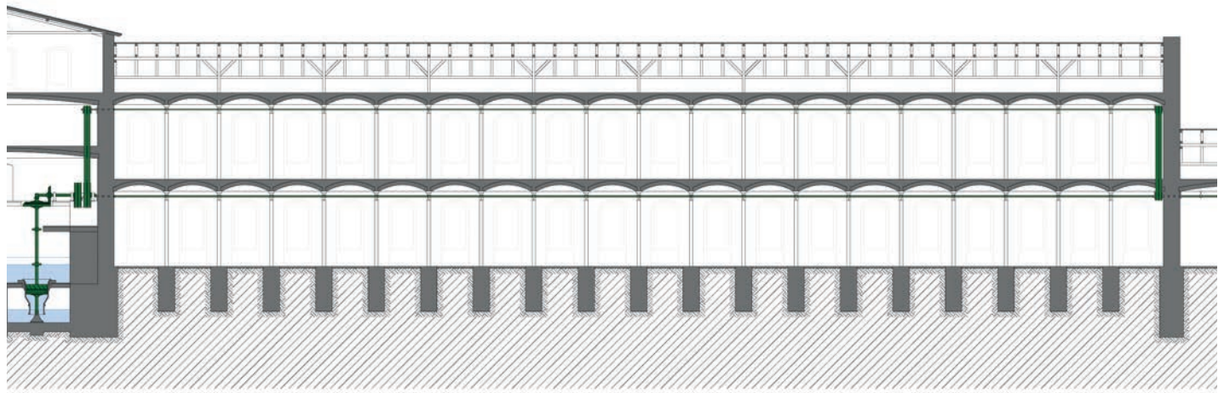


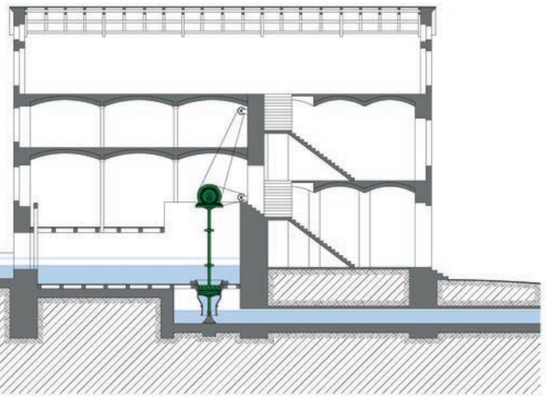
The industrial era

New Lanark (Scotland), mechanical cotton spinning mill

The development of textile manufacture brought with it the need for more efficient spinning techniques, as the mills could no longer meet increased demand for yarn. The mechanization of spinning was an important element in the Industrial Revolution. The new machines led to the creation of the first mechanized spinning mills, and they also brought changes in the organization of labour. One of the first water-powered mechanical cotton spinning mills was built by David Dale and Richard Arkwright near the Scottish village of Lanark. The mill was equipped with water frames – water-powered spinning frames designed by Arkwright. The remote location was chosen because it was close to a series of waterfalls on the River Clyde, which provided an adequate and stable source of energy. The first of four spinning mills was built in 1789. It was a five-floor structure on a long rectangular ground plan oriented perpendicular to a mill-stream, which passed under the centre of the building. At this point there was a water wheel which drove the spinning frames via a transmission system. Although a steam engine was added in 1881, it never completely replaced the original water wheel system. UNESCO World Heritage Site. Photograph Michaela Ryšková, Miloš Matěj (water frame), 2008.







The industrial era

Sudkov, Ignaz Seidl flax spinning mill

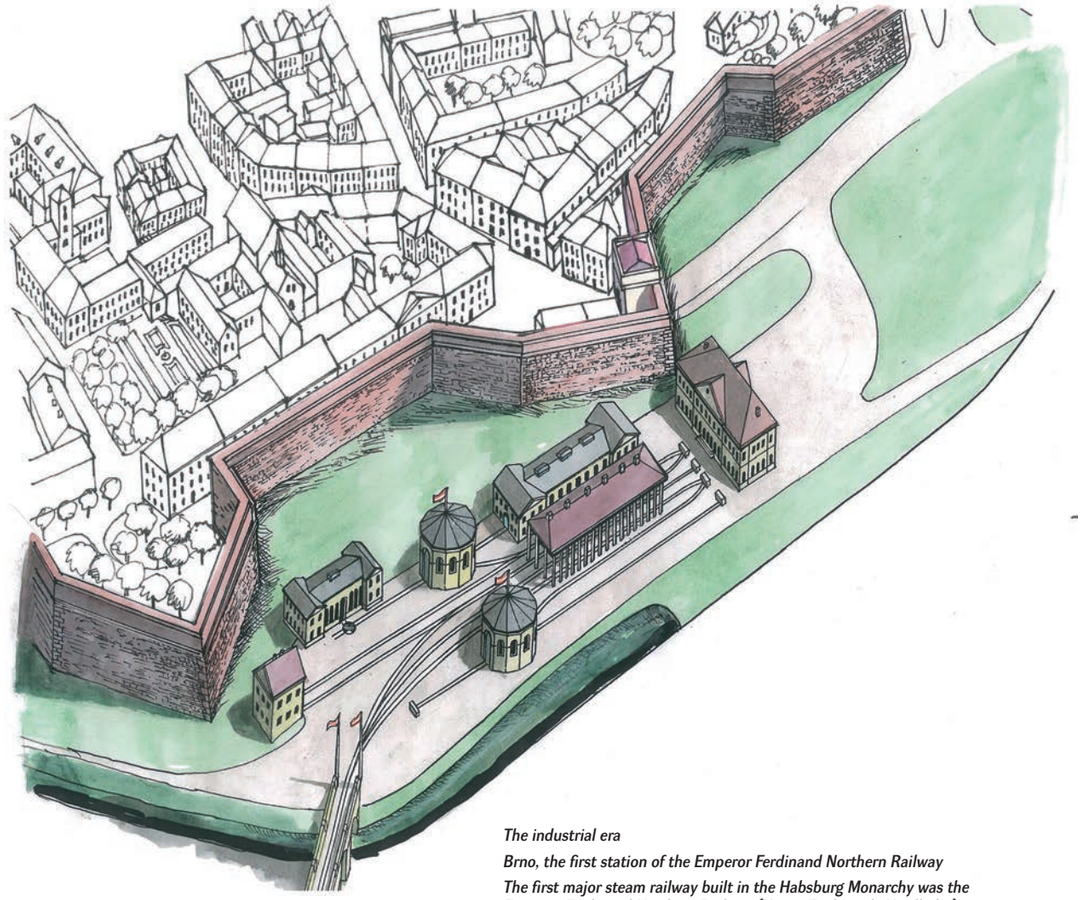
The template created by the first mechanical cotton spinning mills (including New Lanark) was successfully applied on numerous occasions. One of the many examples is the flax spinning mill in the Moravian village of Sudkov, built in 1864. Instead of using a water wheel (a common solution in the late 18th century), the machinery at Sudkov was powered by water turbines. Diagram Radek Míšanec, longitudinal and lateral section showing the turbines and transmission systems, 2018.

Opposite: General view and engine hall of the mill's small hydroelectric power plant equipped with two Francis turbines producing 250 and 167 hp (made by J. M. Voith in St. Pölten, 1902 and 1924) and a Siemens-Schuckert generator (shown in the photograph). Photograph Michaela Ryšková, 2007.

The industrial era

Manchester (England), Liverpool Road railway station

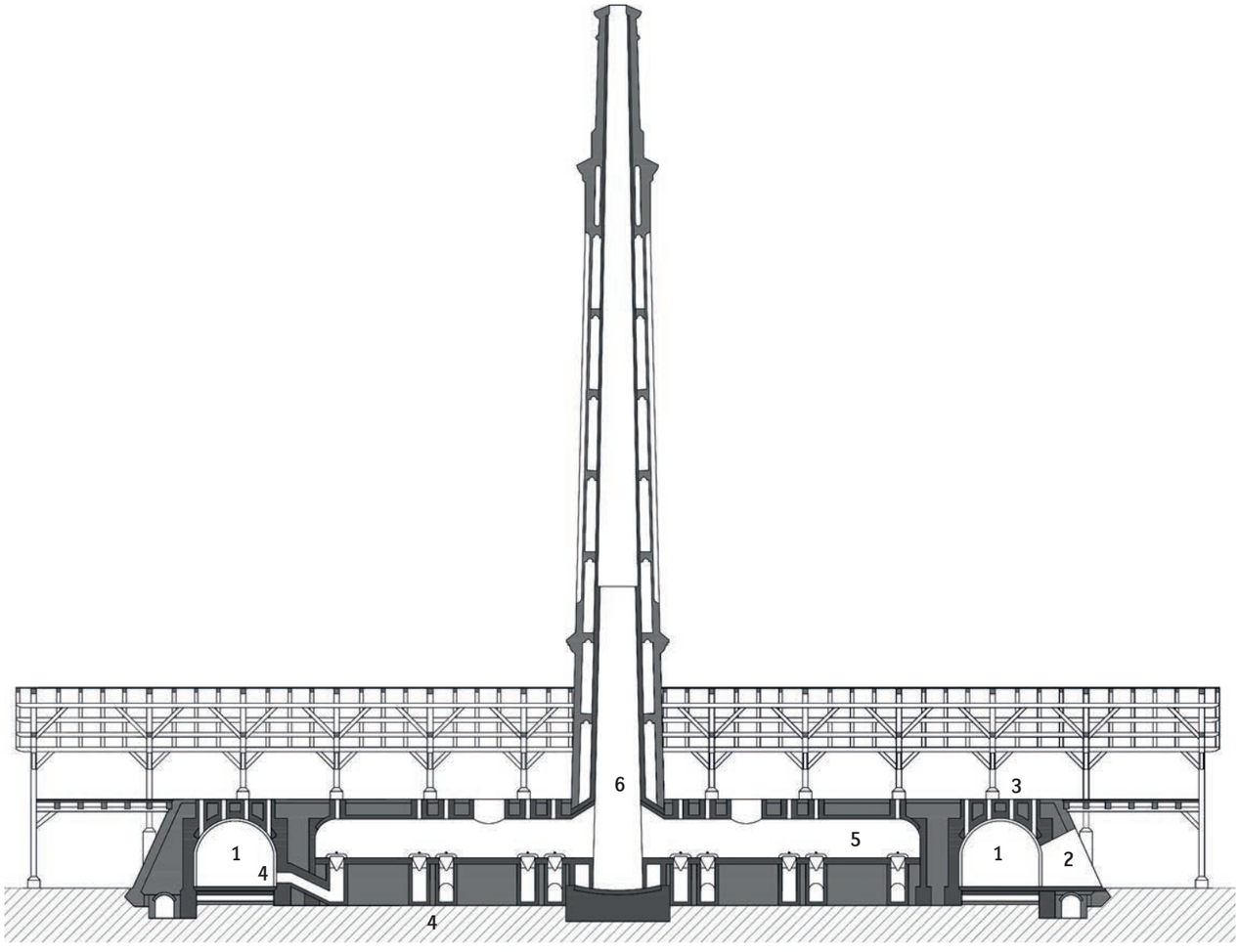
One important facet of industrialization was the development of new transport systems, especially steam railways. In 1830, the railway line built to transport raw cotton from Liverpool docks to the spinning mills in Manchester became the world's first rail line with regular passenger services. Today, the terminus at Liverpool Road railway station is part of Manchester's Museum of Science and Industry. Photographs Michaela Ryšková and Miloš Matěj, 2008.

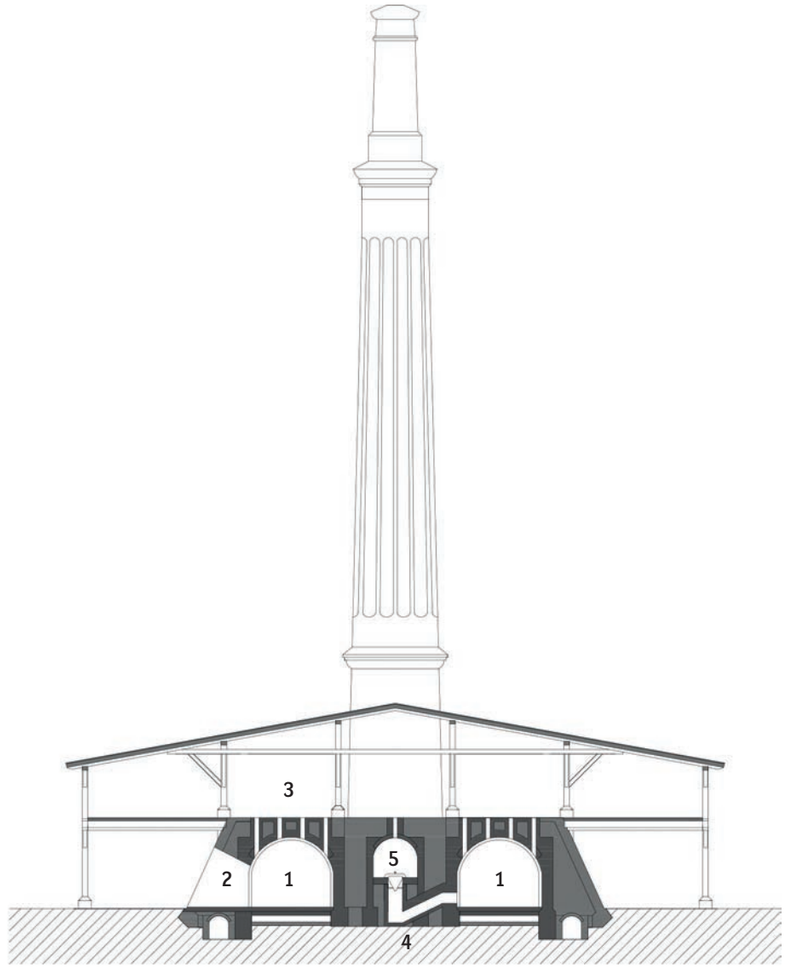


The industrial era

Brno, the first station of the Emperor Ferdinand Northern Railway

The first major steam railway built in the Habsburg Monarchy was the Emperor Ferdinand Northern Railway (Kaiser Ferdinands-Nordbahn), running northwards from Vienna to the salt mines in Galicia. Building work began in 1837, and by 7 July 1839 the branch line to Brno was fully operational. The railway brought a significant competitive advantage for Brno, which was rapidly developing into a major industrial centre. The drawing is a reconstruction of the first station in Brno, built in 1839. The twelve-sided depot (containing a turntable) was based on similar structures in England. Drawing Jaroslav Staněk, 2016.

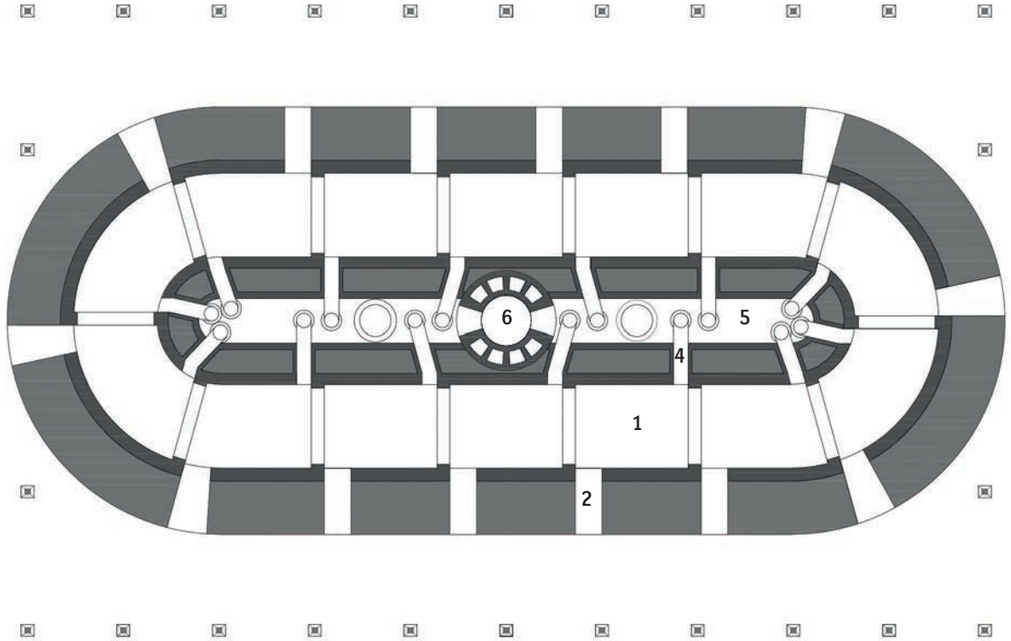




The industrial era

The Hoffmann kiln

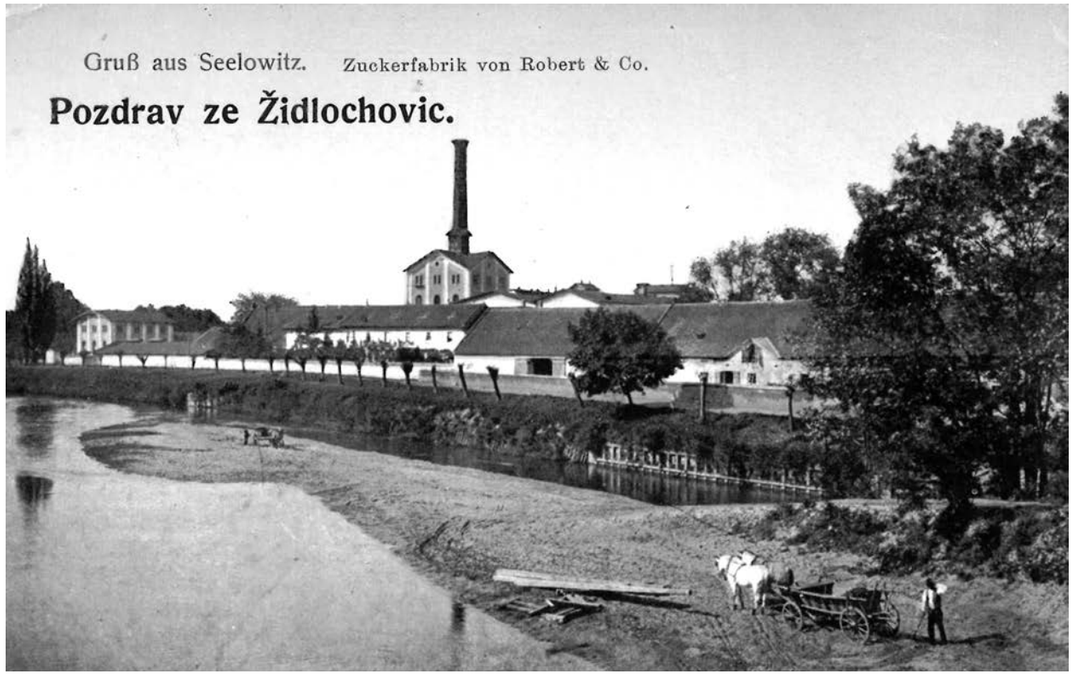
The development of individual industries is propelled forward by ground-breaking inventions. One such milestone invention in the construction industry was the circular Hoffmann kiln (1858), which made it possible to use industrial processes for the production of bricks. The circular Hoffmann kiln moved fire around the perimeter of the kiln; the batch could be prepared, inserted, and then removed after cooling in a continuous process. The circular shape was soon replaced by an oval design. Diagram of a 14-chamber kiln, Radek Míšanec, 2016. Legend: 1 – kiln chamber / heating channel divided into separate chambers; 2 – service opening; 3 – fuel chutes; 4 – smoke extraction; 5 – smoke duct; 6 – chimney.



The industrial era

Olomouc-Slavonín, The Hoffmann kiln

The Hoffmann system was applied in this circular brick kiln with 18 chambers at the brickworks in the Slavonín district of Olomouc. After the closure of the works, the site was used as a print works. The heating channel is used for storage, and there is a wood-built extension housing the company's offices. Photograph Michaela Ryšková, 2015.



The industrial era

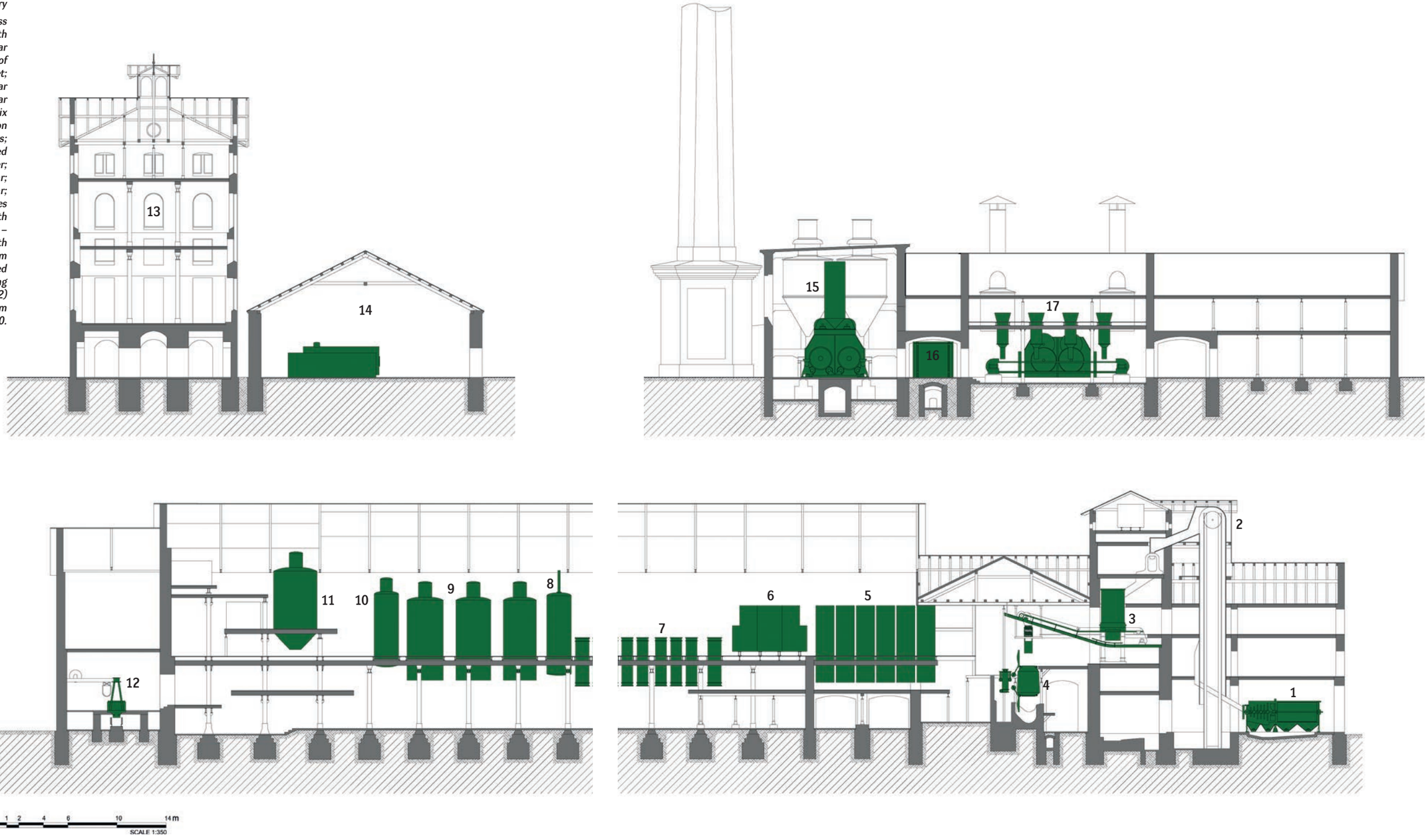
Židlochovice, sugar refinery

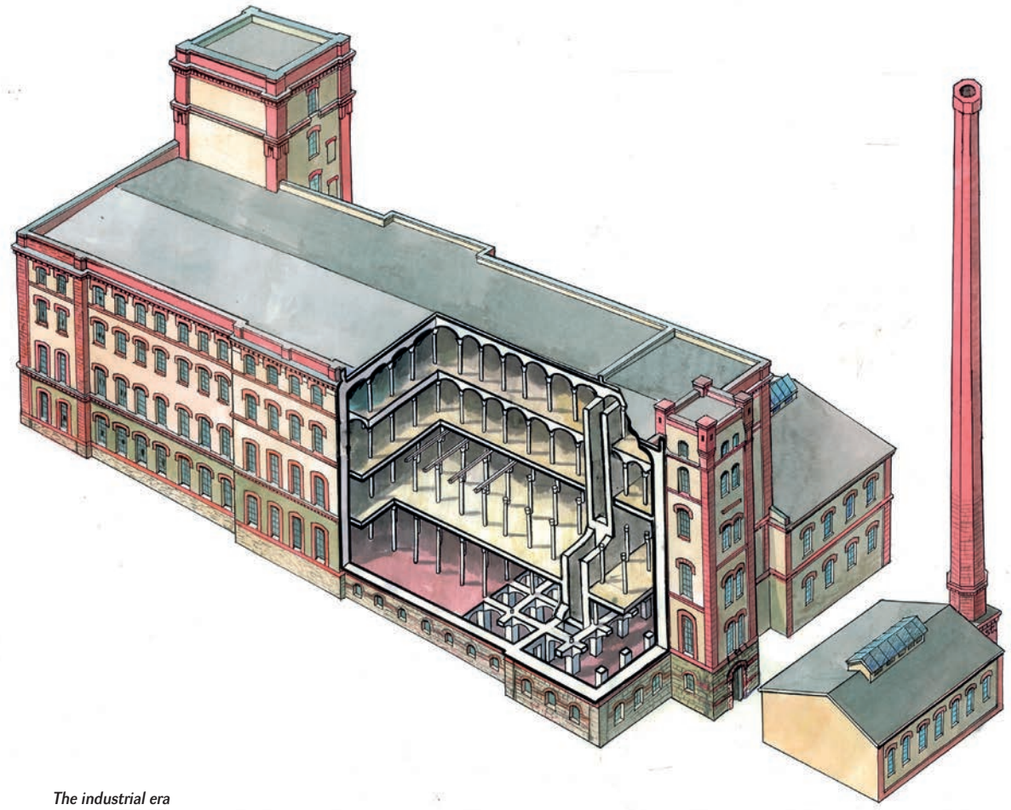
Sugar refining played an important role in the industrialization of rural areas of what is now the Czech Republic. A significant improvement in the refining process was brought by the introduction of Robert's diffusion process, which greatly increased the efficiency of sugar beet juice extraction. The method was first used at the sugar refinery in Židlochovice, where it was trialled in 1864–1865 and introduced fully a year later. Photograph Michaela Ryšková, 2017 (former filtration tower) and collection of Mojmir Leštinský (historical postcard issued in 1910).

The industrial era

Židlochovice, sugar refinery

Reconstruction of the production process at the beginning of the 20th century with a set of Robert diffusers. Legend: 1 – sugar beet washery, patented by Wiesner of Cologne; 2 – hoist for washed sugar beet; 3 – hoppers for washed sugar beet, sugar beet cutters, conveyer belt for cut sugar beet; 4 – fifteen Robert diffusers; 5 – six saturation tanks; 6 – three saturation tanks; 7 – juice heaters; 8 – boilers; 9 – three-part evaporation unit, patented by Vincík Turek; 10 – juice condenser; 11 – 2 vacuum boilers for raw sugar; 12 – 5 Weston centrifuges for raw sugar; 13 – filtration tower, later a molasses production unit; 14 – boiler hall with twelve Lancashire-type flue boilers; 15 – drying shop no. 2 (1917) equipped with a Deelowitz dryer for the cut beet from the diffusers (which was dried and used as cattle feed); 16 – furnace for the drying shops; 17 – drying shop no. 1 (1912) equipped with a Deelowitz dryer.Diagram Radek Mišanec, 2018, scale 1 : 350.





The industrial era

Frýdek-Místek, Adolf Landsberger cotton spinning mill

The use of metal structural skeletons represented a major step forward in the construction of industrial buildings. These structures were widely used in multi-storey textile factories, especially for cotton spinning mills, where there was a high fire risk. The first use of a metal structural skeleton for a factory in what is now the Czech Republic was at Johann Faltis's flax mill in Trutnov. The drawing shows a mill built at a later date – Adolf Landsberger's cotton spinning mill in Frýdek – as it appeared after rebuilding work which followed a fire in 1894. The building no longer exists; despite lengthy efforts to secure legal heritage protection, it was demolished in 2014. Drawing Jaroslav Staněk, 2013.

The industrial era

Brno, United Woollen Goods Factories

From the end of the 19th century, reinforced concrete became widely used as a structural material for factory buildings. The first structure of this type in Brno's woollen industry was the wet finishing shop built for the United Woollen Goods Factories at no. 12 Špitálka St. in 1904. The building was later extended and modified during the 1910s and 1920s. Photograph Viktor Mácha, 2018.

02.04.03. Brownfields

In view of the all-encompassing scope of industrial heritage – comprising all landscape features, buildings, structures, machinery and equipment from prehistoric times to the present day – when considering the management of industrial heritage it is necessary for practical purposes to focus primarily on those entities which have so far not been investigated (due to their size, complexity, or the difficulty of defining their highly specific values). Attention must focus on researching mining sites, transport corridors, energy installations, and nowadays also abandoned former industrial sites known as brownfields.

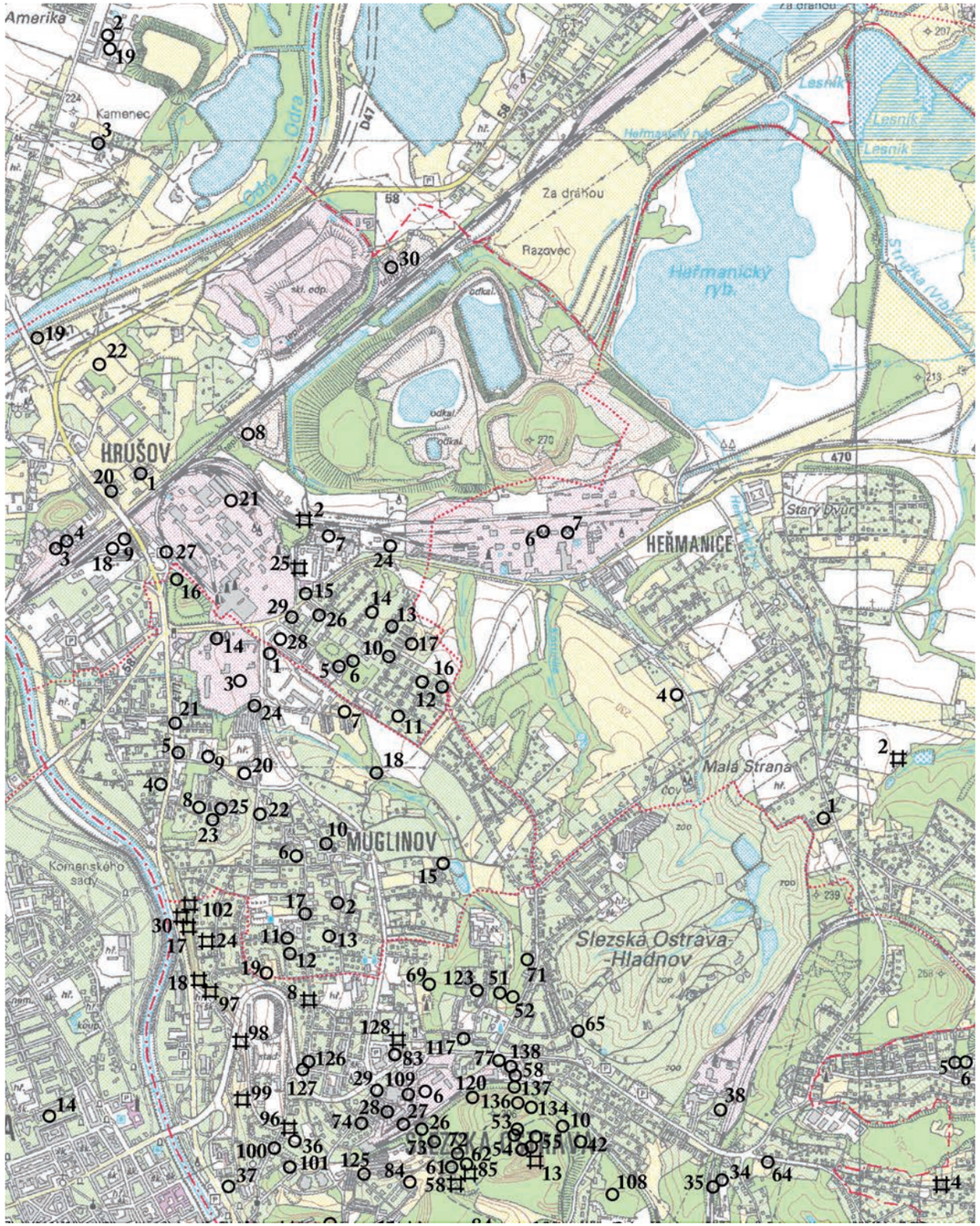
From the perspective of technical monuments, brownfields represent a concentrated yet largely unexplored manifestation of industrial heritage, but they still tend to be viewed in predominantly negative terms. It is therefore essential to elaborate a complete description of a brownfield site; such a description represents a value per se (see chapter 03. Evaluation of industrial heritage) if it describes material risks (e.g. the locations of mine workings where there is a risk of methane escape or the collapse of an inadequately secured shaft, the locations of coking plants and chemical works where there is a risk of groundwater pollution). A precursor to any further activity at such a site should be an assessment of its specific positive and negative values, based on an analysis of its historical, typological and technical development.

Opposite

Brownfields

Ostrava-Karviná coalfield, catalogue of mine openings

In order to carry out an evaluation for heritage management purposes, it is necessary to conduct systematic documentation of all surviving structures. This includes identifying the locations of all known sites (in this case mine workings) within the area under investigation. The mine openings in Slezská Ostrava, marked on an existing 1 : 25,000 map, also represent potential current risk locations. Documentation Jaroslav Klát, 2005–2009.



03. Evaluation of industrial heritage

03.01. Traditional evaluative categories

Technical monuments and industrial heritage are evaluated on the basis of traditionally conceived art-historical, architectural and urbanistic values, as well as values acquired by virtue of their authenticity or importance in the historical context. However, the evaluation of such monuments draws on a broader spectrum of values and specific evaluative criteria, such as typological value, the degree to which technical equipment has been preserved complete and intact, or traces of former operations. In the case of industrial heritage, the traditional categories outlined above (art-historical, architectural and urbanistic values, value derived from age) may acquire new dimensions. To take urbanistic value as an example, structures such as winding towers, blast furnaces or lime kilns have taken on the role of modern landmarks in the urban fabric by virtue of their unprecedented scale and strikingly different forms; such structures played a fundamental role in the transformations of urban and non-urban landscapes during the 19th century.

A monument may be evaluated as important even if its heritage value does not incorporate traditionally conceived values (or if traditional values are only partially present). As a consequence, there have been (and continue to be) cases in which the specific significance of a monument is not recognized and its importance is not appreciated, or when values have been destroyed because traditional (art-historical, architectural) restoration techniques have been used, while the technical essence of the monument has been neglected or even destroyed during the restoration.

Traditional evaluative categories – presence of traditional heritage values

Mohelnice, cast iron fountain

One aspect of documenting industrial heritage involves tracing the work of individual producers. This fountain on the main square in Mohelnice, featuring a statue of the goddess Hygieia, was produced by the Blansko ironworks. Photograph Michaela Ryšková, 2017.

Ostrava-Michálkovice, Michal mine, engine house. Photograph Viktor Mácha, 2018.

Traditional evaluative categories – presence of traditional heritage values

Kokory, brewery

Baroque and Renaissance breweries represent the pre-industrial era. Some buildings from this era are still used to produce beer – such as a Renaissance brewery (1560) in Český Krumlov and a Baroque brewery (1698–1712) in Třeboň. However, due to developments in brewing technologies, in most cases these buildings are now used for different purposes. An example is the former Jesuit brewery in Kokory, in which the value of the symmetrical Baroque architecture (from the first half of the 18th century) is complemented by the artistic (sculptural) ornamentation of the main gate, depicting St. Florian with two putti. Photograph Michaela Ryšková, 2015.

Traditional evaluative categories – presence of traditional heritage values

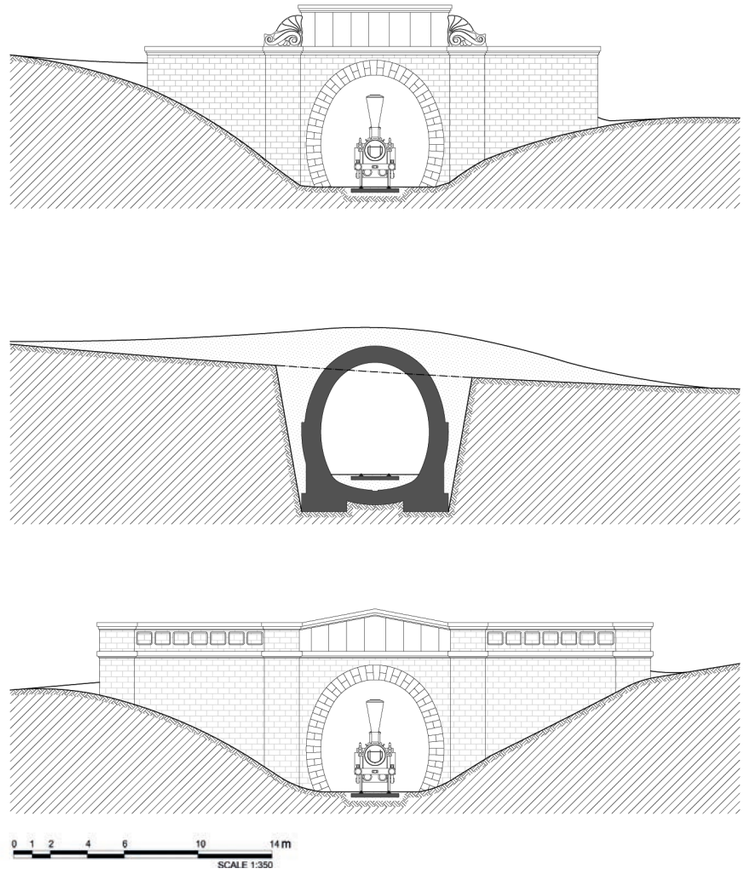
Louny, floodplain bridge

Bridges constitute a sizeable group of technical structures which have been granted legal heritage protection. One example is the floodplain bridge in Louny. The bridge dates from the 16th century, and its current appearance is the result of an Empire-style remodelling in 1814–1863. It is the longest flood bridge in the Czech Republic. Photograph Eva Dvořáková, 2016.

Traditional evaluative categories – presence of traditional heritage values

Slavíč, tunnel

The portals of the tunnel feature distinctive architectural and artistic elements Photograph Michaela Ryšková, 2006.



Traditional evaluative categories – presence of traditional heritage values

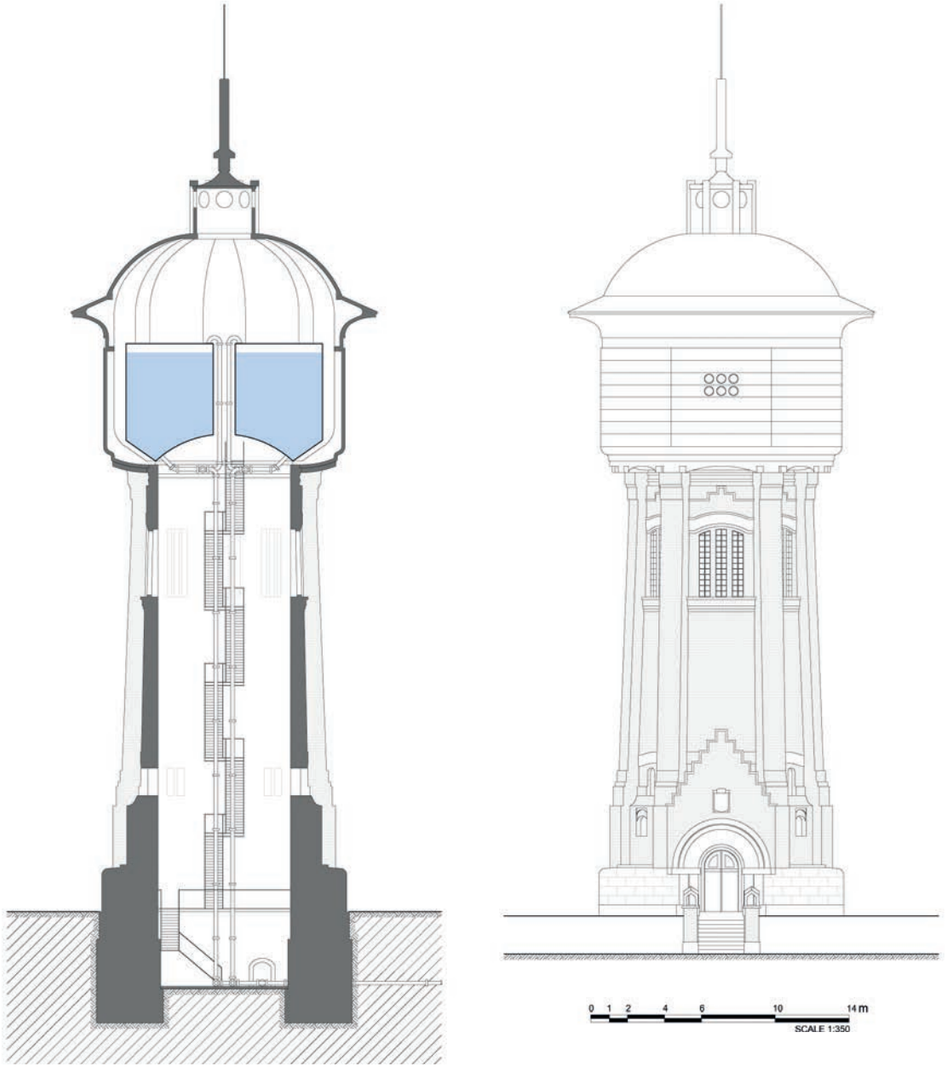
Slavíč, tunnel

The only tunnel on the Emperor Ferdinand Northern Railway (Kaiser Ferdinands-Nordbahn), the tunnel at Slavíč was built in 1846, on the section of the line between Lipník nad Bečvou and Hranice na Moravě, to a design by Karl Hummel. Originally a 12-metre-deep cutting was planned, but the incoherent soil forced engineers to seek a different solution. The 240-metre-long tunnel was excavated as a cutting and then covered. It remained in operation until 1895, when the line was slightly re-routed along a newly built embankment. It is unique among the first railway tunnels in what is now the Czech Republic by virtue of the architectural design of its portals. Diagram Radek Míšanec, portals and lateral section, scale 1 : 350, 2018.

Traditional evaluative categories – presence of traditional heritage values

Prague-Michle, "Green Fox" water tower

This water tower in the Secession style, with a capacity of 1,200 cubic metres, was built in 1906–1907. The structural design was by Karel Kress (whose company also built the tower), the architectural detailing was by Jan Kotěra, and the technical design was by Vladimír Hráský. Although the tower is greatly appreciated for its architectural quality, it is important to view it as an integral part of the Vršovice water supply system, which also incorporated an underground water reservoir, a pumping station and a residential building (in Michle) plus two wells, an engine hall, a boiler hall, and another residential building (in Bráník). The tower remained in service until the 1970s. A modified version of the same design was also used for a water tower in Třeboň. Diagram Radek Míšanec, 2018; photograph Jaroslav Jásek, Prague Water and Sewerage Corporation (PVK) archives, collection of photographs.



Traditional evaluative categories – presence of traditional heritage values

Smržovka, J. Priebsch cotton spinning mill

In many cases, the architectural value of factory buildings is of decisive importance when determining their overall heritage value. The J. Priebsch cotton spinning mill is an example of a factory whose grandiosity and refined architectural forms aimed to impress; the factory has become an important landmark, and is locally nicknamed "the monastery". Photograph Michaela Ryšková, 2015.

Traditional evaluative categories – presence of traditional heritage values

Pardubice, Winternitz Brothers automatic mills

This mill complex on the banks of the Chrudimka River is a similar example of the application of grandiose architectural forms to factory buildings. It was built in two phases to a design by the Czech Rondocubist architect Josef Gočár. The first phase comprised the mill itself, plus a silo with attics featuring swallow-tail forms. The complex was then extended during the 1920s; the original building was raised, a water tank was added, and a new silo was built, linked to the original silo via a bridge. Photograph Michaela Ryšková, 2016.

Traditional evaluative categories – absence of traditional heritage values

Mikulov, Lehnschafter mine complex

Mining sites without above-ground structures lack traditional heritage values; however, such sites may include mine workings (shafts, adits), manifestations of mining activity (subsidence basins and depressions), or the remnants of systems that were used to extract or process raw materials (e.g. canals, ditches and reservoirs for water supply). The Lehnschafter mine complex, a system consisting of four connected adits (horizontal mine tunnels), dates from the 16th to the 19th century. There is a portal at ground level, though it was moved to its current site from the former Karolina adit in Ohníč during the 1990s, and the heritage value of the Lehnschafter complex lies underground. This extensive mine system (which is partially open to the public) includes sections dating back to the first phase of mining activity at the site, including a number of remarkable details such as depictions (chiselled into the rock) of the process used when excavating an adit, dates (the oldest being 1553), and remnants of timber linings. Photograph Ondřej Malina, 2014.

Traditional evaluative categories – absence of traditional heritage values

Ostrava, Emma slag-heap
This conical slag-heap – a spoil-tip consisting of waste material from the Trojice, Emma and Lucie coal mines – dates partly from the second half of the 19th century and mainly from the first half of the 20th century. It is an important landmark on the eastern horizon of Ostrava, and reaching an elevation of 325.5 m above sea level it is one of the highest points in the city. In recognition of its distinctive role as a symbol of Ostrava's coal-mining history, it was declared a cultural monument in 1995 (along with the complex of buildings at the former Trojice mine). Photograph Roman Polášek, 2018.

Traditional evaluative categories – absence of traditional heritage values

Cromford (England), Cromford Mill

The Derwent Valley Mills are a UNESCO World Heritage Site which consists of a number of buildings connected with textile production in the Derwent Valley and along the Cromford Canal: the canal itself, cotton spinning mills (Cromford Mill, Masson Mills with its textile museum, Strutt's North Mill) and a silk mill, plus adjacent towns and villages with workers' housing dating from the late 18th century (Cromford, Darley Abbey, Belper). One of the sites is the complex of buildings at the Cromford Mill – a cotton spinning mill built by Richard Arkwright between 1771 and 1791. The oldest building has been preserved; this multi-storey structure with thick brick outer walls is a typical example of the oldest textile factory buildings, though it lacks appreciable aesthetic qualities. Its value lies elsewhere, as it is the world's first successful water-powered cotton spinning mill, representing one of the breakthrough moments in the Industrial Revolution. Photograph Michaela Ryšková, 2011.

Traditional evaluative categories – absence of traditional heritage values

Letovice, water tower of the Northern State Railway

Work on building the Northern State Railway (Nördliche Staatsbahn) began in the 1840s. This was one of two core strategic railway lines in the Habsburg Monarchy; funded by the state, it connected the major port cities of Hamburg and Trieste. The Northern State Railway was connected to the privately-owned Emperor Ferdinand Northern Railway (Kaiser Ferdinands-Nordbahn), which was under construction at the same time; from this line, the Northern State Railway continued to Prague and then onwards to Podmokly (now Děčín) on the Bohemian-Saxon border, where it linked up to the Saxon railway to Dresden. A linking line between Brno and Vienna was built at a later date. As was the case with the Emperor Ferdinand Northern Railway, the first stations on the Northern State Railway were individually designed. Later, standardized designs were introduced; one of the first structures to feature such a standardized design was a two-floor water tower with single-floor lateral wings, which was built at 14 different locations along the line. The only surviving example of this design is at Letovice (though the wings have been rebuilt). Photograph Michaela Ryšková, 2016.

03.02.Specific evaluative categories

03.02.01. Historical value (positive, negative)

An essential precondition for assessing the historical value of a technical monument is a description of what remains of it – either by projecting historical published and unpublished sources onto the site itself, or by identifying the physical remains (landscape remnants, structures, fragments of technical equipment) using information in historical sources and literature. By analyzing and uncovering a monument's (usually no longer current) function, it is possible to confirm or reject commonly accepted information about it, and if appropriate, to attribute to the location either a positive historical value (if the location provides evidence of a particular stage of technical development or if surviving fragments are of unique importance) or a negative historical value (if the location is affected by pollution, risk of ground subsidence, etc.).

03.02.02. Typological value

Every industry – whether mining, transport, storage or any other – is associated with a specific scale of typological importance. In order to arrive at an objective assessment of typological value, it is necessary to trace the typological development associated with the particular industry and to identify the key moments (turning-points, node points) in the development of a specific technology. This schematic framework should then be populated with all known surviving examples and representatives of the particular industry and technology. This makes it possible to gain an overview of the frequency with which individual developmental phases are represented, and thus the extent to which examples of these phases are either unique or general. Axel Föhl formulated five criteria for the classification of technical monuments and industrial heritage sites: with respect to typological value, these include typicality (historically typical monuments/sites), uniqueness (historically unique monuments/sites), and monuments/sites representing the beginning and end of a developmental process.[17)]

Depending on the frequency with which a type is represented, we can distinguish:

– unique examples, i.e. examples which are the only (surviving) representatives of their particular type, such as basic units of production, technological nodes or symbols of a particular industry – e.g. for the mining industry, mine openings – defined by the portal of an adit or a pit-head building and winding tower; for the iron industry, blast furnaces or steel furnaces and related steelworks structures; for transport, bridges and other types associated with individual modes of transport (air, water, road, rail) – e.g. for rail transport: passenger buildings, depots, signal boxes, water towers, guard-houses etc.; for air transport: passenger terminals, air traffic control towers, hangars, etc.
– typical/characteristic representatives of a particular type, i.e. a single representative of that type selected from a number of surviving examples. Besides the degree of preservation (authenticity), other factors that should be taken into account include technical parameters (production capacity, power, dimensions, etc.), whose importance grows as the values of the parameters become higher (illustrating the limits of the particular technology and technical solution).

In order to arrive at an objective assessment, it is necessary to possess a broad knowledge of surviving remnants, ideally based on territorial and industry-specific research of industrial heritage both in the Czech Republic and in an international context – especially in the case of linear structures (such as railways) or regions which experienced a similar course of economic development, where current international frontiers represent a relatively new element in view of the values under assessment (e.g. in the case of Silesia).

17) FÖHL, Axel. *Bauten der Industrie und Technik*. Bonn, pp. 23–28.

Specific evaluative categories – typological value

Rajhrad, passenger building

Rajhrad station was one of the first three stations built on the Emperor Ferdinand Northern Railway (Kaiser Ferdinands-Nordbahn), ceremonially opened on 7 July 1839. The buildings were designed by the architect in charge of the first phase of construction, Anton Jüngling. A unique feature from the typological perspective is the passenger building, which in the early phase of operation combined its passenger-handling function with the function of an engine-house for locomotives; it was there that the line's first locomotive – the Moravia – was assembled. The entrance to the engine-house was via the central arch of the central risalit (avant-corps); it was later walled up, and the adjacent turntable was taken out of service. Photograph Alena Borovcová, 2012 and collection of Mojmír Leštinský.

Specific evaluative categories – typological value

Korno, Tomášek lime works

The Tomášek company's lime works was built in several stages at the limestone quarry in Korno. It is a unique complex consisting of three types of lime kilns. The oldest is a simple stack-type kiln on a square ground plan with a vaulted access corridor. The next phase of development is represented by one of the original two Pacold-type double-stack kilns, each of which had a pair of cylindrical stacks (the collapsed remnants of the second kiln are also present at the site). The final phase of development is exemplified by a Kohout-type stone-built circular kiln with 12 chambers, dating from 1905; the kiln has been preserved, though without its roof (the only surviving remnants of the original superstructure are the concrete columns encircling the furnace). Photograph Eva Dvořáková, 2016.

Specific evaluative categories – typological value

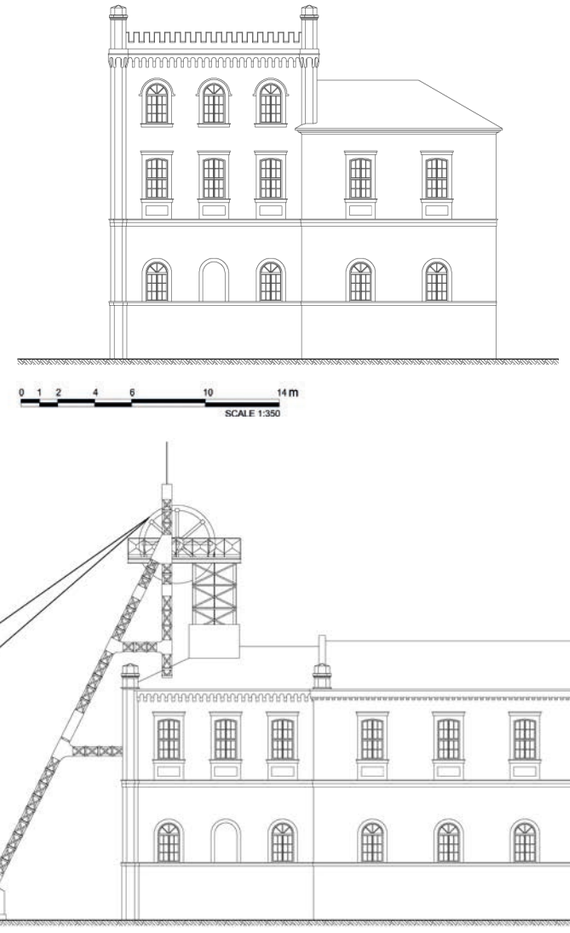
Zbýšov u Brna, winding tower of the Simson mine

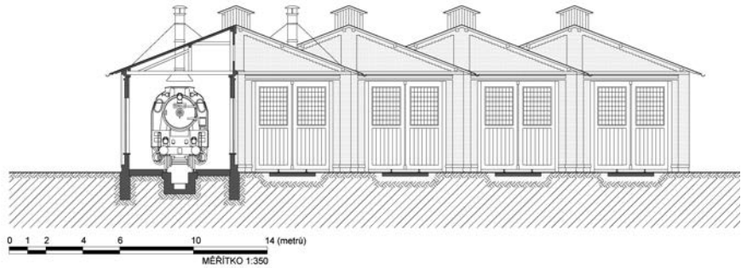
Photograph Rosice-Oslavany Local History Association VSRO (historical postcard showing the situation after the 1902 rebuilding) and Miloš Matěj, 2012.

Specific evaluative categories – typological value

Zbýšov u Brna, winding tower of the Simson mine

The mine's original pit-head building, dating from the 1850s, included an engine hall and a brick-built Malakov-type winding tower featuring architectural motifs of crenellations and corner turrets (upper diagram); the only other use of these features at a coal mine in what is now the Czech Republic was at the Müller mining company's Zbýšov mine and in Žacléř. When the Simson mine was modernized after 1900, a new engine hall was built, the height of the original winding tower was reduced, and a winding tower with a strut-framed structure based on an English model (known as the Thomson trestle was inserted into it (lower diagram); this structure is a unique example of its type in the Czech Republic. Diagram Radek Míšanec, scale 1 : 350, 2018.

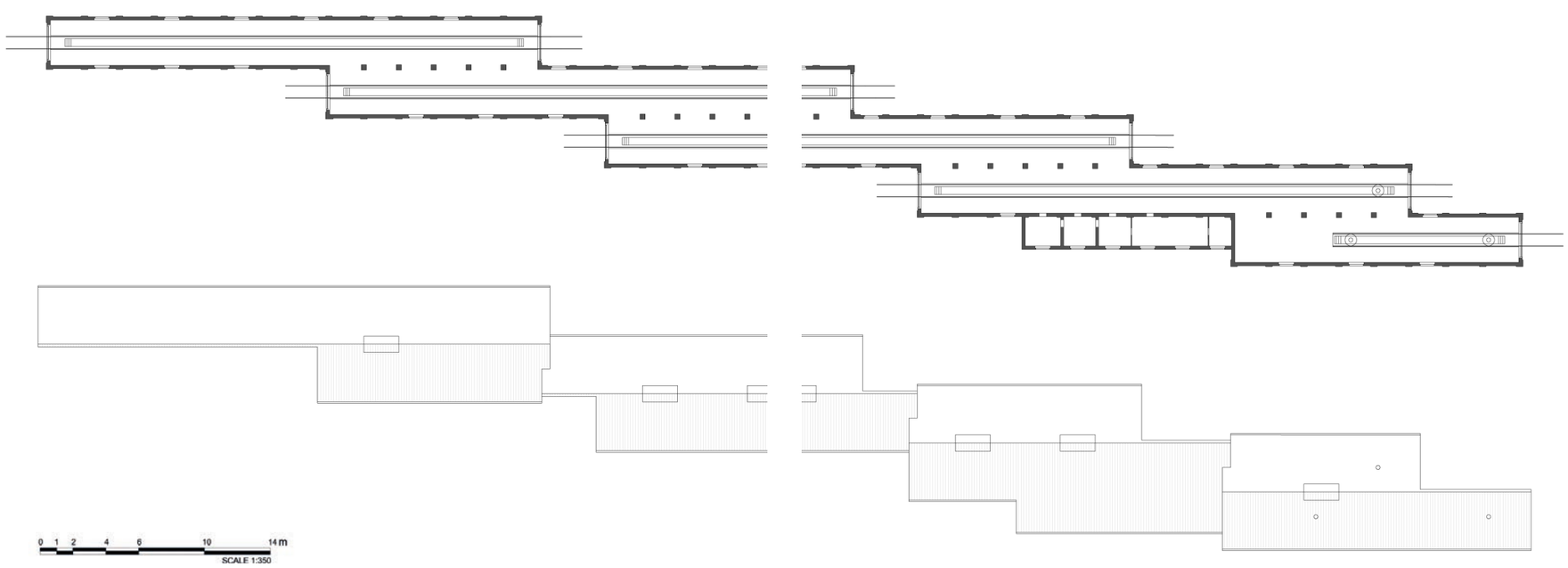


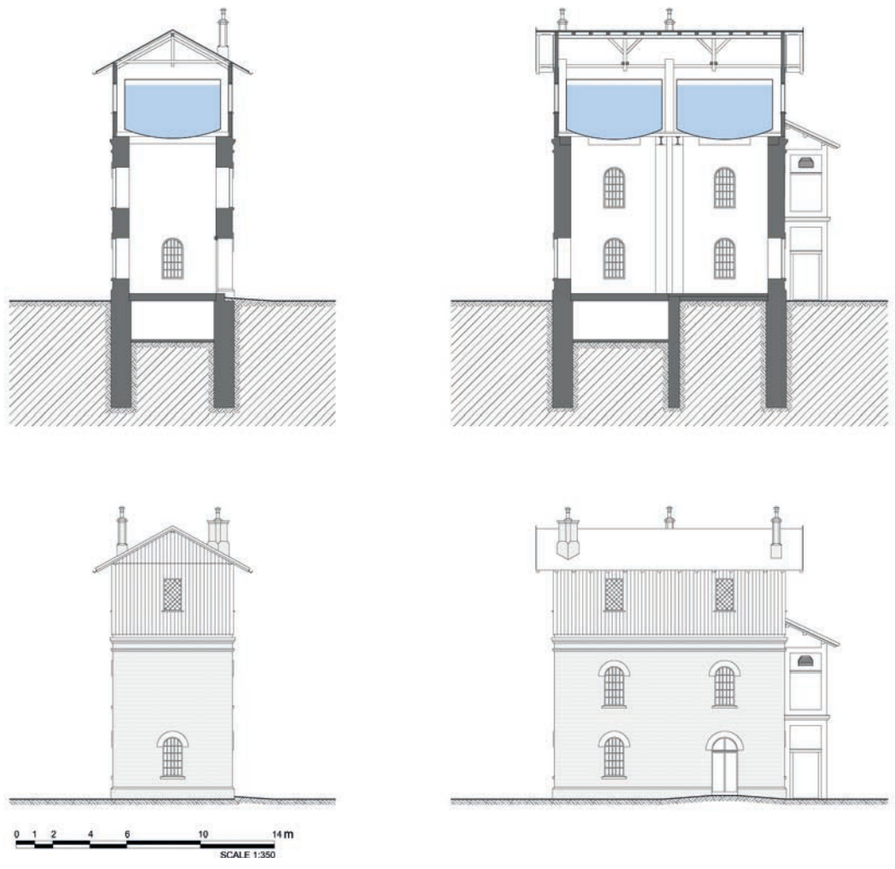


Specific evaluative categories – typological value

Ostrava, Montanbahn locomotive engine-house

This typologically unique sawtooth-type engine-house was built in 1909 for the Montanbahn (mine railway) of the Emperor Ferdinand Northern Railway (Kaiser Ferdinands-Nordbahn) at the marshalling yard of what is now Ostrava's main station. Most engine-houses were built either on rectangular or circular ground plans (the latter type also known as roundhouses); this is the only example of a sawtooth-type layout, which was evidently chosen due to the limited space available. Diagram Radek Mišanec, 2018, scale 1 : 350; photograph Alena Borovcová, 2012.

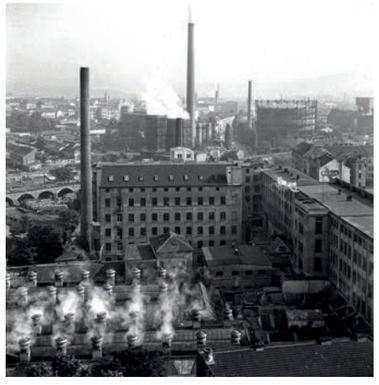


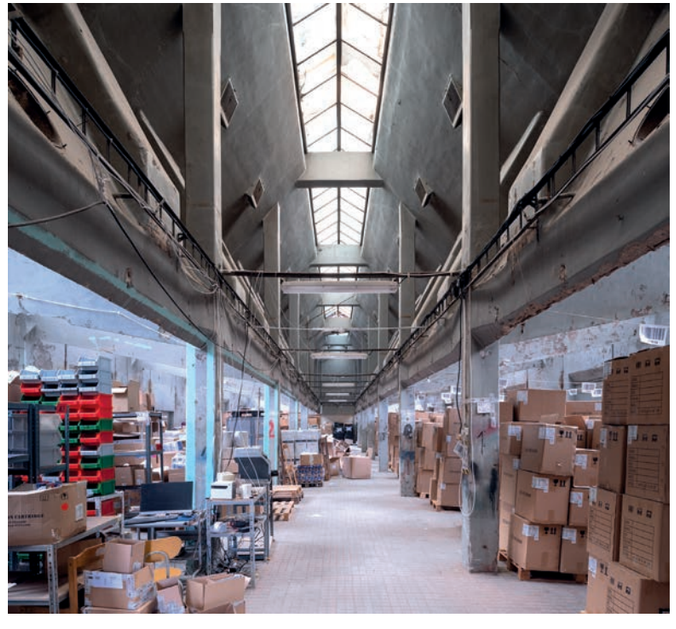


Specific evaluative categories – typological value

Skalice nad Svitavou, water tower of the Northern State Railway

The earliest phase of building on the Northern State Railway (Nördliche Staatsbahn) was characterized by individual designs, but later phases shifted towards the use of standardized designs – tried-and-tested templates which were built repeatedly at different locations. The water tower in the station at Skalice nad Svitavou is a three-floor structure with two circular tanks, built to a standardized design elaborated by the Imperial-Royal Directorate for the Lines of the Former State Railway Company dating from 1910. Diagram Radek Míšanec, 2018, scale 1 : 350.





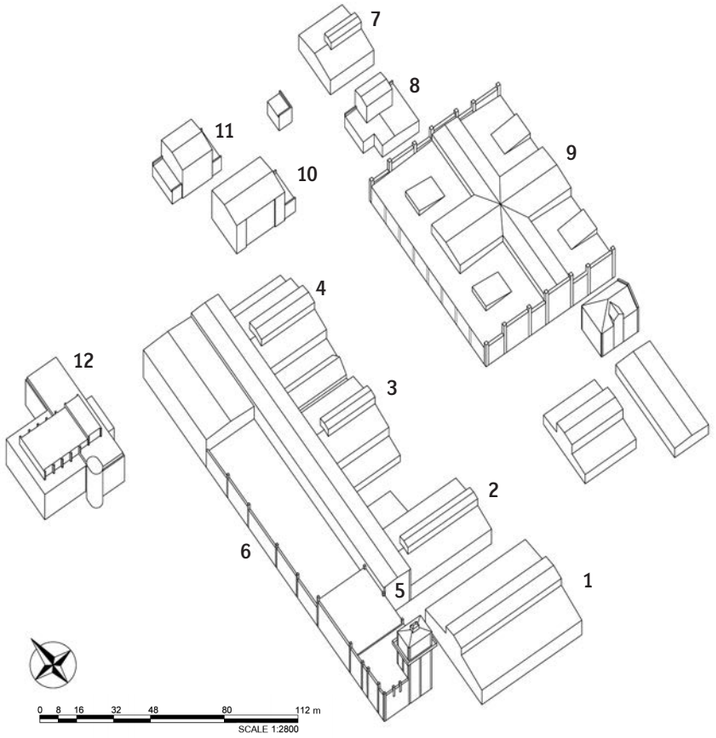
Specific evaluative categories – typological value

Brno, dyeing shops of the United Woollen Goods Factories and the D. Hecht factory

The specific conditions and requirements of woollen goods finishing shops were reflected in the structural designs used in their buildings. Heat, steam, and the fumes from the dyeing tanks were extracted from dyeing shops via open skylights at the top of the roof. The architect Bruno Bauer, a specialist in reinforced concrete industrial buildings, incorporated these ventilation systems into the monolithic structures of his buildings. Photograph Viktor Mácha, 2018 (top – D. Hecht dyeing shop, bottom – United Woollen Goods Factories) and the Moravian Museum, photographic archives of the History Department, inv. nos. K319, K915 (United Woollen Goods Factories dyeing shop).

Specific evaluative categories – typological value

Prague-Holešovice and Brno-Trnitá, central slaughterhouses
Although it was not unusual for cities to build municipal slaughterhouses in the 19th century, it was not until cities began to experience rapid growth (as a result of industrial development) that the necessity for central slaughterhouses arose; these facilities were built to replace operations at small-scale slaughterhouses and home slaughtering. Two types of large-scale slaughterhouse can be distinguished according to their functional configuration. The first configuration was used at the Prague central slaughterhouse in Holešovice. It consisted of separate buildings connected by a system of streets. The second type of central slaughterhouse concentrated operations in a single building, or in several buildings linked by covered corridors or connecting routes; the Brno central slaughterhouse in Trnitá is an example of this type.



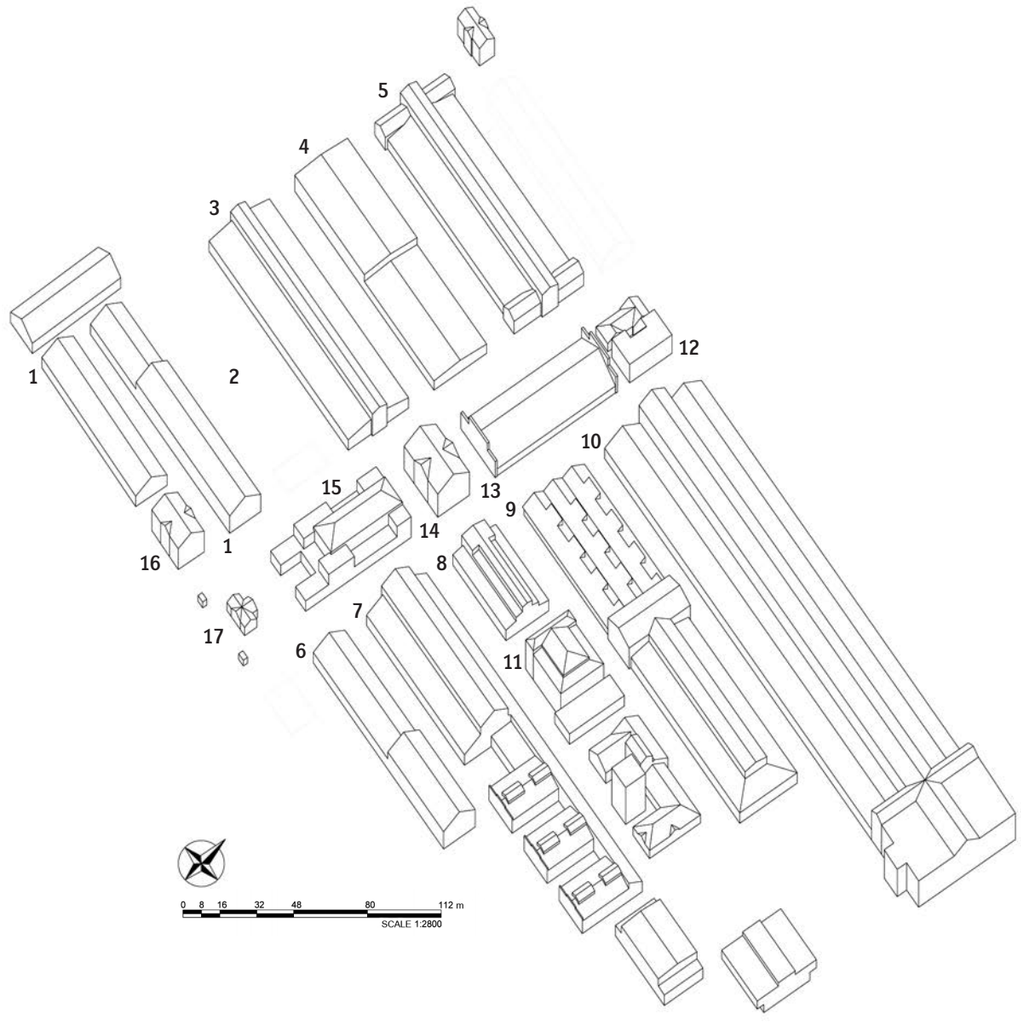
Specific evaluative categories – typological value

Brno-Trnitá, central slaughterhouse

Axonometry, current situation. Legend: 1 – holding area for cattle; 2 – slaughtering area for cattle; 3 – slaughtering area for small livestock (sheep); 4 – slaughtering area for pigs; 5 – covered corridor; 6 – cold stores, engine hall, boiler hall, water tower; 7 – slaughtering area for horses; 8 – auxiliary building; 9 – cattle market (earlier phase); 10 – office building; 11 – residential block; 12 – meat market (1920s, architect Bohuslav Fuchs). Diagram Radek Míšanec, 2018, scale 1 : 2,800.

Specific evaluative categories – typological value

Brno-Trnitá, central slaughterhouse. General view from Masná Street and the main connecting route. Photograph Michaela Ryšková, 2009.



Specific evaluative categories – typological value

Praha-Holešovice, central slaughterhouse

Axonometry, current situation. Legend: 1 – holding area for cattle; 2 – open-air holding area; 3 – cattle market; 4 – open-air holding area, covered holding area; 5 – small livestock market; 6 – holding area for cattle; 7 – slaughtering area for cattle; 8 – slaughtering area for sheep and calves; 9 – meat market, cold stores; 10 – slaughtering area for pigs; 11 – tripe processing area, boiler hall, chimney, engine hall, water tower; 12 – slaughtering area for police purposes; 13 – vehicle parking area; 14 – office building; 15 – market and inn; 16 – residential block; 17 – main entrance flanked by statues, reception. Diagram Radek Míšanec, 2018, scale 1 : 2,800.

Specific evaluative categories – typological value

Praha-Holešovice, central slaughterhouse

Holding areas and slaughtering areas for cattle, at the bottom the main entrance with a residential block and the reception.

Photograph Michaela Ryšková, 2017.

Specific evaluative categories – typological value – emblems and symbols

Karviná and Houthalen (Belgium), winding towers of defunct coal mines

The preservation of individual winding towers in former coalfields represents one way of preserving place memory while also retaining important landmarks in the local landscape. Photograph Jana Kynclová, 2016 (Barbora mine, left), Michaela Ryšková, 2009 (Houthalen, right).

03.02.02.01. Emblems and symbols

During the course of their typological development (or at least in some phases of this development), many technical and industrial structures were so distinctively influenced by their function that a characteristic configuration of operational components or buildings, a specific structural form or a typical detail took on an emblematic role, making the structure immediately recognizable as an example of its type. From around the end of the 19th century, the distinctive structural configurations of winding towers thus became emblems of the mining industry as a whole, even though they in fact represent only a relatively short phase in the industry's complete course of development. A range of other structures and features (details) played a similarly symbolic, emblematic role: chimneys came to symbolize industry in general, grain silos symbolized agricultural areas, distinctive conical roof structures symbolized malt houses, cooling towers or power line pylons symbolized power generation, and so on.

However, this symbolic relationship also operated in the opposite direction. Established architectural forms (styles) or unified shared architectural features were used in order to symbolize, or rather demonstrate, that a building belonged to a particular company – or even to a state (the Habsburg Monarchy). In the case of linear structures (railways) and large companies, such features should be evaluated in the context of their era and in the context of Central Europe as a whole, in order to understand the operational and economic intentions underlying the use of these features.

Specific evaluative categories – typological value – emblems and symbols

Kladno, Vojtěch ironworks, lime kilns

This trio of stack-type lime kilns at the Vojtěch ironworks plays an important role in graphic representations of the site and its history. The kilns have been incorporated into the logo of the "Kladno – záporno" project, which seeks to raise awareness of the values associated with Kladno's history of mining and industry. Photograph Viktor Mácha, 2018.

Specific evaluative categories – typological value – emblems and symbols

Žatec, Dreher malt house and brewery and Olomouc-Holice, Heller & Husserl malt house

Among the most obvious identifying features of any type of building were the roofs of malt houses. The silhouette of the covered ventilation chimneys is a distinctive identifying feature of a malt house. Photograph Eva Dvořáková (Dreher malt house and brewery) and Michaela Ryšková (Heller & Husserl malt house, below), 2018.

Specific evaluative categories – typological value – emblems and symbols

Lichoceves–Suchdol, section of VHV power line

This almost 4 km-long section of VHV power line between Lichoceves and Suchdol is a remnant of a line built to connect the Ervěnice power station with the city of Prague in 1924–1926. It constitutes a complete technical ensemble, including three basic standardized types of pylons used on the oldest existing VHV power lines in the former Czechoslovakia, all preserved in their original state (with the exception of the insulating elements). Photograph Jiří Chmelenský, 2018.

Specific evaluative categories – typological value – emblems and symbols

Hustopeče, grain silo

Granaries and grain stores were a distinctive feature of agricultural landscapes; nowadays, large-capacity reinforced concrete grain silos play the same role in the landscape. These structures consist of deep ventilated storage chambers with four-sided ground plans (later also six-sided and circular), configured into groups sharing the same roof. There are numerous examples of such grain silos in the Czech Republic, the oldest dating from the 1920s (e.g. Znojmo-Starý Šaldorf, Kojetín). Developments in the structural design of silos (especially after the Second World War) shifted to an emphasis on standardized large-capacity reinforced concrete structures with storage chambers based on circular or hexagonal ground plans; the largest of these (at Hustopeče) is over 200 metres in length and has a capacity of 93,000 tonnes.

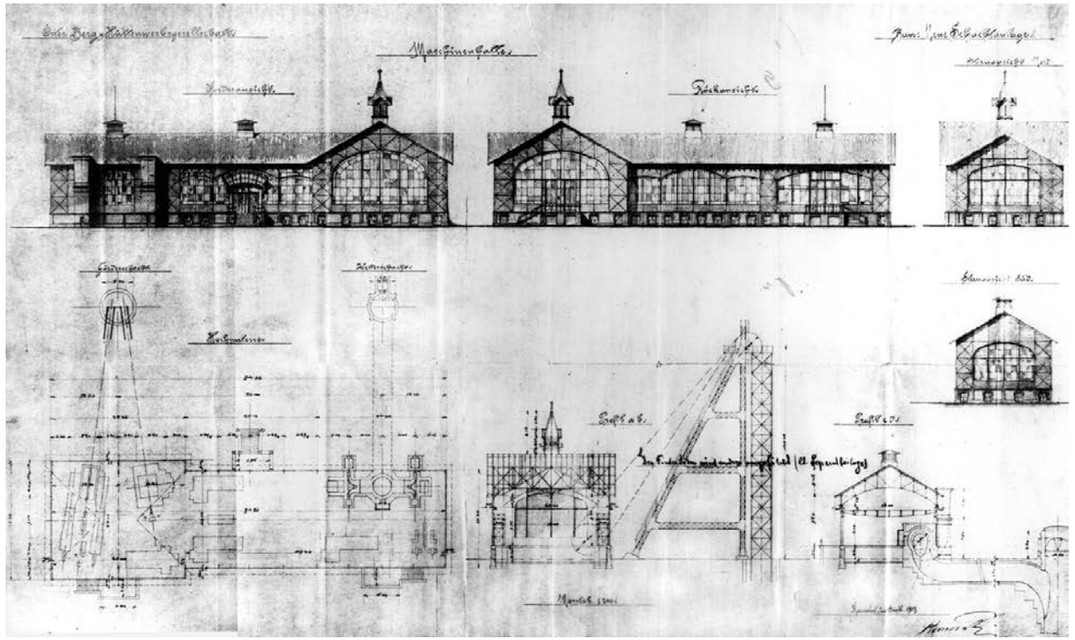
Specific evaluative categories – typological value – emblems and symbols

Ostrava, Hlubina mine, Vítkovice, coking plant and blast furnaces

One of the fundamental values of this national cultural monument is the overall panorama of the Hlubina coal mine and the coking plant and blast furnaces of the Vítkovice ironworks – a panorama which has become a symbol of the city of Ostrava. The skyline consists of the Hlubina mine winding tower, a trio of blast furnaces, the blast stoves of blast furnace no. VI, the coal tower of the coking plant, plus chimneys and material transportation bridges. The original panorama has been disrupted by the demolition of some transportation bridges and the addition of a superstructure to blast furnace no. I. Photographs Miloš Matěj, 2006 and Michaela Ryšková, 2016.

03.02.02.02. Precursors, models, modules

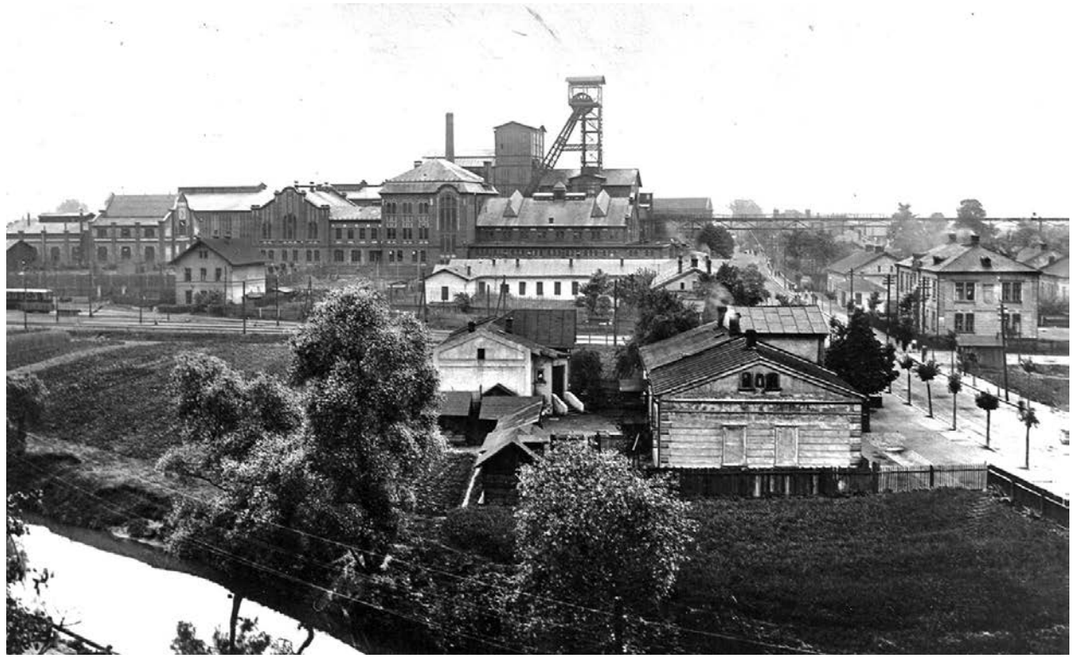
Established technical, structural or architectural solutions may perform the role of precursors which are imitated at different locations for similar purposes. This process may involve the adoption of model solutions that were published in the contemporary literature, the application of established solutions (operational, technical or architectural), or the use of established modular structural systems.



Specific evaluative categories – typological value – precursors, models, modules

Dortmund (Germany), Zollern 2/4 mine and Karviná-Doly, Barbora mine

The Zollern 2/4 mine in Dortmund (1903–1904) was used as the model for the Barbora mine in Karviná (built in 1908). Besides imitating the German mine's modern technical configuration (concentrating all the above-ground machinery in a single monumental engine house), the Karviná mine also adopted the elliptical window as an architectural motif accentuating the main entrance. Photographs Miloš Matěj, 2005 (Zollern 2/4) and 2007 (Barbora). Opava Provincial Archive, BHS-BŘ collection, 1906–1945, cat. 334, invent. no. 1886, reproduction by Opava Provincial Archive.



Specific evaluative categories – typological value – precursors, models, modules

Ostrava, Michal and Hermenegild mines

The same design by the architect František Fiala was applied during complete reconstructions of the above-ground structures at two coal mines in Ostrava, evidently in order to emphasize their shared corporate identity as well as demonstrating their economic strength and technical sophistication. The design was implemented at the Michal mine in Michálkovice and the Hermenegild mine in Slezská Ostrava in 1912–1915. The Hermenegild mine (later renamed Zárubek) was demolished in the 1990s after not receiving legal heritage protection.

Hermenegild/Zárubek mine, general view and courtyard area with the registration room (at the centre), boiler hall (left) and engine hall (right) in 1972. Photograph Landek Park Mining Museum, collection of photographs (historical postcard) and archives of the National Heritage Institute (Methodological Centre for Industrial Heritage), technical monuments Ostrava, historic fonds from the Ostrava-Karviná coalfield mines: evaluation of the current situation, phase II, SURPMO (Specialized Institute for the Reconstruction of Historic Urban Areas and Structures), 1972.

Specific evaluative categories – typological value – precursors, models, modules

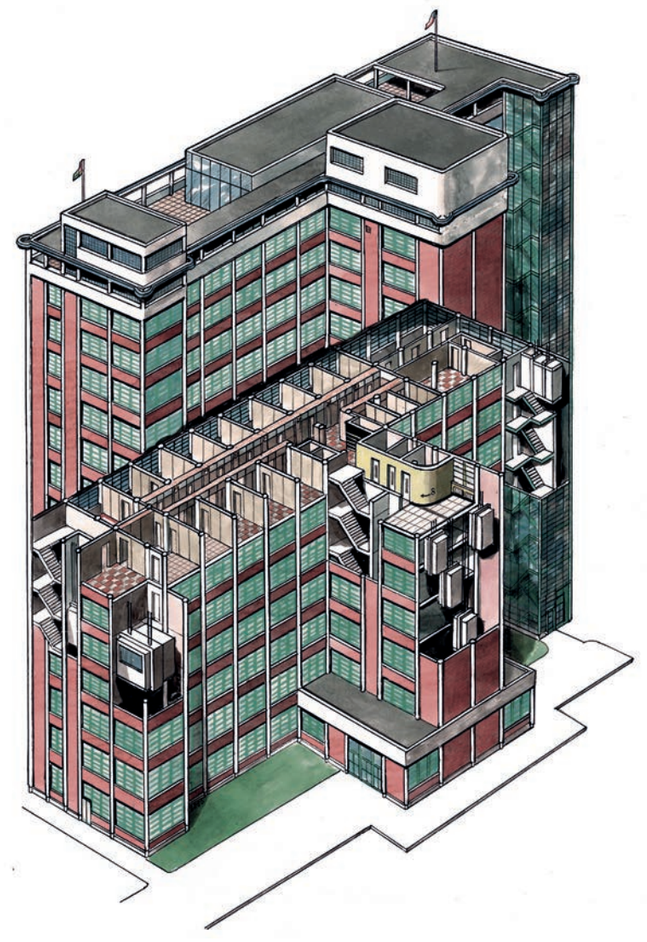
Ostrava, Michal and Hermenegild mines

Michal mine, street-facing façade of the office building and general view of the mine site. Photograph Michaela Ryšková, 2018 and Landek Park Mining Museum, collection of photographs (historical postcard).

Specific evaluative categories – typological value – precursors, models, modules

Oslavany, Kukla mine, and Pécs (Hungary), Emperor Franz Joseph mine and Count Andrássy mine

The Kukla mine in Oslavany (built 1911–1913) became a model for mines built in the Hungarian city of Pécs, which (paradoxically) are often cited as among the first examples of the use of reinforced concrete in winding towers. Photograph Miloš Matěj, 2013 (top – Kukla mine, centre and bottom – mines in Pécs).



Specific evaluative categories – typological value – precursors, models, modules

Zlín, Baťa

A modular system based on reinforced concrete modules of 6.15 × 6.15 × 6.15 m became the officially standardized structural unit for almost all of the Baťa company's production facilities, making it an unmistakable distinctive feature of the company's architecture. The Baťa module was also used in public buildings whose construction was financed by the company, as well as in the company's other production facilities practically all over the world. Administrative building no. 21, drawing Jaroslav Staněk, 2016.

Specific evaluative categories – typological value – precursors, models, modules

Zlín, Baťa, city centre with part of the Baťa factory complex (top left) and a less compact area of public and commercial buildings which also adopted the company's modular structural system. Legend: 1 – Baťa company factory complex; 2 – office building, no. 21; 3 – market; 4 – department store; 5 – community centre, hotel; 6 – hostels for workers; 7 – study institutes; 8 – Tomáš Baťa memorial; 9 – buildings of Tomáš Baťa University, designed by the architect Eva Jiřičná and built on the site of the Masaryk schools (which were demolished due to the poor technical condition of their concrete structures). Drawing Jaroslav Staněk, 2016.

03.02.03. The value of the technological flow

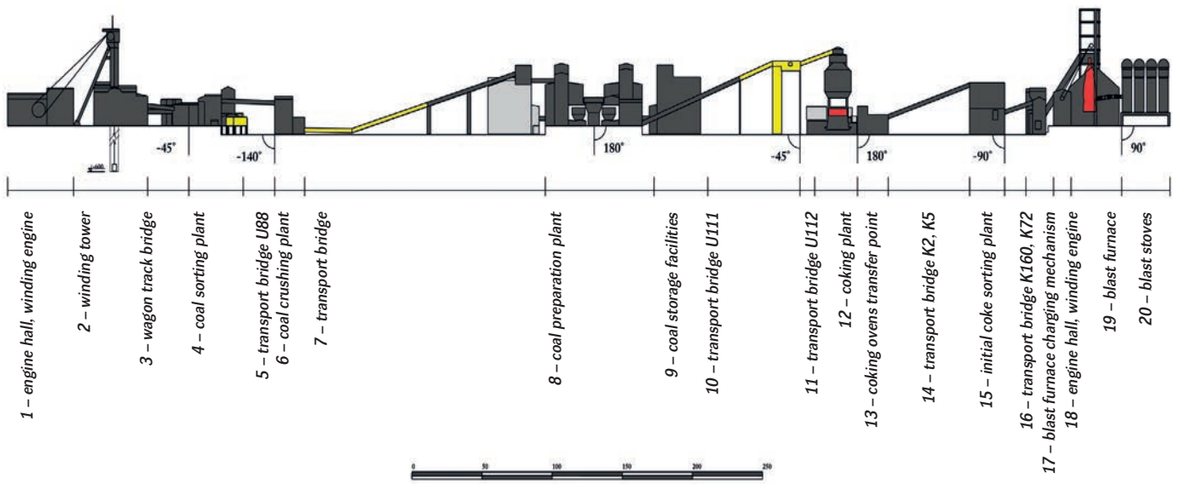
When assessing industrial heritage, it is essential to analyze technological interconnections and technological flows. The technological flow – i.e. the complete course of the production process, from raw materials to the finished product – is an integrated set of technical equipment and interconnections. Although the individual elements that combine to make up the technological flow may possess limited or zero heritage value when viewed in isolation, in their broader context they all acquire the value of the technological flow as a whole. Without these individual elements, the technological flow as a whole would be incomplete; it would lack operational logic and functionality, and it would lose part of its value. An individual technological component that individually lacks heritage value may nevertheless acquire this value by virtue of forming part of a technological flow, so technical equipment must always be evaluated in its broader context.

Failure to take this broader context into account may lead to situations in which only the more visually interesting parts (or the oldest parts) of a logically integrated flow are preserved, while the technologically essential remainder is removed. The resulting fragment thus becomes a mere incomplete remnant, detached from its essential technological context, its meaning thereby rendered opaque. However, due to the extreme difficulty and limitations of finding new uses for complete technological ensembles in their entirety, it is only in exceptional cases that the technological flow can be preserved to its complete extent.

Within the context of a single production site, it is important to identify those key structures and examples of technical equipment which were essential for its operations. For example, an underground mine is characterized by its pit-head building, winding tower and engine hall (including machinery), while its accompanying components include the sorting plant, coal preparation plant, ventilator building and compressor building. A textile factory displaying the complete production cycle will consist of a spinning mill, a weaving mill and a finishing shop. Modern sugar refineries encompass the entire technological flow, incorporating facilities for washing the raw material (sugar beet) and implementing the subsequent steps in the production process: cutting, soaking (diffusion), pressing, purification, filtration, evaporation, boiling, crystallization, and centrifugal separation. These elements may be accompanied by a lime kiln. In the past, this process was often divided between two sites – one processing the beet into raw sugar, and the other refining the raw sugar into the finished product.

Besides buildings and equipment directly related to production processes and technologies, an integral part of industrial sites is also their power generation equipment: boilers, steam engines or steam turbines, water supply structures, water wheels or water turbines, and in the case of electrified factories also switching stations.[18)]

18) Industry-specific typologies and technological entities and flows will be discussed in subsequent industry-specific methodological publications.

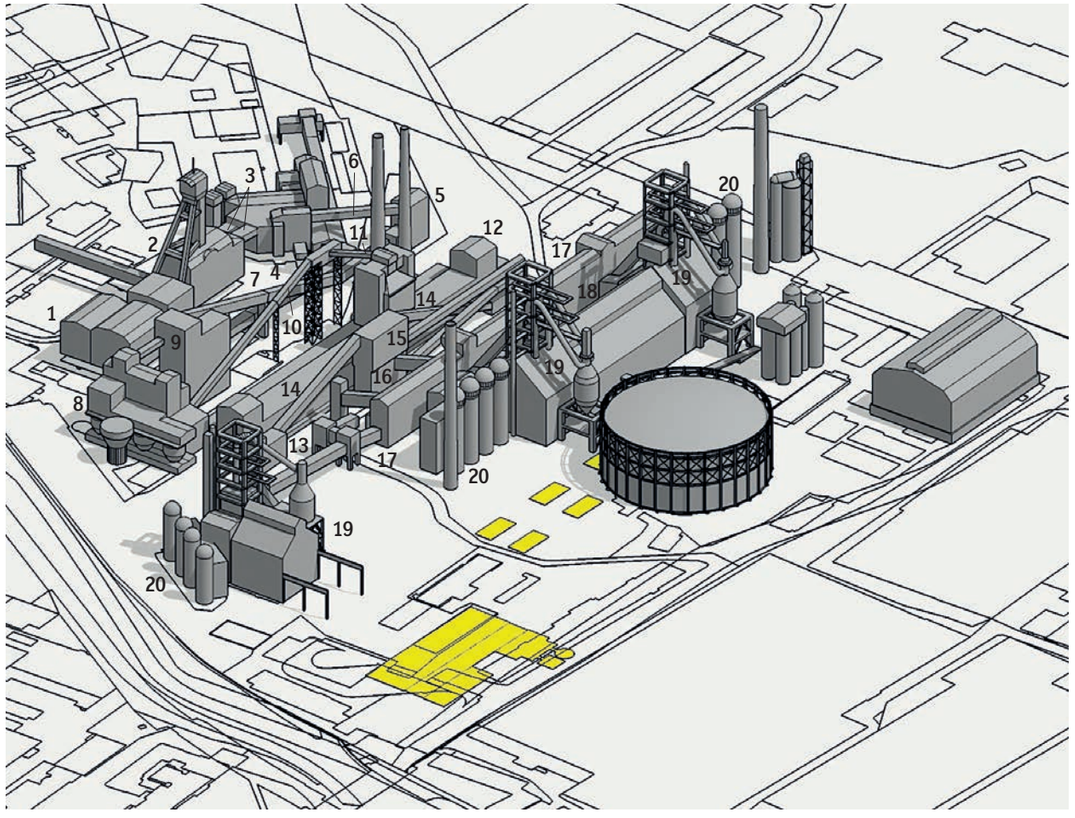


Specific evaluative categories – the value of the technological flow

Ostrava, Hlubina mine, Vítkovice, coking plant and blast furnaces

In 1828, Archbishop Rudolf of Olomouc (Olmütz) established an ironworks in the village of Vítkovice, located at a mill-stream fed by the Ostravice River. The plan was to use the local coal to produce iron in coke-fuelled blast furnaces. Vítkovice was the first ironworks in the Habsburg Monarchy to puddle iron (1830) and to use coke in iron production (1836). The establishment of the Hlubina coal mine adjacent to the ironworks created a unique technological flow on a relatively compact site, encompassing coal mining, coke production and iron production. The ironworks remained operational until 1998. The values of the complex have been defined as follows: 170 years of unbroken production, a complete technological flow (coal – coke – iron), the technical and architectural values of the individual components which combine to make up the technological flow, the panorama (a skyline which has become a symbol of the city of Ostrava), and the genius loci embodying Ostrava's image as a "steel city". Thanks to these combined values, the individual components of the technological flow have been declared cultural monuments, and the complex as a whole is a national cultural monument. The Vítkovice complex was also one of the sites in Ostrava selected to be nominated for inscription as a UNESCO World Heritage Site.

The diagram depicts the node points in the technological flow (the winding tower, winding engine, sorting plant, coal preparation plant, coal storage facilities, coking plant – production area in red, bellows, gas-holder) and the interconnections between the nodes (technological bridges, pipelines). The demolition of several bridges (marked in yellow) made the technological flow less clearly visible and detracted from the heritage value of the complex. Diagram Pavel Maren, 2015.



Specific evaluative categories – the value of the technological flow

Ostrava, Hlubina mine, Vítkovice, coking plant and blast furnaces.

Axonometry. Legend: 1 – engine hall, winding engine; 2 – winding tower; 3 – wagon track bridge; 4 – coal sorting plant; 5 – transport bridge U88; 6 – coal crushing plant; 7 – transport bridge; 8 – coal preparation plant; 9 – coal storage facilities; 10 – transport bridge U111; 11 – transport bridge U112; 12 – coking plant; 13 – coking ovens transfer point; 14 – transport bridge K2, K5; 15 – initial coke sorting plant; 16 – transport bridge K160, K72; 17 – blast furnace charging mechanism; 18 – engine hall, winding engine; 19 – blast furnace; 20 – blast stoves. Diagram Pavel Maren, 2018.

Specific evaluative categories – the value of systemic and technological interconnections
Narvik–Kiruna–Luleå (Norway, Sweden), systemic interconnections, chain of production
Kiruna (Sweden), mine. Photograph Miloš Matěj, 2018.

03.02.04. The value of systemic and technological interconnections

Because no production process can exist entirely in isolation, detached from the geographical and social context of the time in which it takes place, a description of systemic and technological interconnections is an essential evaluative criterion. The basis of such a description are the connections between resources (raw materials), their transportation, the production process, the transport of products to the place of consumption, and institutions providing social stability (catering, accommodation, education, health care, social services). In more complex cases (especially in industrial agglomerations), these interconnections involve different production processes and industries cooperating with transportation systems (which have emerged during the course of history and correspond with local geographical conditions) and institutions providing social stability. An example of this cooperation can be found in the Ostrava-Karviná agglomeration; the area was a source of raw material and fuel (coal), which was then processed into coke, iron and power, as well as being further processed by the chemical industry.

These systemic and technological interconnections are represented by examples of individual industries (mines, coking plants, blast furnaces, gas-holders, power plants, railway signal boxes, workers' housing schemes, etc.) and the node points of technological flows (technical equipment, buildings and landscape traces demonstrating individual production processes). The historical experience associated with these interconnections is a source of positive value, even if subjective perceptions may be quite the opposite, associating these elements with negative phenomena such as noise, smoke, dust, visual ugliness, social problems, or even accidents and catastrophes. Characteristics of systemic and technological interconnections (including their positive value) include the quantification of production volumes during specific developmental phases, historical innovations, inventions, local traditions, or exceptionality.

Specific evaluative categories – the value of systemic and technological interconnections
Narvik–Kiruna–Luleå (Norway, Sweden), systemic interconnections, chain of production

An example of systemic interconnections and the chain of production is the use of blast furnaces to produce pig iron; blast furnaces were generally built at locations with deposits of cokable coal. However, high-quality iron ore had to be transported to the ironworks from elsewhere, and this often brought substantial complications. High-quality Swedish ore mined in the region of Kiruna and Gällivare was used by most of Europe's major ironworks (including the Vítkovice ironworks). To transport the ore to the works, the so-called Iron Ore Line (Malmbanan) was built, linking the mines with the nearest seaports. The first part of the line to be built (in the 1880s) was from Kiruna via Gällivare to the Swedish port of Luleå. However, the port froze up in the winter, so in 1902 a highly demanding mountain section of the railway (known as the Ofoten railway) was built connecting Kiruna to the Norwegian port of Narvik; the port itself had been built to transport Kiruna ore, and it was ice-free all year round, being located on the Gulf Stream. The strategic importance of this railway was highlighted by events in 1940, when it became the scene of the first large-scale sea and land battles of the Second World War, with German units facing Norwegian, British and Polish land and sea units. A characteristic feature of the Iron Ore Line was its use of distinctive wagons with three axles, which still serve as symbolic emblems of the line. At the line's former directorate, above the port of Narvik, is Museum Nord, which includes an exhibition on the construction of the line and the structural and technical development of the port. Photograph Miloš Matěj, 2018 (Vassijaure station passenger building and water tower on the Kiruna–Narvik line, port in Narvik).

Specific evaluative categories – the value of systemic and technological interconnections

Prague-Vinohrady, Transgas

The issue of heritage value has been repeatedly discussed in the case of a complex of structures built in 1972–1978 for the control centre of the central gas transit pipeline, the Federal Ministry of Fuel and Energy and the World Federation of Trade Unions to a design by Václav Aulický, Jiří Eisenach, Ivo Loos and Jindřich Malátek (collectively known as the Transgas complex). The complexity of the issue is reflected in the fact that even among experts from the National Heritage Institute, there is no clear consensus opinion. The Committee for the Protection of Heritage Assets from the Second Half of the 20th Century (part of the Institute's General Directorate) has recommended that the complex be declared a cultural monument, basing its opinion on urbanistic and archeological values and the values embodied in the technical and structural solutions applied at the site ("the levitating angular mass of the control centre, which thanks to Juraj Kozák's ingenious design is supported at just four points in order to protect the computer technology from vibrations emanating from trains in railway tunnels under the site") as well as the values derived from the complex's age and authenticity. From the perspective of industrial heritage, the control centre is also important in terms of its systemic interconnections, as well as the technical value embodied in its use of technology which was pioneering at the time of construction. The complex was built as part of a gas transit pipeline from the Soviet Union to Western Europe. It thus formed part of an energy system which reached beyond national boundaries in both scale and importance, and this was reflected in the construction of a control centre equipped with the latest computer technologies. The specific demands of the centre's function and location were reflected in the structural solutions applied; the original function is thus imprinted on the structure itself (despite the absence of the original equipment). Photograph Michaela Ryšková, 2017.

Specific evaluative categories – the value of systemic and technological interconnections

Ostrava, industrial agglomeration

The discovery of coal deposits and the beginnings of systematic mining in what is now the city of Ostrava date back to the mid-18th century, and the mining industry developed very rapidly in the 19th and 20th centuries. Around 350 mine openings (shafts, adits) were dug within the territory of today's city. In 1828 the Vítkovice ironworks were established in the cadastral area of Vítkovice (at that time a separate village); the intention was to produce iron for the construction of the Emperor Ferdinand Northern Railway (Kaiser Ferdinands-Nordbahn) which was to lead northwards from Vienna to the salt mines in Galicia; Ostrava was connected to the railway in 1847. The railway thus stimulated Ostrava's further development; it provided a market for the locally produced rails and railway wheels, as well as acting as a distribution channel for local coal. Coal mining led to the establishment of coking plants, power plants and chemical works. The population grew very rapidly, creating an urgent need to build new housing, especially in the final quarter of the 19th century. Miners' housing schemes built in the vicinity of collieries still make up a substantial part of the housing stock in certain districts of the city. Vítkovice experienced the most dynamic growth; thanks to the plans devised by the ironworks director Paul Kupelwieser, an entire new town (known as "New Vítkovice") sprang up on greenfield sites between 1870 and 1914. The new town included a central square flanked by important buildings (a church with a tower that also functioned as a water tower, a town hall, a company hotel, and new residential buildings), as well as other developments stretching out along the newly created streets (including a hospital, schools, a preschool, a creche, an orphanage, a senior citizens' home, shops, a market hall, a gymnasium, plus outdoor and indoor swimming pools). Several important components in this structure are legally protected heritage sites: former coal mines (including 13 winding towers as symbols of the industry and landmark features of the urban fabric), the complex consisting of the Hlubina coal mine and the Vítkovice coking plant and blast furnaces (known as the Lower Vítkovice complex), technical equipment at the adjacent metallurgical plants, the industrial town of "New Vítkovice", the locomotive engine-house at the mining railway (the Montanbahn, which linked individual mines to the main railway line), and the passenger buildings at Ostrava-Svinov railway station (built for the Emperor Ferdinand Northern Railway), Ostrava-Vitkovice and Ostrava-střed. The image shows Vítkovice (blast furnaces and rolling plant), historical postcard, collection of Miloš Matěj.

Specific evaluative categories – the value of systemic and technological interconnections

Ostrava, industrial agglomeration

One of the legally protected former mine sites within the city of Ostrava (and one of the monuments on the indicative list for UNESCO World Heritage Site status) is the Vrbice ventilation shaft, established by the Emperor Ferdinand Northern Railway Mining Company. The pit-head building and ventilator hall, facing onto the main railway line, were designed in 1911. Photograph Michaela Ryšková, 2012.

Specific evaluative categories – the value of systemic and technological interconnections

Ostrava, industrial agglomeration

Ostrava-Vítkovice railway station

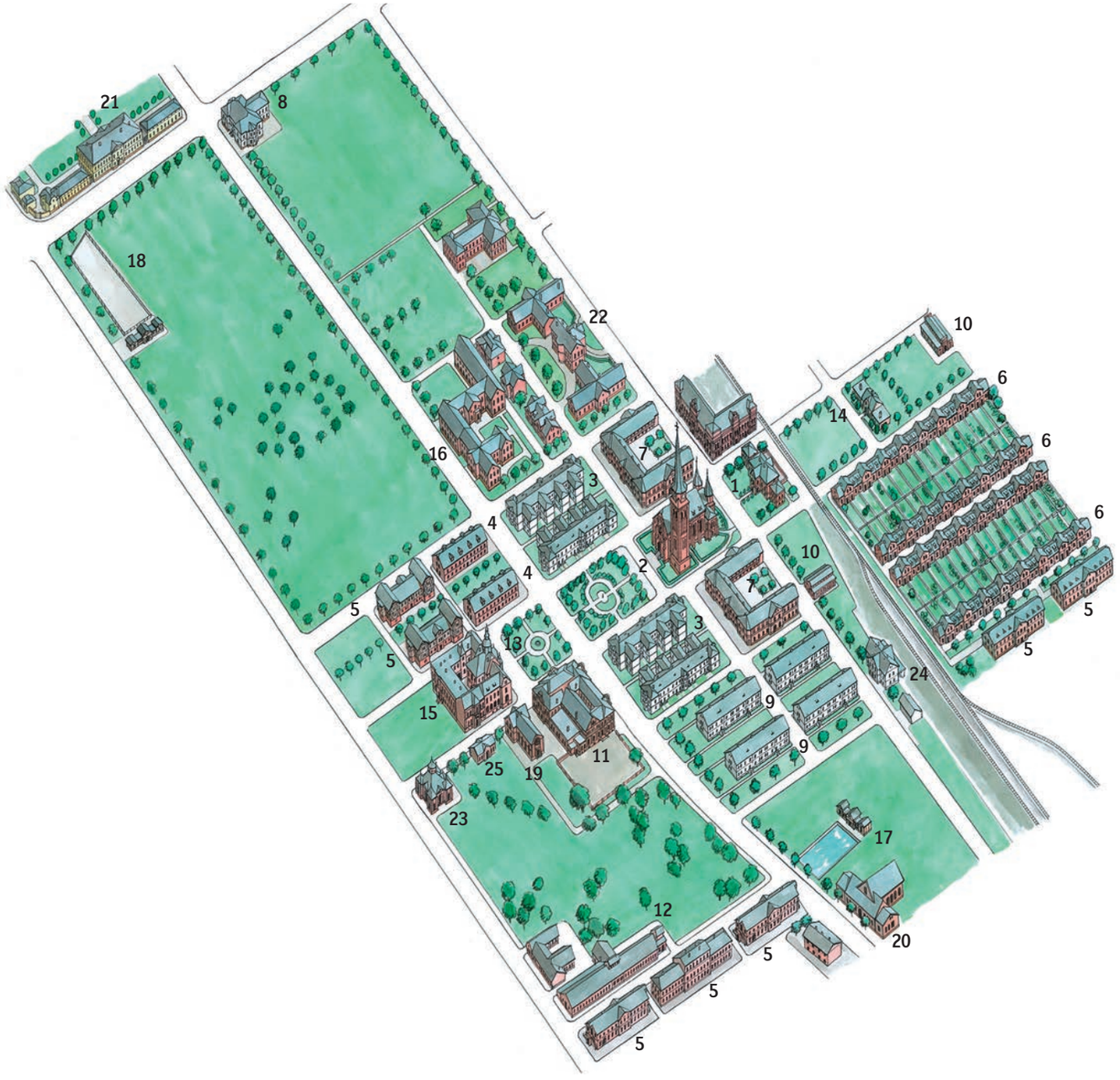
The railway station in Vítkovice was built as part of the Polanka link line, which was constructed along an east-west axis to link a number of railway lines within the Ostrava agglomeration. Its functions included providing an alternative route in case of flooding (to which Ostrava's main station and Svinov station were vulnerable) and enabling through-traffic bound for Slovakia to pass through Ostrava more quickly. The passenger building of the Vítkovice station was built in the 1960s. In architectural terms it is one of the most valuable examples of the so-called "Brussels style" in the Czech Republic. Photograph Roman Polášek, 2018.

Specific evaluative categories – the value of systemic and technological interconnections

Ostrava, industrial agglomeration

An ensemble of steam hammers and presses at the old forge of the Vítkovice ironworks has been granted legal heritage status. The photograph shows a 1.7-tonne steam hammer built in 1902 by the Wulkan works in Vienna and an 800-tonne steam hydraulic press made in 1908 by Davy Brothers of Sheffield. Photograph Miloš Matěj, 2014.

A Mannesmann pilgrim-step rolling mill in a rolling plant originally belonging to the Vítkovice ironworks. Photograph Miloš Matěj, 2014.



Specific evaluative categories – the value of systemic and technological interconnections

Ostrava, industrial agglomeration

New Vítkovice, reconstruction of the situation in 1901, drawing Jaroslav Staněk, Miloš Matěj, 2015. Legend: 1 – rectory; 2 – Church of St. Paul and water tower; 3 – "English" housing scheme; 4 – I-blocks; 5 – workers' hostel; 6 – "gable" housing scheme; 7 – U-blocks; 8 – villa for office workers ("English" housing scheme); 9 – Westend (housing scheme); 10 – market; 11 – company hotel; 12 – company canteen; 13 – town hall; 14 – creche; 15 – German school / secondary health care college; 16 – company girls' school / German girls' school; 17 – lido; 18 – skating rink; 19 – gymnasium; 20 – company bath-house; 21 – chateau; 22 – company hospital; 23 – exhibition pavilion; 24 – railway station passenger building; 25 – tram stop. Drawing Jaroslav Staněk, Miloš Matěj, 2015.

Ostrava, industrial agglomeration

The industrial town of "New Vítkovice" was built to serve the rapidly growing Vítkovice ironworks from the 1870s onwards. Individual buildings have been granted legal heritage protection, and the entire area forms part of an urban heritage zone. The upper photograph shows the church tower/water tower (1882), the Church of St. Paul (1883–1886) and one of the so-called U-blocks with outside walkways (1883–1884), the lower photograph shows the courtyard of one of the U-blocks and the "gable" housing scheme, consisting of 32 cottages each containing two apartments (1883–1885). Photograph Michaela Ryšková, 2018.

03.02.05. Technical value

The essence of the technical value of industrial heritage and technical monuments is connected with technical equipment. Because in many cases surviving buildings and sites are now empty spaces bearing only traces of where equipment used to be, the presence of original equipment and machinery associated with a building or site's original function is per se an important source of heritage value. This value is accentuated:

- if the technical equipment represents an entire production process or constitutes a "chain-link" connecting the particular technology with the overall technological flow,
- if the technical equipment has been preserved including its connection with the energy source that was necessary to power it (a mill-stream, water wheel, water turbine, steam engine or other source of power),
- if the technical equipment is in a functioning state, i.e. in a condition enabling it to be used to demonstrate its function.

Although it may be desirable to maintain technical equipment and machinery in a functioning state (or to restore it to such a state), this process may be at odds with the requirement to maintain the material authenticity of the equipment and machinery. It is thus always necessary to consider the extent to which the functionality of the equipment (for demonstration purposes) requires extensive alterations and the replacement of old parts with new ones. It is essential to make a choice between retaining all original preserved elements (at the cost of functionality) in cases when the equipment is unique and no other examples exist, and ensuring that the equipment is able to function in accordance with the original technical design (while retaining as many authentic original components as is practically possible).

A specific issue arises when equipment and machinery is present at sites whose functions have been retained (and whose values thus also include functional authenticity), but where technologies are undergoing modernization requiring changes to essential structural elements or the removal of equipment and machinery with heritage value. In such cases it is desirable to reach a compromise between the preservation of heritage values and the operational requirements of the site as determined by technological developments or current industry norms and standards. In practice, this means that two fundamental questions have to be answered:

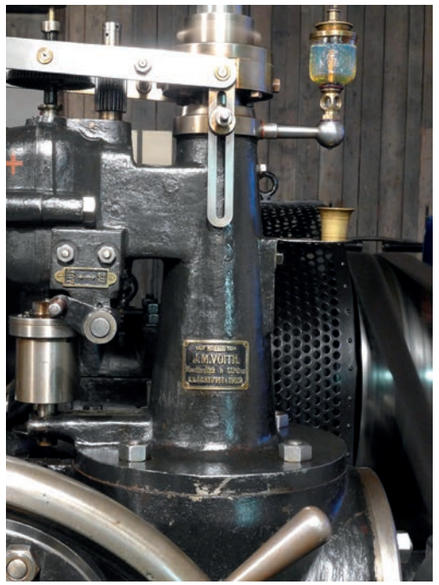
- how to deal with equipment that has lost its original function (and will be replaced by newer / more efficient or entirely new technologies),
- how to deal with the necessity for modernization (which requires the replacement of some equipment, changes to original structures or configurations, etc.).

The possible answers to the first question can be defined with a good degree of clarity; it involves either retaining the equipment in situ, relocating it to a different (protected) space though still in its original environment, or (as the last resort) moving the complete ensemble or its key parts to museum collections and rescue depositories. To find an answer to the second question, it is necessary to judge each case on an individual basis.

Specific evaluative categories – technical value

Veselí nad Moravou, hydroelectric power plant

One hydroelectric power plant that still possesses equipment dating from the early 20th century is Count B. Chorynský's power plant in Veselí nad Moravou. In 1915 an existing power plant was modernized to produce alternating current and a 123 kW vertical water turbine was installed, originally powering a three-phase AEG generator producing 175 kW at 6 000 V. Photograph Miloš Matěj, 2014.



Specific evaluative categories – technical value

Telford (England), Blists Hill Victorian Town

Combining a functioning steam boiler and steam engine in the boiler hall and engine hall of a small mine shaft, this museum not only provides information on the function of the machinery, but also offers visitors a genuine sensory experience including the characteristic odours of coal smoke and burned oil, intense heat, and the hiss and whistle of escaping steam – all accompanying the repeated motion of a steam engine piston. Photograph Michaela Ryšková, 2011.

Specific evaluative categories – technical value

Kopřivnice, the "Slovak Bullet" train

Plans to restore the M290.001 "Slovak Bullet" locomotive and return it to a functioning state were based on historical technical plans and contemporary depictions. In order to determine the methods to be used in the restoration project, it was necessary to (a) decide on the future use of the train (i.e. whether it was to be a stationary exhibit or a fully functioning locomotive), and (b) to decide whether to preserve it in its existing state (which is the result of alterations made during the 1960s, when the original fittings were removed from half of the locomotive in order to create an exhibition space) or to restore it to its original appearance. In this case the restorers prioritized functional authenticity and chose to restore the locomotive to a functional state (while respecting both the original technical equipment and individual details as far as was feasible) and to recreate the original design concept (because the later alterations detracted from the quality of the original design solutions). The components that will have to be removed as they are no longer functional will be thoroughly documented and stored. The missing materials and elements that were removed during the previous alterations will be replaced (cork floors, wallpaper, woven surfaces, upholstery). Chairs, tables, lamps and small accessories will be produced as replicas of the originals. The colour scheme will be based on the result of a stratigraphic analysis. Photograph Michaela Ryšková, 2016.

03.02.06. The value of authenticity

Discussions on general principles of authenticity in monuments can also be applied to industrial heritage – whether we consider authenticity of material, form, function, location and environment, the authenticity of the urban fabric, or the authenticity of traditional production processes.[19)]

Theoretically, the highest degree of authenticity is represented by the preservation of structures and technical equipment in their original unchanged state, while the lowest degree is embodied by a fragment, or in some cases mere historical information (without any surviving physical traces). However, in practice, authenticity can be correlated with the various developmental phases of a particular building or site; the authenticity of the building or site can be evaluated differently with respect to each individual phase. In cases when value is attributed to the original form which has since been degraded by later alterations, a different approach will be taken than in cases when the resulting state is viewed as the outcome of a series of qualitatively valuable transformations and alterations which document, for example, the technical development of a particular industry or the evolution of a particular type of technology.

When considering restoration and determining the guiding concept for the restoration work from a heritage management perspective, it is necessary to produce a precise description of the degree and type of authenticity present at the monument (consisting of one or more variables) as well as elaborating a precise formulation of the future use of the monument, which brings with it the necessity for certain interventions and certain risks. A specific issue of relevance to industrial heritage is the loss of a monument's original function – for example in the case of monofunctional structures for which it is often difficult to find a future use. In the case of multifunctional structures, which are more easily adapted for new uses, the conversion of the structure (i.e. a change in its function, while wholly or partially retaining its material basis) necessitates substantial interventions. Particularly when the new function of the building is significantly different from its old function (as a production or storage facility), the necessary changes may be quite radical, involving alterations to the interior layout or structural systems. In such cases, the quality of the intervention should be taken into account; such an intervention is only justifiable if it brings a new layer of value in the development of the monument. On the other hand, new functions and new uses of buildings should not be accepted if they lead to the replacement of original materials and forms by utilitarian solutions, bringing an irreversible loss of authenticity and directly causing the degradation of the building's heritage values.

Specific evaluative categories – the value of authenticity

Tourcoing (France), the first use of reinforced concrete structures (François Hennebique)

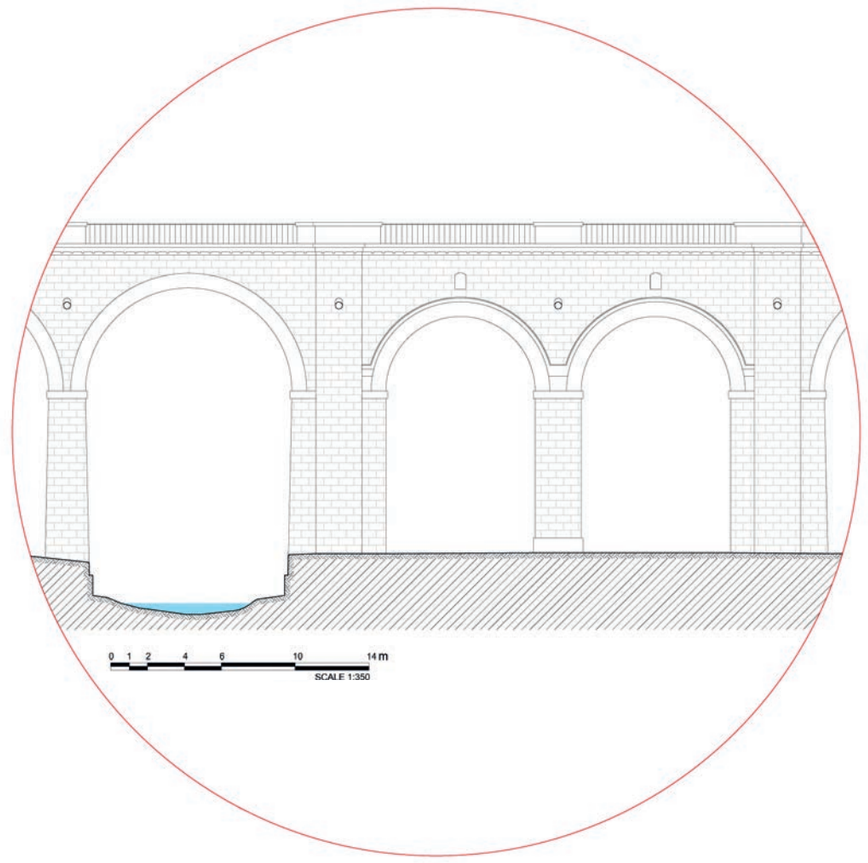
The first use of reinforced concrete in the supporting structure of a multi-storey textile factory (in the French town of Tourcoing, 1895) was a milestone in the history of factory buildings. The factory was designed by François Hennebique, who had patented his system three years earlier. Although the building was later demolished, part of its perimeter wall has remained in situ, forming the perimeter of the site. Although it is a mere partial remnant, this fragment of the authentic structure retains some of its values, and is an important manifestation of a structural "prototype". Photograph Michaela Ryšková, 2013.

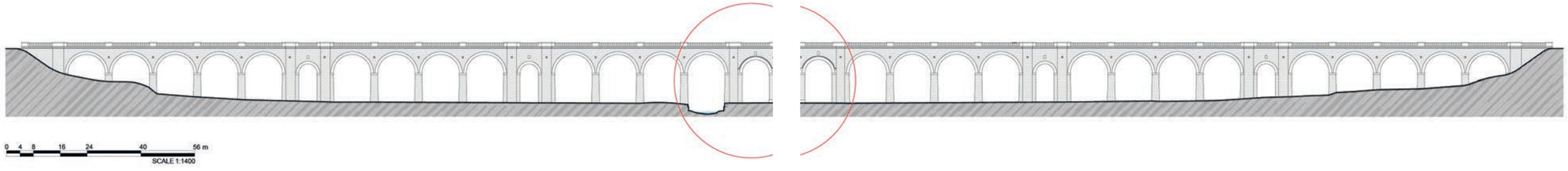
19) ŠTULC, Josef. Autenticita památky a problém její rekonstrukce (několik poznámek k věčně aktuálnímu tématu památkové péče). *Zprávy památkové péče*, 2001, no. 8, pp. 242–247.

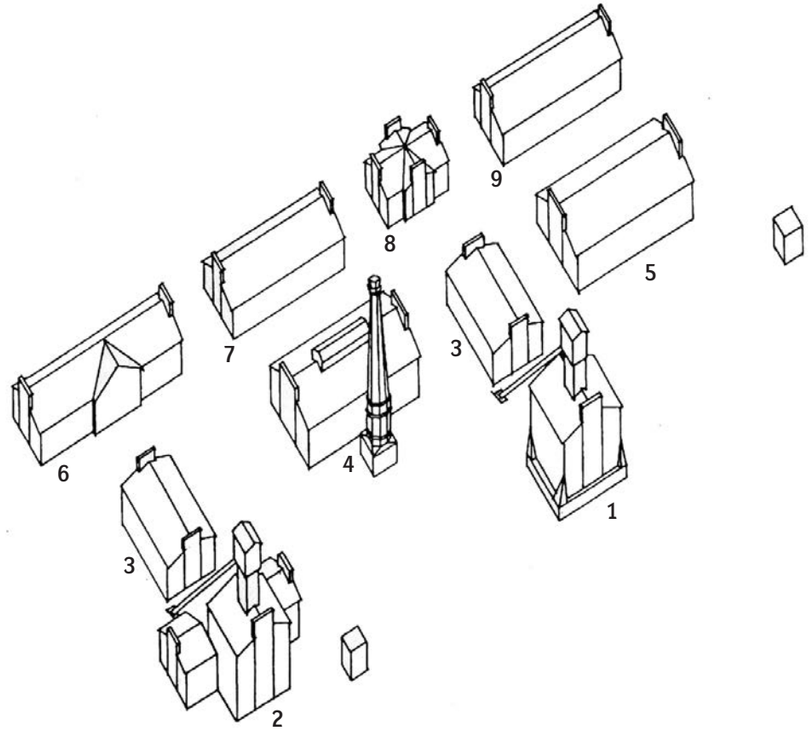
Specific evaluative categories – the value of authenticity

Hranice, railway viaduct

One of the first railway viaducts in what is now the Czech Republic, built between 1845 and 1847. Its importance consists in its combination of historical value, parametric value and authenticity. The three parallel bridges were built in succession: first a brick bridge for the first track, then a stone bridge (1873), and then a dual-track bridge (1910–1918). An older viaduct in Brno (1839) has been submerged under an embankment between the Svratka River and the city's main station, and a longer viaduct in nearby Jezernice has been dismantled down to the level of the arches and rebuilt using a different structural solution in order to meet the requirements of a modern rail corridor. The first viaduct in Hranice, which is now used only as a shunting area, has been preserved in its original form. Diagram Radek Míšanec, 2018, scale 1 : 350 and 1 : 1,400. Photograph Alena Borovcová, 2007.





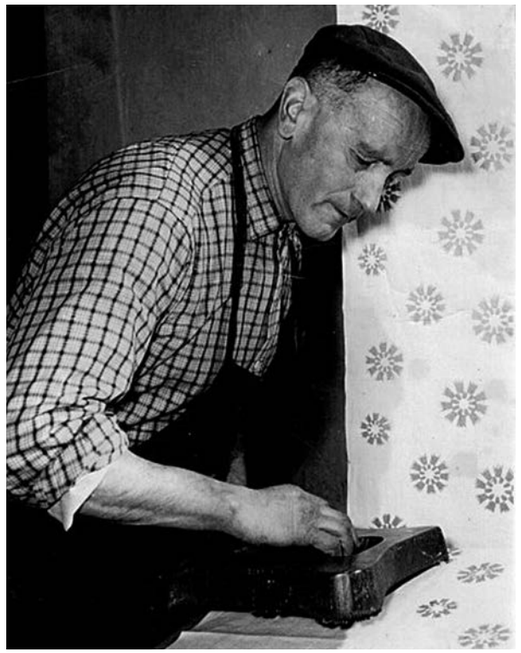


Specific evaluative categories – the value of authenticity

Ostrava-Kunčičky, Alexandr mine
The Emperor Ferdinand Northern Railway Company acquired or established a number of coal mines which met the demands of the railway's steam engines. At the end of the 19th century the company built the Alexandr colliery on a greenfield site, facing towards one of its branch lines (known as the Frýdlant line). The Historicist architecture transplanted Baroque principles into an industrial setting. An open space (the "cour d'honneur") is flanked by winding towers, with the boiler house at one end. The axis of the entire configuration is formed by a chimney – a symbol of power, energy, and the triumphant industrial age. Later construction work detracted from the grandiose nature of the ensemble; one of the winding towers and both engine halls were demolished, and the other buildings were degraded by alterations. The site was closed down in 1993–1994. Buildings at the site that were viable for alternative use were sold off, and insensitive alterations contributed to the general degradation of the complex. Nevertheless, in 2001 the site was granted legal heritage protection. Although some of the buildings remain in a very poor state of repair, the site is undergoing gradual renovation with an emphasis on restoring the original urbanistic and architectural forms (including the restoration of the original yet no longer existing segmentation of the façades). Three of the buildings have been modified for use by a charity (as sheltered workshops and accommodation). Both winding towers and pit-head buildings (administered by the state-owned Diamo company) are currently being restored. In 2015 restoration plans were drawn up based on historical architectural surveys, and in 2016 pit-head building no. 2 was restored. Because the original structural documentation is missing, the composition of the façades (including their individual details) was based on historical photographs and postcards.

Axonometry. Legend: 1 – winding tower and pit-head building no. 1; 2 – winding tower and pit-head building no. 2 (ventilation shaft); 3 – engine hall for winding engines; 4 – boiler house, chimney; 5 – compressor house; 5 – bathrooms; 7 – registration room, lamp store; 8 – office building; 9 – carriage shop. Diagram Miloš Matěj, 1993.

Opposite: General view, ventilation shaft winding tower and pit-head building before and after renovation. Photograph Roman Polášek (aerial view, winding tower and pit-head building after renovation, 2018) and Jana Kynclová (before renovation, 2015).



Specific evaluative categories – the value of authenticity

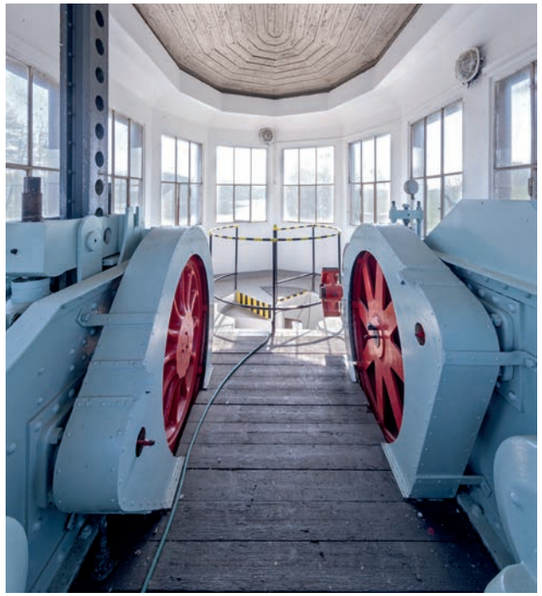
Olešnice, Danzinger manufactory for blue-printed goods

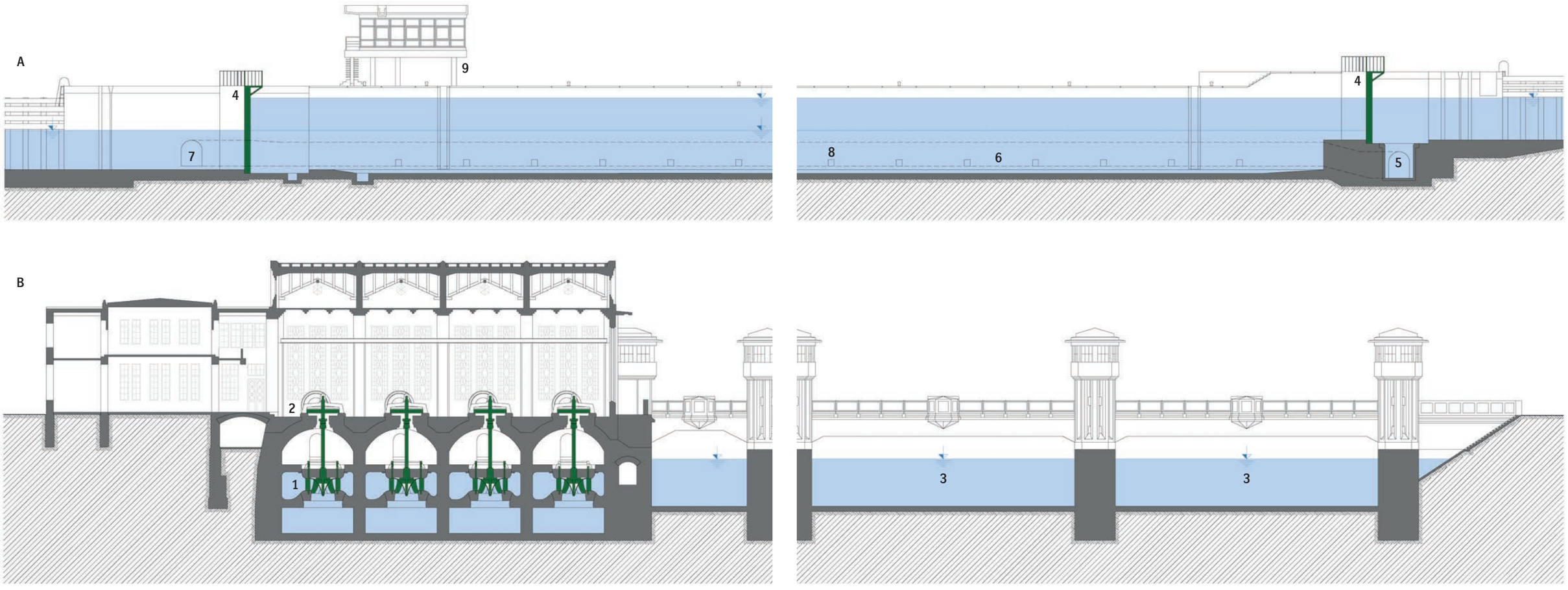
Blue-printing (Blaudruck, modrotisk) was a special method for finishing linen and (from the 19th century) cotton cloth. It was a form of negative printing which transferred patterns from wooden or metal templates to the cloth using a special paste made from clay and gum arabic. After drying, the cloth was repeatedly dyed in a cold indigo bath, and when a dark blue tint was achieved, the dye was washed out of the part of the cloth without the pattern. Blue-printing was widespread in Bohemia and Moravia, and blue-printed cloth became an integral part of local folk costumes in the regions of Horácko and Wallachia. The expansion of factory-produced cloth led most blue-print manufacturing workshops to close down; the last of them ceased operating in the 1950s. Only two have been preserved – in Strážnice and in Olešnice. The technical value of the manufactory's equipment is also related to the value derived from the authenticity of this traditional production method. The method was jointly nominated by five Central European countries for inscription on UNESCO's Intangible Cultural Heritage List (2017). Photograph from the Danzinger family archives (Josef Danzinger applying dye, 1970s) and Michaela Ryšková (Jiří Danzinger applying dye, workshop equipment – moulds, dyeing tank from the mid-19th century, calender for mangling the finished cloth).

Specific evaluative categories – the value of authenticity

Poděbrady, river lock and hydroelectric power plant

This hydroelectric power plant and river lock, built at Poděbrady in 1914–1923, is of outstanding heritage value because it represents at least three value systems (levels). It embodies technical value (machinery made by the František Křižík company and J. Prokop & Sons, Pardubice), architectural value (the design by the architect Antonín Engel), and the value of authenticity (the architectural and technical elements have been preserved in their entirety). Photograph Viktor Mácha, 2018.





Specific evaluative categories – the value of authenticity

Poděbrady, hydroelectric power plant

Longitudinal sections of the lock and power plant. Legend: A – longitudinal section of the lock chamber; B – longitudinal section of the power plant turbine hall and longitudinal section of the weir fields; 1 – four Francis turbines made by J. Prokop & Sons; 2 – four electric AC generators producing 250 kW, made at the František Křižík works, producing a total maximum output of 1 MW; 3 – two weir fields; 4 – two water-retaining mitre gates at the ends of the lock chamber, operated by hydraulic cylinders; 5 – inflow to the bypass channel with hydraulic gate; 6 – bypass channels for filling and emptying the lock chamber; 7 – outflow from the bypass channel with hydraulic gate; 8 – connecting channels between the lock chamber and the bypass channel; 9 – lock chamber control centre. Diagram Radek Míšanec, 2018, scale 1 : 350.

03.02.06.01. The authenticity of the “last working day”

Another specific methodological approach that is applied in connection with the preservation of technical monuments and that is directly related to issues of authenticity is the principle of the “last working day”.[20] As has been mentioned above, authenticity should not necessarily be understood solely as the situation immediately after a particularly entity has been created; instead it is the result of a process of development, combined with environmental effects and human activity.

If, therefore, we are evaluating the structural development of a building from the perspective of its authenticity, then it is essential to evaluate the entire context of this development. We need to consider whether the individual phases of development involved “deliberate artistic transformations and additions” – and if this is indeed so, then their artistic values and formal authenticity cannot be denied. In the case of technical monuments, the above-mentioned criterion should be expanded to include “deliberate technical changes and improvements”. The result of such changes and improvements is a sequence of separate states of authenticity, each characterized by their performance of a particular function within the original operational and architectural solution.

The end point in the course of time – i.e. the point at which a monument achieves the final state that can be considered authentic – is the last working day; it is on this day that the monument ceases to perform the function for which it was intended. If the existence of the monument is to be prolonged by means of heritage management, then it is necessary to consider the preservation of all traces of the monument’s functionality – traces which also (equally importantly) act as witnesses to the people who worked there. Traces of their presence can assume a wide range of forms: minor wear and tear from everyday use, worn steps, railings and door-handles worn smooth from repeated touching, writings and drawings on walls and dusty windows.

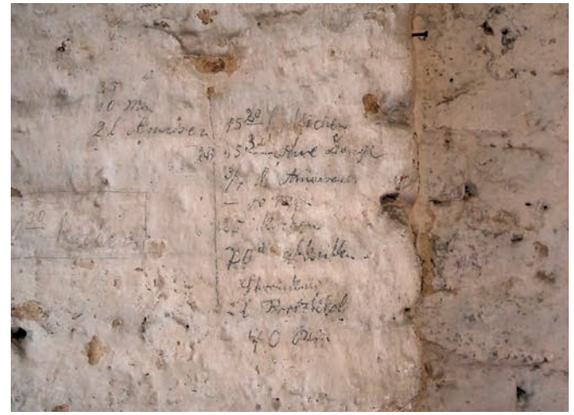
If various different states of authenticity are valid for a particular monument, the question arises which guiding concept should be applied to heritage management – in other words, which of these different states is to be given priority over the others, to be respected as the target state of authenticity during the restoration project. However, in addition to technical and artistic aspects, it is always necessary to respect the traces of the people who worked there – without whom no technical and industrial monument could ever have served its original purpose. Specific evaluative categories – the value of authenticity, the authenticity of the “last working day”.

20) NOVOTNÝ, Vladimír. O autentičnosti památek. *Památky a příroda*, 1969, vol. 29, no. 1, pp. 1–12; ŠTULC, Josef. Autenticita památky a problém její rekonstrukce. *Zprávy památkové péče.* 2001, vol. 61, no. 8, pp. 242–247, which distinguishes between authenticity of material, form, environment and technique; ŠTULC, Josef. K ožívání puristických metod při sanaci a komplexní obnově stavebních památek. *Památky a příroda.* 1984, vol. 44, no. IX, pp. 124–142.

Specific evaluative categories – the value of authenticity, the authenticity of the “last working day”

Euskirchen (Germany), LVR-Industriemuseum – Tuchfabrik Müller

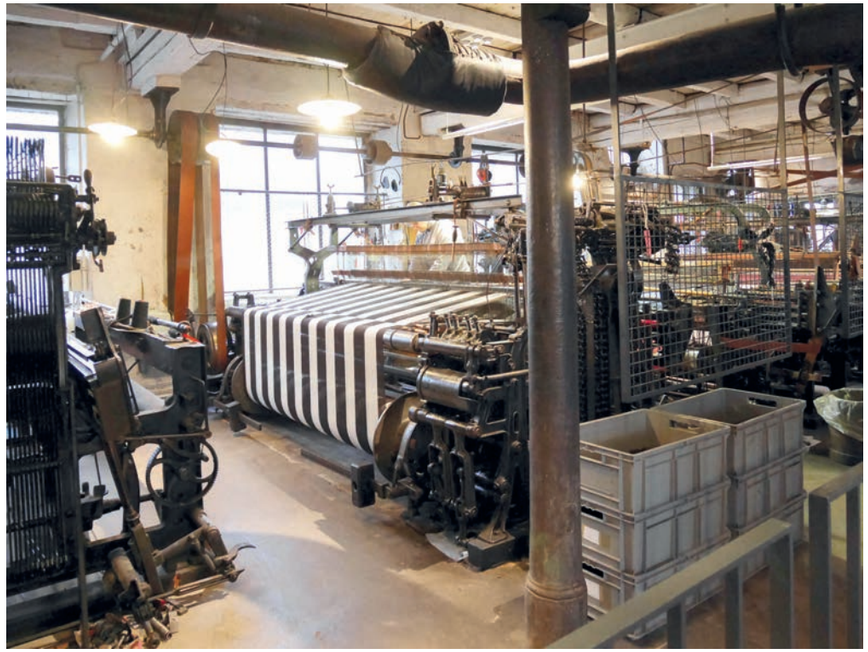
Originally built as a paper mill at the beginning of the 19th century, in 1894 the building was used to produce woollen goods. In 1961 production ceased due to a general slump in the woollen industry, but the owner did not give up home of resuming production. In 1988 the factory – including its complete equipment and machinery – was purchased by the provincial government of North Rhine-Westphalia. In 2000 a museum was opened at the site, presenting to visitors the complete production cycle of a woollen goods factory using machinery from the late 19th and early 20th century. Photograph Michaela Ryšková, 2016 (dyeing shop, traces of dye mixtures on the shop walls).



Specific evaluative categories – the value of authenticity, the authenticity of the "last working day"

Euskirchen (Germany), LVR-Industriemuseum – Tuchfabrik Müller

Self-acting mules and mechanical dobby looms. Photograph Michaela Ryšková, 2016.

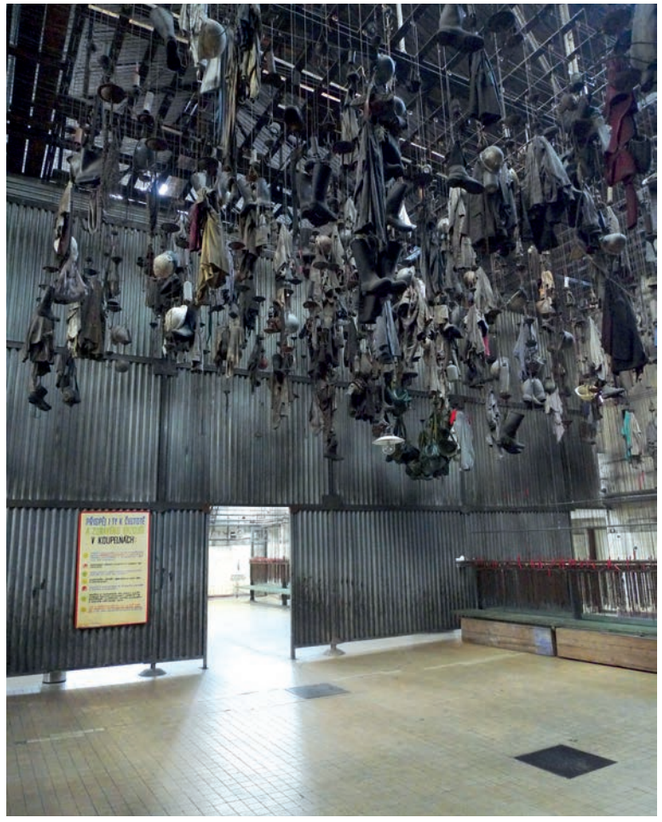


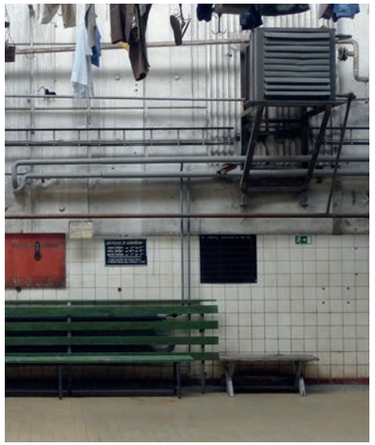
Specific evaluative categories – the value of authenticity, the authenticity of the "last working day"

Ostrava-Michálkovice, Michal mine

The Michal coal mine represents a broad spectrum of values. It documents the early beginnings of electrification at industrial sites, embodying the grand, impressive architecture that was intended to showcase the company's economic strength and societal prestige; it also possesses authentically preserved technical equipment, buildings and the complex as a whole. It is an example of the application of the "last working day" principle.

The mine was established in 1843. Its current appearance dates from 1915, when a complete reconstruction of the above-ground part of the site (designed by the architect František Fiala) was completed. The individual buildings and the above-ground machinery (dating mainly from the 1910s and 1920s) remained in operation until 1993. When the mine was closed down, there were already plans to convert it into a museum, so the above-ground parts of the site were preserved essentially unchanged from the last working day. Since 2000 the mine has been run by the National Heritage Institute and is open to the public. The tour route leads along the same route taken by miners when starting their shift. It also includes the engine hall, control centre and boiler hall (with a subsequently installed steam engine). From the very outset, the goal of heritage management at the Michal mine was to preserve the original, unadorned setting bearing traces of everyday life and work at the mine. All these traces have been preserved intact – the worn steps and railings, peeling paint and cracked plasterwork, and the WW2 blackout curtains over the engine hall windows. The patina of age and use, deliberately and selectively conserved in the areas of the complex that are open to the public, must nevertheless remain clearly distinguishable from the rest of the site, which by contrast is kept clean and well-maintained. The clear distinction between the new exhibition elements and the old architectural elements is essential to the authenticity of the entire concept. Worn and dirty surfaces must be protected against further degradation by chemical fixation and regular conservation work. The approach applied to essential repairs can be illustrated using the example of the winding tower, which underwent a restoration in 2011–2012. The parts of the tower's structure that had been damaged by exposure to the elements were completely sandblasted, the damaged parts were repaired, and then the structures were repainted. The concrete foundation blocks of the tower, also in a poor state of repair, were likewise restored. A different approach was taken to the parts of the tower's structure that were protected by the pit-head building. Here the structure was merely cleaned and repaired, as was the inside staircase and the base blocks of the pillars, but it was not repainted as a whole. This enabled the authenticity of the interior parts of the pit-head building to be retained. Photograph Michaela Ryšková, 2011–2018.

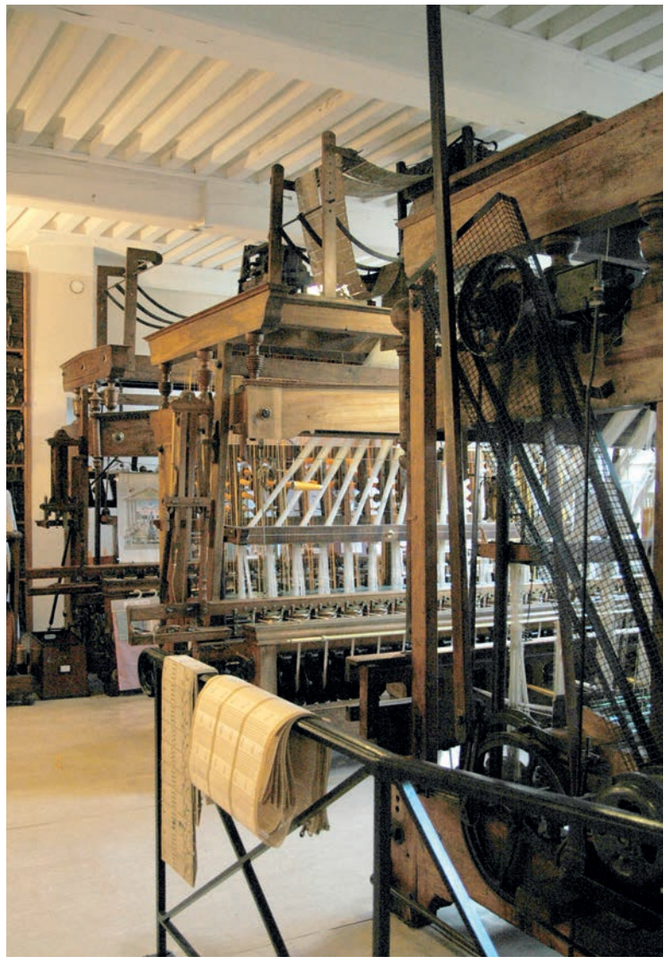





JÁMA PETR CINGR-HLAVNÍ ODDĚLENÍ
SPODNÍ LANO
SVRCH. LANO
NALOŽENÍ
ODDÍLY
ZÁLOŽNÍ

03.02.07. The value of the "genius loci"

The preservation of a specific atmosphere is an important element in preserving the essence of a technical monument. This atmosphere may be reduced or even removed completely by overly enthusiastic attempts to create a clean, tidy environment – removing the patina of age, small details, fragments of original features, or changing the types of surfaces. The introduction of new elements and materials should be considered carefully, always taking into account whether the new element or material detracts from the overall impression to ensure that any new introductions are not immediately noticeable at first sight.



Specific evaluative categories – the value of the "genius loci"

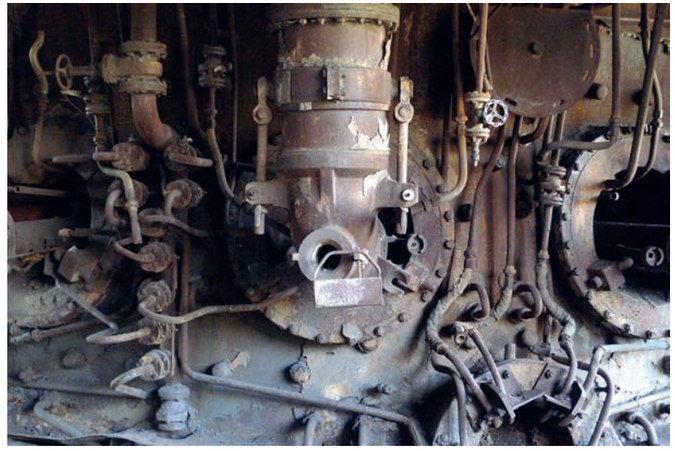
Lyon (France), L'atelier municipal de passementerie – Soierie Vivante

The tradition of silk-making in Lyon was associated with numerous workshops and manufactories of varying sizes. Today, this tradition is commemorated not only by a museum, whose collections include examples of local silk goods, but also by several active silk-making workshops and a small family workshop run by the Soierie Vivante ("Living Silk Association") foundation. The workshop was donated to the foundation by its last owner, Mrs. Letourneau, who was born at the workshop in 1912 and spent her entire life there. The original equipment of the workshop is used to demonstrate the production of silk ribbons, and videos of interviews with Mrs. Letourneau help to convey the human stories of the workshop and the way the local silk tradition was reflected in everyday life. Photograph Michaela Ryšková, 2007.

Specific evaluative categories – the value of the "genius loci"

Ostrava, Hlubina mine, Vítkovice, coking plant and blast furnaces

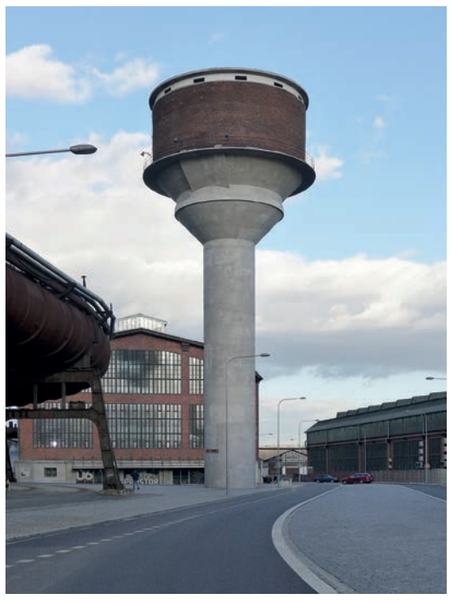
Among the fundamental values of this national cultural monument are its unique setting, powerful atmosphere and genius loci. These values result from several factors: the compactness of the site, its complexity, density and ostensibly chaotic nature, the raw industrial environment which borders on the bizarre, as well as the striking contrast between the huge, monumental structures and the numerous small additions or modifications which are on a distinctly human scale, somehow accentuating the power of the site as a whole. The ongoing clean-up work at the complex includes the removal of some of these additional layers and attempts to create a more aesthetically pleasing environment; however, this detracts from the raw power of the site, an element which greatly contributes to its genius loci. Photographs Michaela Ryšková, 2011–2012.



Specific evaluative categories – the value of the "genius loci"

Ostrava, Hlubina mine, Vítkovice, coking plant and blast furnaces

The photographs opposite show the buildings and spaces before conversion – control centre no. VI with gas bellows, transport bridges and blast furnace no. 1. The photographs at the right document the new appearance of the site, which has now lost some of its original atmosphere and industrial rawness. The new dominant feature is the modified former control centre for blast furnace no. 1, which has been transformed into an information centre and raised in height; the superstructure on top of the blast furnace obscures the furnace's original appearance. Photograph Michaela Ryšková, 2011–2013, Miloš Matěj, 2007 (bellows).



Dubí, František Josef I. / Prago mine, engine house. Photograph Viktor Mácha, 2016.

04. Recording and documenting as tools for selection and heritage protection

04.01. The formation of an awareness of industrial heritage and systematic surveys

Probably the first person to formulate a methodological basis for researching technical monuments in what is now the Czech Republic was František Zuman, an expert on the history of paper production. In the 1920s he noted that the Czech part of Czechoslovakia (the historical provinces of Bohemia, Moravia and part of Silesia, formerly part of the Habsburg Monarchy) had been rich in raw materials, creating a momentum which had facilitated the development of technical labour and enabled industry in these provinces to excel in various sectors (raw material production, construction, cotton, wool and linen production, paper, porcelain, chemicals, sugar-refining, engineering, brewing and more). Zuman found the history of technical labour to be a broad and fascinating topic, and he noted that numerous museums collected technical monuments to illustrate the historical development of trades and crafts. "However, larger movable technical monuments (such as large machines and complete sets of factory equipment), and immovable monuments (buildings), still remain very much neglected, even though these types of monuments are rapidly vanishing." [21] In Zuman's view, these types of technical monuments could be preserved and rescued by drawing up an inventory of them. He compiled a survey form to collect the necessary information, and he promoted his idea at the Masaryk Academy of Labour and the Technical Museum. In 1923 he published an appeal in the technical journal Technický obzor calling on experts to contribute to the inventory; the appeal was supported by the Ministry of Education. However, Zuman rightly noted that "... it is not enough to issue a general appeal to do this work; the work needs to be properly organized, above all by setting up a committee of technical experts and historians, in the manner of the committee of literary and artistic experts which since 1895 has been active at the Czech Academy of Sciences publishing the 'Inventory of Historic and Artistic Monuments'." [22] The first step was to be the compilation of an inventory from data collected via survey forms (questionnaires) and the excerption of as much information as possible from the relevant literature. The inventory thus collated was then to be used as a basis for the elaboration and publication of descriptive texts; unlike the literary and artistic inventory, which was organized on a territorial basis, the inventory of technical monuments was to be subdivided by industry. Zuman appealed to experts to work quickly in order to create an essential foundation enabling the monuments to be protected as soon as the necessary heritage legislation was approved. Unfortunately, his principle of drawing up inventories for each industry individually and applying this industry-specific approach to the evaluation of factory equipment and machinery has only been applied to a limited extent, for just some industries and for selected locations and territories.

The 1970s and 1980s brought a growing awareness in the former Czechoslovakia of issues related to the importance, preservation and protection of industrial heritage. However, the first attempts at systematic documentation and evaluation date back to the 1960s, and were coordinated by Professor Miroslav Baše of the State Institute for the Reconstruction of Historic Cities and Buildings. The surveys conducted by Baše's team focused on the Ostrava agglomeration, specifically on coal mines, coking plants, iron and steelworks and workers' housing schemes; however, due to the political climate at the time their conclusions were not reflected in actual heritage protection activities. [23]

21) ZUMAN, František. Technické památky. *Národní listy*, no. 289, 19 October 1924, educational supplement.
22) Ibid.
23) MATĚJ, Miloš. Péče o technické a průmyslové památky. *Zprávy památkové péče*, vol. 68, 2008, no. 5, pp. 415–419.

Prague, passenger building at the Těšnov railway station
Photograph from the 1940s. National Heritage Institute, General Directorate, photographic archive, negative no. N155401.

As in many other countries,[24] it was only the loss of valuable monuments that finally sparked public discussions on heritage protection. In the late 1980s two iconic buildings were demolished – the neo-Renaissance passenger building at Prague's Těšnov station (1872–1875), whose grandiose architecture reflected the building's importance as the terminus of the Austrian Northwestern Railway (Österreichische Nordwestbahn), and the monumental Functionalist building of the "wet plant" at the Karolina coke works in Ostrava, situated in the close vicinity of the historic city centre.

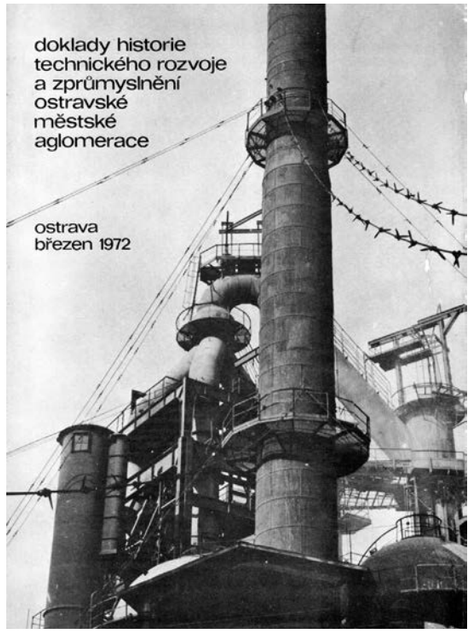
These demolitions led to much discussion among experts (from universities, heritage management authorities and museums) on the values embodied in the buildings and on questions related to heritage protection. These debates eventually gave the impetus for the establishment of the Section for the Protection of Industrial Heritage at the National Technical Museum. Headed by Professor Emil Hlaváček, the section's members included experts specializing in a range of different fields, who in the late 1980s collectively helped to formulate the fundamental principles for evaluating industrial heritage and outlined the options for preserving and protecting it.

The practice of heritage management likewise underwent a process of change and development regarding the evaluation and protection of industrial heritage. Initially, heritage management focused on small-scale technical structures (small bridges, fountains) and sites connected with traditional economic activity or pre-industrial production (mills, pre-industrial iron production facilities, etc.). Larger industrial sites or larger examples of infrastructure were only sporadically granted heritage protection, and this happened mainly in cases when their values essentially corresponded

24) A similar role was played in Britain by the demolition of the Euston Arch (1837, the original entrance to London's Euston railway station) in the early 1960s, and in Germany by the threat (eventually averted) of the demolition of the engine hall at the Zollern 2/4 mine in Dortmund. – see FÖHL, Axel. Záchrana průmyslové minulosti – zkušenosti z Německa. Saving the Industrial Past – The German Experience. In *Průmyslové dědictví. Industrial Heritage. Sborník příspěvků z mezinárodního bienále Industriální stopy.* Praha 2008, pp. 32–41.

Ostrava, coal preparation plant at the Karolina coking plant

Photographs during operation and prior to demolition at the end of the 1980s. Photograph from the archives of the National Heritage Institute (Methodological Centre for Industrial Heritage), technical monuments Ostrava, historic fonds from the Ostrava-Karviná coalfield mines: evaluation of the current situation, phase II, SURPMO (Specialized Institute for the Reconstruction of Historic Urban Areas and Structures), 1972 (when still in operation) and Miloš Matěj, late 1980s.



Recording and documenting

Ostrava-Karviná agglomeration, survey for SURPMO (Specialized Institute for the Reconstruction of Historic Urban Areas and Structures), 1970s

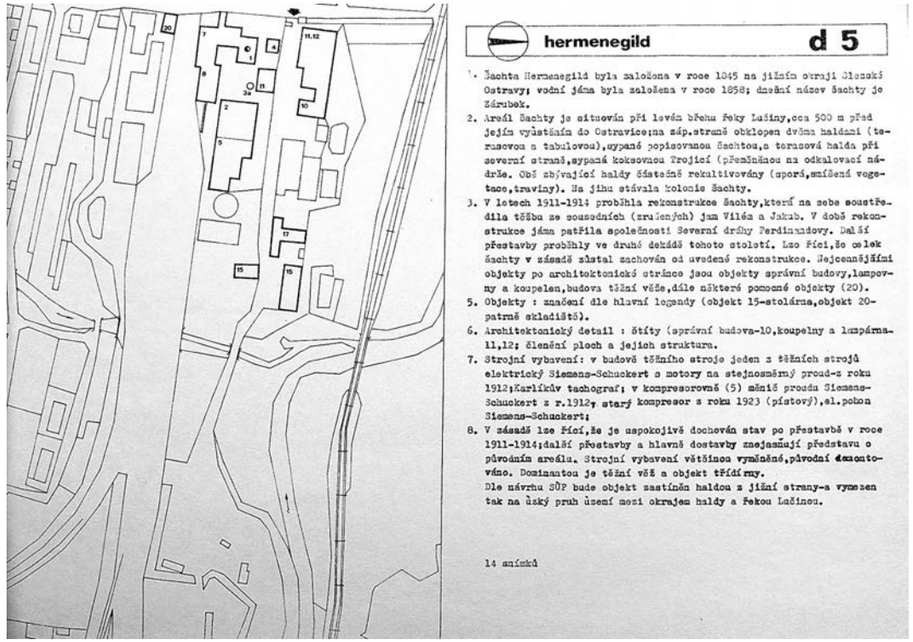
This was the first survey of industrial heritage in the Ostrava-Karviná agglomeration (and apparently in the whole of Czechoslovakia). It focused on mines, coking plants, iron and steelworks, and workers' housing schemes. Title page of the accompanying report and examples of the survey's evaluation – Hermenegild mine, Zvěřina housing scheme (opposite). Archives of the National Heritage Institute (Methodological Centre for Industrial Heritage), technical monuments Ostrava, historic fonds from the Ostrava-Karviná coalfield mines: evaluation of the current situation, phase II, SURPMO (Specialized Institute for the Reconstruction of Historic Urban Areas and Structures), 1972; ibid., housing schemes in the Ostrava agglomeration.

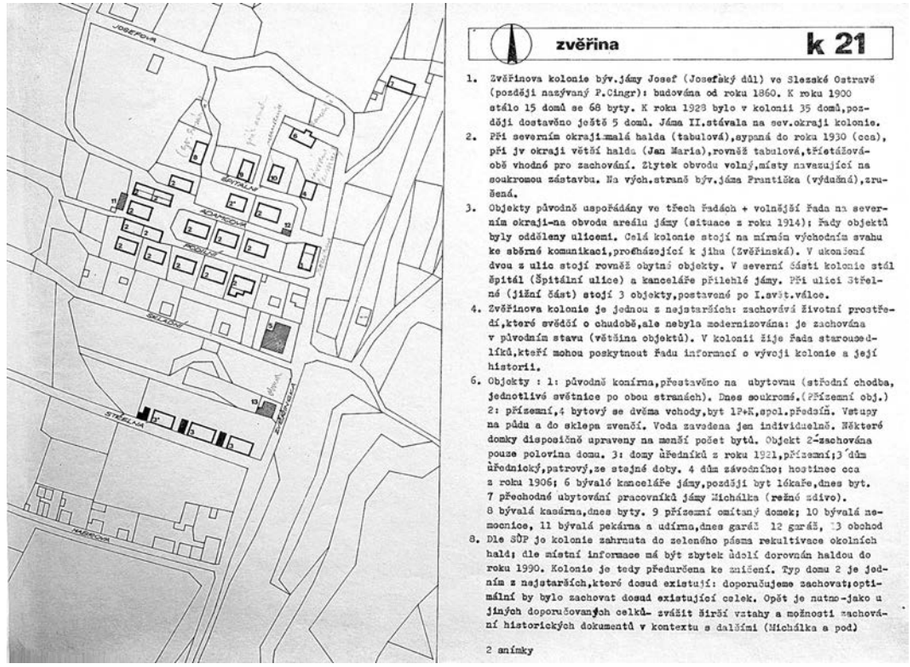
with the traditional criteria for heritage management (the water tower in Prague's Malá Strana district, buildings connected with the horse-drawn railway from České Budějovice to Linz, power plant no. IV in Ostrava-Vítkovice, the water tower in Prague's Podolí district, the Winternitz automatic mills in Pardubice, the Schwarzenberg canal, etc.).

Museology likewise experienced a shift in attitudes to the use of buildings and the presentation of machinery and equipment, as museums began to present such items in their original settings rather than relocating them to form part of a traditional museum display. The Technical Museum in Brno acquired a Renaissance mill in Slup and a former ironworks with a charcoal-fuelled blast furnace near Adamov (Stará Huť u Adamova). Primarily thanks to Jiří Merta, the ironworks held regular demonstrations of small-scale iron production (smelting iron ore in the furnace), reconstructing historical production techniques to reflect developments in the newly emerged field of industrial archeology.

A turning-point in Czech heritage experts' approach to industrial heritage came in the 1990s, when heritage management had to respond to rapid social and economic changes following the collapse of the communist regime in 1989. The state-supervised closure of the coal mines and the gradual decline of several other industries opened up a debate on heritage values and the options for preserving machinery, buildings, and large industrial sites. Documentation of industrial heritage was launched, initially focusing on large industrial centres. Researchers surveyed specific industries with the aim of enabling an objective selection of the most important monuments to be proposed for heritage protection. The documentation began with the individual coalfields in the Czech Republic, continuing with coke production and the metallurgical industry in the Ostrava-Karviná agglomeration, rail corridors (the Emperor Ferdinand Northern Railway and the Northern State Railway), the textile industry in Moravia and Silesia, and other industries – as well as documentation of workers' housing schemes. Territorial surveys were also conducted in order to document the industrial heritage in individual regions. Researchers additionally focused on exceptional and unique monuments such as the waste water treatment plant in Prague's Bubeneč district or the Mayrau coal mine in Vinařice near Kladno.[25)]

25) MATĚJ, Miloš. Péče o technické a průmyslové památky. *Zprávy památkové péče*, vol. 68, 2008, no. 5, pp. 415–419.





Recording and documenting

Adamov, old ironworks (Stará huť u Adamova), iron ore smelting demonstration

The photographs show two stages in the demonstration – heating the furnaces, and the smelting itself. In the upper photograph the furnaces are being heated. The furnaces were then closed using a brick insert (seen in front of the furnace at the right). The hole in the insert was for a tube through which air was blown into the furnace for several hours. The furnace was charged with charcoal and iron ore. When the smelt was completed, the brick insert was broken away and the mass of iron and slag (the bloom) was removed for immediate further processing. Photograph Technical Museum in Brno, Martin Barak, 2018.

For many years, industrial heritage has been a major focus of architecture faculties at Czech universities. Among the academics who have supervised surveys, research projects and student dissertations are Professor Helena Zemánková (at the Brno University of Technology), Professor Emil Hlaváček and Professor Tomáš Šenberger (at the Czech Technical University in Prague).[26] In 2002 Benjamin Fragner established the Research Centre for Industrial Heritage at the Czech Technical University's Faculty of Architecture. The Centre's approach focuses on architectural aspects of industrial heritage, including the architecture of industrial buildings, their typology, and options for new use or conversion.[27]

04.02. Methodology of heritage management research

The evaluation and selection of buildings and equipment for heritage protection is based on a process of objective evaluation. The total heritage value of a monument is always the sum total of its various partial values, depending on its degree of authenticity and also its position within the typological development of the industry in question. This position lies on a broad scale ranging from unique items (solutions not repeated elsewhere, prototypes, representatives of "blind alleys" of development, etc.) to buildings and technical equipment that are entirely ordinary and unimportant from the perspective of heritage management. In order to evaluate a monument's typological importance, it is essential to be able to compare it with other monuments; this requires a knowledge of its position within the relevant course of development as well as a knowledge of its frequency of occurrence (in a particular location, region, or larger area).

04.02.01. Territorial research

Thorough territorial research forms the basis of our knowledge of surviving industrial heritage assets. This research should not only record and describe individual buildings and sites (functional, non-functional, preserved fully intact or only in fragmentary form); it should also take into account the interconnections with raw material resources (mining), energy resources (watercourses and mill-streams which played a decisive role in the first phase of industrialization, sources of coal, electrification), and transport links.

04.02.01.01. Basic documentation

The basic form of documentation should be an entry in a register. This entry should record information on a defined area based on study of the relevant literature, field surveys, and archive research. The information thus acquired – in the form of notes from literature, second-hand information ("they say there was something there"), the researcher's own findings from field surveys, and "photographic scrapbooks" – should be ordered according to location (cadastral areas). This basic documentation should also include all fundamental technological units which characterize the industry in question and which helped to stimulate and guide its development. This documentation will thus produce a body of information which will not only enable an initial evaluation to be made (i.e. the selective identification of locations, buildings and sites with heritage potential, which will then form the subject of more detailed research in the next stage of documentation), but which will also provide industry-specific information enabling researchers to trace typological developments in individual industries (see the section on industry-specific research below).

26) HLAVÁČEK, Emil. *Architektura pohybu a proměn*. Praha 1985; ZEMÁNKOVÁ, Helena. *Tvořit ve vytvořeném. Nové funkční využívání uvolněných objektů*. Brno 2003; *Databáze průmyslového dědictví Moravy* [on-line]. URL http://www.fa.vutbr.cz/home/zemankova/.

27) The Research Centre has coordinated a number of research projects whose findings have been presented in book form (in a systematic series entitled "Industrial Topography", whose individual volumes map the situation in different regions), and also online, as part of a web-based project of the same name. The Centre also holds the biennial event "Vestiges of Industry". A selection of its publications is given in the literature and sources section.

Recording and documenting

Tatenice, railway tunnel

This tunnel on the Olomouc-Prague line (abandoned when the line was rerouted along the section between Zábřeh na Moravě and Krasíkov) has been documented as part of a research project focusing on the Northern State Railway. Photograph Michaela Ryšková, 2016.

04.02.01.02. Catalogue documentation

Once particular locations, buildings and sites have been identified as possessing heritage potential, they then form the subject of more detailed research. Records of these monuments (current practice is based on the compilation of catalogues of monuments) should contain comprehensive information: basic identifying details, a characterization of the broader context (location within the landscape, links to technological systems, transport infrastructure, natural resources etc.), a description of relevant technologies, an analytical description of the buildings at the location (drawing on knowledge of technological developments), basic dates and attributions, photographic documentation (current and archive images), an evaluation of the monument with respect to heritage care, and a recommendation that the monument should / should not be granted heritage protection.

04.02.01.03. Proposals for heritage protection

The highest level of this documentation process comprises proposals for legal heritage protection. In the field of industrial heritage, if a monument is proposed for heritage protection, the information and conclusions contained in the catalogue documentation can be supplemented by additional surveys or architectural-historical surveys, or by additional information on systemic and technological interconnections and further documentation of technical equipment and machinery.

04.02.02. Industry-specific research

Research focusing on the most important individual industries, transport or storage should not only describe the situation in agglomerations, specific areas and systemically interconnected entities; it should also help to define and trace typological developments within each industry, creating industry-specific typologies.[28] Based on this research, it

28) URBÁNEK, Radim, Vodní mlýny a posuzování jejich hodnoty. *Zprávy památkové péče*, vol. 70, 2010, no. 1, pp. 23–30; MATĚJ, Miloš – KLÁT, Jaroslav – KORBELÁŘOVÁ, Irena. *Cultural Monuments of the Ostrava-Karviná Coalfield*. Ostrava 2008.

is possible to conduct evaluations of specific locations, sites and technical equipment. Practical experience has shown that industry-specific research needs to take full account of systemic interconnections such as transportation routes or links with other industries.

Heritage experts currently divide the spectrum of industries into nine separate areas:

- energy – sites, buildings and equipment designed for energy production, concentration, distribution and transformation,
- food and drink – sites, buildings and equipment designed for the production and storage of food and drink,
- manufacturing – sites, buildings and equipment designed for the processing of natural resources (e.g. lime, wood, oil, clay, leather etc.), chemical production.
- metallurgy (including mechanical engineering) – sites, buildings and equipment designed for the production, refining and further processing of metals and glass, and subsequently for metal finishing/forming and the production of machinery,
- mining – sites, buildings and equipment designed for the extraction of mineral resources,
- science, technology, others – sites, buildings and equipment designed for the observation and measurement of natural phenomena or activities not classifiable under the other areas,
- textile production – sites, buildings and equipment designed for the processing of raw materials for textiles, the production and finishing of yarn, cloth, clothing and hats,
- transport – sites, buildings and equipment designed for air, road, water and rail transport and travel,
- water management – sites, buildings and equipment designed for the regulation of watercourses, retention, accumulation, treatment and purification of water, and water structures for energy generation and production facilities,

Inter-industry links involve the concept of one industry "serving" another, e.g.:

- buildings and equipment supplying energy to industrial facilities (water wheels, boilers, turbines, boiler houses, chimneys, engine halls for steam engines, etc.) form part of the area designated above as "energy", but they also provide a service to other industries,
- water structures supplying water as a power source for machinery and equipment (e.g. dams, weirs, mill-streams) form part of the area designed as "water management", but they also provide a service to other industries and can thus be grouped together with the buildings and sites that they were intended to serve (mills, power plants etc.),

water structures related to transport (canals, canal locks, etc.) form part of the area designated as "water management", but they also provide a service to transport.

The above-listed categories are supplemented by universal buildings (office buildings, warehouses, workshops etc.) and buildings providing social infrastructure (workers' housing schemes, market halls, schools etc.).

04.02.03. Interdisciplinary research

An integral part of industrial heritage is its reflection in the arts, conveying the atmosphere of the working environment and the social problems associated with it. Works of literature, art and cinema are able to capture the typical characteristics of a period, ways of life and working conditions by distilling them into their artistic essence. People's lives, fates and the traces they have left behind them represent an inseparable part of industrial heritage, and they are as important as the monuments themselves. Indeed, without these people's knowledge, skills, labour and personal stories, the monuments would not even exist.

Kovanec, water tower.
Photograph Viktor Mácha, 2018.

05. Heritage protection (the institutionalization of selective heritage management in the form of legal heritage protection)

05.01. Heritage protection on the national level

Currently, the legal protection of industrial heritage (as part of the Czech Republic's cultural heritage) is defined in Act no. 20/1987 Sb. on state heritage management. The Act sets out the legislative framework for the protection of individual monuments and ensembles (cultural monuments, national cultural monuments) as well as the protection of territorial entities that are of heritage value (heritage reservations, heritage zones).

The specific characteristics of industrial heritage (i.e. the technical essence of a monument, and often also the physical size of buildings and sites or issues connected with finding new uses while preserving essential heritage values) mean that when proposing that a particular monument should be granted legal heritage protection, it is necessary to provide precise and structured details of the values embodied in the monument and the requirements for their protection (including the selection or combination of different forms of protection – either as a monument or as a museum exhibit).

05.01.01. Cultural monuments

The term "technical monument" (in Czech "technická památka") is in wide use, but it is not codified by the Czech Republic's current heritage protection legislation. The previous legislation on cultural monuments (Czechoslovakia's first heritage protection law, Act no. 22 of 195829) defined the term "monument" ("památka", in the sense of a legally protected monument) as *"... a cultural good which demonstrates the historical development of society, its art, technology, science and other fields of human labour and life, or it is the preserved historical environment of settlements and architectural ensembles, or an item with a connection to important persons and events in history and culture"*. The current legislation, dating from 1987, modifies this definition as follows: *"Under this Act, the Ministry of Culture of the Czech Republic declares cultural monuments to be ... movable and immovable items or ensembles of such items (a) which are important demonstrations of historical developments, ways of life and the environment of society from the earliest time to the present day, as manifestations of the creative abilities and labour of people from the most varied fields of human activity, for their revolutionary, historical, artistic, scientific and technical value, (b) which are directly related to important persons and historical events"*.[30] The current legislation differs from the previous legislation in defining two specific situations pertaining to the relationship between an entity and its parts, which are of substantial importance to the field of industrial heritage. The current Act states that *"cultural monument status may be granted individually to a building which is not a separate entity, or to an ensemble of buildings"*, and that this status may also be granted to *"an ensemble of items or buildings even if one or more of those items or buildings do not display the characteristics of a cultural monument"*. This definition enables legal heritage protection to be granted to a complete entity (an entire site), but also to a separate part of a larger entity (part of a site, an ensemble of buildings). It also enables less valuable

29) Act no. 22/1958 Sb., on cultural monuments, Part 1, Division 1 – Protection and management of monuments, Section 2 – The subject of heritage protection, the concept of monuments.

30) Act no. 20/1987 Sb., on state heritage management, Part 1 – Basic provisions, Section 2 – Cultural monuments.

components to be subsumed into a larger entity if they are of importance to the entity as a whole (e.g. in order to maintain the integrity of the complete technological flow, an urbanistic structure, or a panorama).

Act no. 20/1987 Sb. also enables persons other than expert institutions and heritage management authorities to submit proposals for the award of cultural monument status and to initiate heritage protection proceedings.

A cultural monument ("kulturní památka"), a national cultural monument ("národní kulturní památka"), and a protected territorial entity – i.e. a heritage reservation ("památková rezervace") or a heritage zone ("památková zóna") – is inscribed in the Czech Republic's Central Register of Cultural Monuments ("Ústřední seznam kulturních památek"), which covers both movable and immovable monuments and is a fundamental tool for heritage protection. A decision issued by the Czech Ministry of Culture has entrusted maintenance of the Central Register to the National Heritage Institute (Národní památkový ústav, NPÚ). Prior to current heritage management legislation, monuments were inscribed in the Central Register by regional authorities, which (working in conjunction with district authorities, i.e. lower-level local government units) compiled the first inventories of movable and immovable monuments – including monuments from the domain of industrial heritage. Initially, the selection of monuments suffered considerably from the inadequate methodological principles that were applied to the selection (with a particular emphasis placed on architectural values) and an inadequate knowledge of broader contexts. The monuments selected for inscription in the Central Register during this early phase were mainly immovable monuments, sometimes including movable items; movable items were only selected if they were not owned by individuals or did not form part of museum and gallery collections. Immovable items were represented primarily by relatively small-scale technical and industrial structures – mills, bridges etc. – and only sporadically by larger entities and examples of industrial heritage.[31)]

In the field of heritage management, industrial heritage is thus viewed as part of the broadly conceived "umbrella" notion of cultural heritage. The term "technical monument" ("technická památka") is a loose designation for monuments whose construction and use were associated with production (and mining), transport or storage. A very sizeable proportion of these monuments are buildings which straddle the boundary between production and ethnography. The inclusion of structures such as small bridges in rural landscapes, or buildings such as granaries, mills, drying kilns, wine cellars and other agricultural structures, means that the most heavily represented areas of industry among these monuments are food and drink as well as transport. Also viewed as technical monuments in a looser sense are structures that lie outside the definition of industrial heritage – military structures (fortifications, barracks, cavalry stables) or structures connected with social and municipal infrastructure (fountains, bath-houses, fire stations, etc.), most of which were granted legal heritage protection on the basis of their architectural and artistic value.

Out of the total sum of movable and immovable cultural monuments, over 2,500 can be identified as buildings or ensembles that were originally designed for production, transport or storage, but only some of these 2,500 monuments meet the criteria of industrial heritage.

05.01.02. National cultural monuments

A national cultural monument ("Národní kulturní památka") is defined by Act no. 20/1987 Sb. as follows: "Cultural monuments which represent the most important aspect of the nation's cultural wealth are declared by the Government of the Czech Republic to be national cultural monuments; the Government stipulates the conditions for their protection".[32)] Monuments are proposed for national cultural monument status by the Czech Republic's Ministry of Culture.

The Czech Republic currently has 304 national cultural monuments, which include individual monuments and ensembles from the field of technical structures and industrial heritage. No unified concept has yet been applied to the selection of these monuments for national cultural monument status; in addition to monuments of national (and in some cases international) significance, the category also includes monuments which are merely of regional importance.

31) Act no. 22/1958 Sb., on cultural monuments, Part 1, Division 1 – Protection and management of monuments, Section 7 – Records of monuments; The management of movable items in museum collections is covered by Act no. 122/2000 Sb., on the protection of museum collections and amendments to other acts.

32 Act no. 20/1987 Sb., on state heritage management, Part 1 – Basic provisions, Section 4 – National cultural monuments.

Háj u Mohelnice, Třeština hydroelectric power plant

This power plant was built in 1922–1923 on the Morava River to a design by the architects Bohuslav Fuchs and Josef Štěpánek. Its function is expressed in its architectural language; the architectural elements depict the energy contained in the water and its subsequent transformation and concentration. The machinery is also valuable: a Francis turbine dating from 1932 is still operational. Photograph Miloš Matěj, 2016.

The first technical structure to be granted national cultural monument status (1962) was the Charles Bridge in Prague. It was later followed by the stone bridge in Písek (considered to be the oldest bridge in the Czech Republic), the country's last large chain bridge (moved to Stádlec from its original location in Podolsko), and a unique reinforced concrete bridge (1926–1928) in Bechyně. Transport infrastructure is also represented by the Czech part of the horse-drawn railway from České Budějovice to Linz (represented in České Budějovice by the Nissl house and the municipal salt-house, which included the salt store for the railway, as well as by guard-houses in České Budějovice, Kamenný Újezd, Včelná, Chlumec and Zvíkov, horse-changing stations in Bujanov and Holkov, and a section of the line at Suchdol) and by a system of canals in the Šumava mountains. The mining industry is represented by the Michal coal mine in Ostrava, which has been preserved intact (including machinery dating from just before the First World War), several ore mines in the Březové Hory hills near Příbram, examples of ore mines in the Ore Mountains (the Mauritius mine in Hřebečná and the Jeroným mine in Čistá), and the uranium ore sorting plant in Ostrov, which possesses powerful symbolic value (being known as the "Tower of Death" as it formed part of a communist-era forced labour camp where prisoners were exposed to dangerous levels of radiation). Metallurgy is represented by the old ironworks (Stará Huť) near Adamov, as well as by the integrated complex of the Hlubina coal mine and the Vítkovice coking plant and blast furnaces. Besides two mills of primarily ethnographic interest, the Winternitz automatic mills complex (designed by the architect Josef Gočár) is also a national cultural monument. Other industries are represented by isolated examples: the pattern shop at the former Alois Larisch & Sons cloth factory in Krnov, glassworks in Harrachov and Tasice, a waste water treatment plan in Prague's Bubeneč district, a hydroelectric power plant in Třeština (designed by the architect Bohuslav Fuchs), and the television transmitter on the summit of the Ještěd mountain. Movable monuments in this category include the "Slovak Bullet" locomotive and several historic cars from the vehicle collection of the National Technical Museum. A complete listing of national cultural monuments in the domain of technical and industrial heritage can be found in the Appendix.

05.01.03. Territorial heritage protection

05.01.03.01. Heritage reservations and heritage zones

Territorial protection is granted depending on the density of cultural monuments within a particular area and their importance in forming the character of the urban or rural landscape. A heritage reservation ("památková rezervace") is defined as "an area whose character and environment is determined by an ensemble of immovable cultural monuments or archeological finds",[33] while a heritage zone ("památková zóna", a lower level of protection) is "an area of a settlement or its part with a lower proportion of cultural monuments, or a historical environment or part of a landscape entity displaying important cultural values".[34] Heritage reservation status is granted by the government (analogously to national cultural monument status), while heritage zone status is granted by the Ministry of Culture following consultation with the relevant regional authority.

Currently, only one heritage reservation represents industrial heritage – the old ironworks complex (Stará Huť) near Adamov, which has held this status since 1971. Industrial heritage is more strongly represented among heritage zones. In 2014 four landscape heritage zones were created in recognition of the role of the mining industry in shaping the landscape: Jáchymov, Krupka, Abertamy – Horní Blatná – Boží Dar, Háj – Kovářská – Mědník. The delineation and evaluation of these zones was conducted as part of the preparations for the nomination of the Erzgebirge/Krušnohoří (Ore Mountains) mining landscape for inscription on the UNESCO World Heritage List.[35] The crucial role of industrial history in forming urban landscapes was recognized by the creation of urban heritage zones in Zlín (1990)[36] and Ostrava-Vítkovice (2003), which incorporate not only industrial sites, but also residential areas that were built in connection with the development of industry. The Sidonie workers' housing scheme in Brumov (built for glassworkers) became a heritage zone in 1995, and the wine cellars in Petrov-Plže in 1983. In 2003, the urban heritage reservation in Žatec (declared 1961) was expanded to include the Pražské Předměstí district (the town's urban heritage zone), which is dominated by highly distinctive structures connected with the local hop industry (2003).

05.01.03.01. Protective zones

A protective zone ("ochranné památkové pásmo") is a tool for protecting the area immediately surrounding a cultural monument or heritage zone. Such a zone may prevent inappropriate changes from being made to the exteriors of nearby buildings, preserve distinctive panoramas or views, or impose height restrictions (preventing excessively tall buildings from being built). A protective zone is declared by the local or municipal authority; in the case of national cultural monuments, heritage reservations and heritage zones, the authority is instructed by the (higher-ranking) regional authority to declare the protective zone – following consultation between the regional authority and the state heritage management body, i.e. the National Heritage Institute.[37]

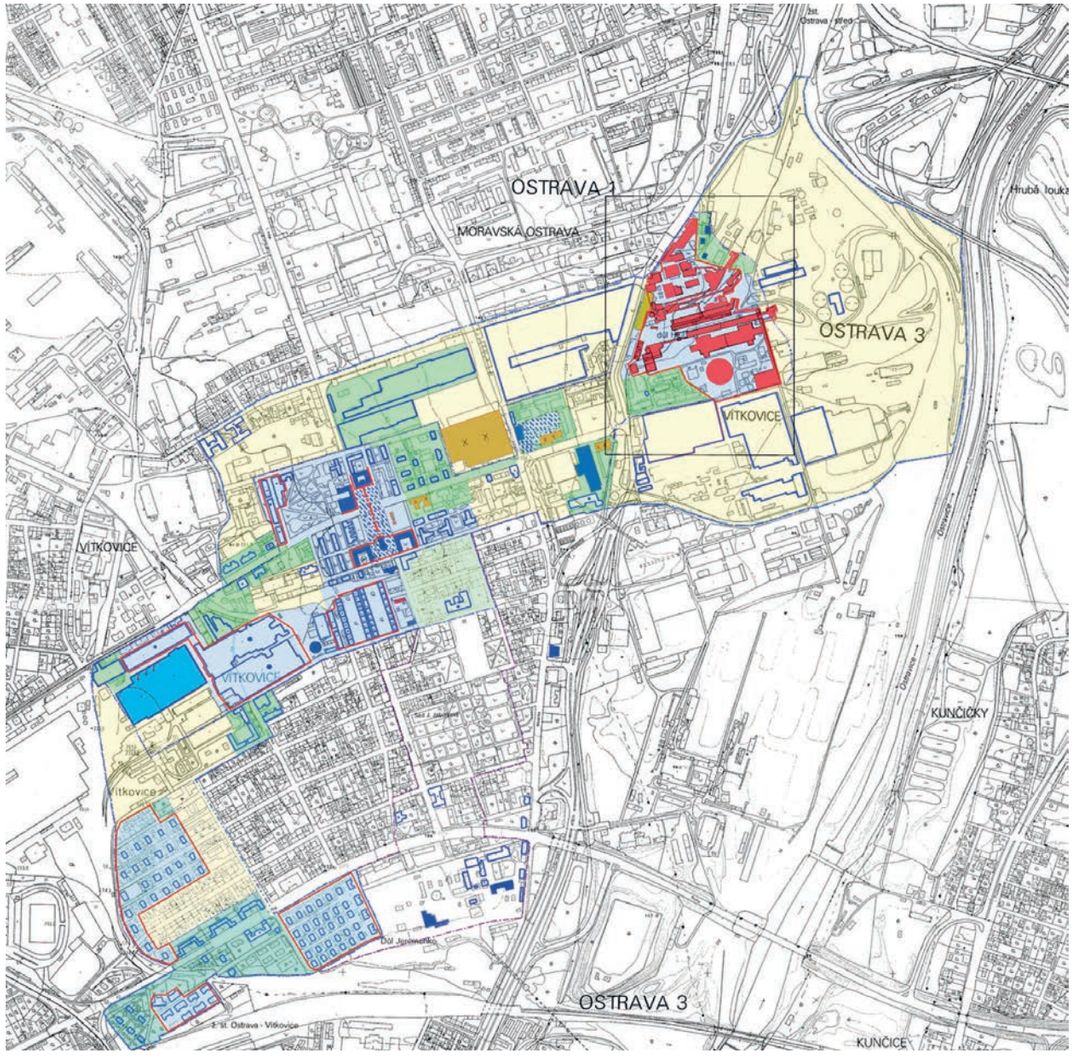
33) Act no. 20/1987 Sb., on state heritage management, Part 1 – Basic provisions, Section 5 – Heritage reservations.

34) Ibid., Section 6 – Heritage zones.

35) For more details see e.g. KAREL, Tomáš – KRATOCHVÍLOVÁ, Alžběta – MALINA, Ondřej. Shrnutí problematiky průzkumu montánní krajiny Krušnohoří. *Zprávy památkové péče*, 2016, no. 5, appendix, pp. 87–92; The survey of the Ore Mountains, funded by the DKRVO (long-term conceptual development for research institutions) programme in 2012–2017, focused on documenting and evaluating mining settlements and traces of mining activity forming part of the mining landscape. The programme's outputs also included maps and atlases for selected areas, which are available online at the National Heritage Institute's website.

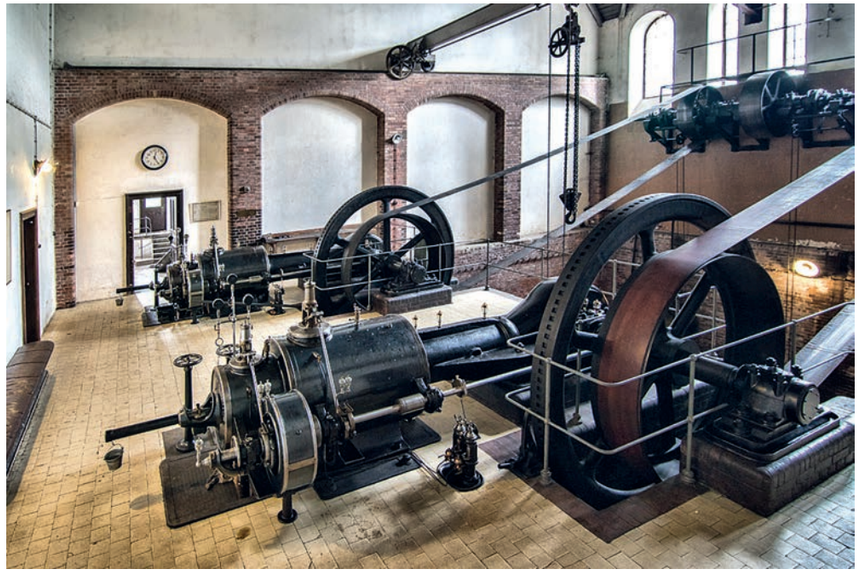
36) For more details see e.g. BUCHTA, Ladislav. Tovární areál firmy Baťa ve Zlíně. In MATĚJ, Miloš – RYŠKOVÁ, Michaela – GUSTAFSSON, Ulf Ingemar (eds.). *Technical monuments in Norway and the Czech Republic / Technické památky v Norsku a České republice*. Ostrava 2016, pp. 135–145 and MATĚJ, Miloš – KORBELÁŘOVÁ, Irena – TEJZR, Ludvík. *The Cultural Heritage of the Vítkovice Ironworks*. Ostrava 2014.

37) Act no. 20/1987 Sb., on state heritage management, Part 2 – Management of cultural monuments, Section 17 – Protective zones.



Ostrava, Vítkovice urban heritage zone

One of four urban heritage zones within Ostrava's boundaries is the Ostrava-Vítkovice urban heritage zone (granted this status on the basis of Regulation no. 108/2003 Sb. conferring heritage zone status on areas with a historical environment in selected cities and municipalities and determining the conditions for their protection, issued 1 April 2003). The zone incorporates areas connected with the development of the Vítkovice ironworks (established in 1828) and the related industrial town known as "New Vítkovice", which was built in several phases from the 1870 up to the outbreak of the First World War. The map shows buildings with legally protected status – the national cultural monument consisting of the Hlubina mine and the Vítkovice coking plant and blast furnaces (marked in red) and cultural monuments of both industrial and urban types (blue). The map also shows buildings which, although not legally protected, nevertheless possess a certain degree of heritage potential (outlined in blue). The degree of territorial protection granted to various buildings and parts of the zone differs; the highest degree of protection applies to the national cultural monument itself (the oldest part and the core of the Vítkovice ironworks, in the eastern part of the zone), the central part of "New Vítkovice" (including the square, town hall, church, school, preschool, creche, services, shops, residential buildings), the adjacent buildings of the "old steelworks", and separate residential development in the southern part of Vítkovice. Alongside these highly protected areas there are also areas with a less rigorous degree of protection (marked in green), and finally areas which the lowest degree of protection (yellow); here the protection applies only to height restrictions for new structures. Map by the National Heritage Institute, Ostrava branch, 2007.



Praha-Bubeneč, old waste water treatment plant

The city of Prague built a sewerage system in the late 19th century as a response to severe pollution in the Vltava River. Many large cities were facing similar problems, but unlike most of them, Prague did not merely create a system of waste water conduits; the city also built a mechanical system for treating (purifying) the waste water, designed by the pioneering civil engineer William Heerlein Lindley in 1894. The system consists of brick-lined main sewers draining water from an area of almost 5,500 hectares and a treatment plant equipped with screens for catching large debris, a sand trap, desludging reservoirs, and a central drive system powered by two Breitfeld & Daněk steam engines and two boilers. The plant operated between 1906 and 1967, when it was replaced by a new treatment plant built on an island in the city's Troja district. The system is exceptional on several levels: it used highly advanced technology for its time, it was built to a high aesthetic standard throughout the entire system, it possesses an exceptional genius loci, and it also attains a high degree of authenticity (which has been preserved because the plant was closed down in 1967). The old waste water treatment plant was declared a national cultural monument in 2010, and it is set to be included in the indicative list of monuments proposed for UNESCO World Heritage Site status. Photograph Továrna industrial real estate management company.

05.02. Heritage protection on the international level

05.02.01. The UNESCO World Heritage List

The foundations for the creation of the UNESCO World Heritage List were laid in 1972 with the signature by UNESCO member states of the Convention Concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention). The signatory states committed to protect, restore and present their heritage sites to the general public – a process that would include the creation of an essential legal framework enabling the values of heritage sites to be protected.

The UNESCO World Heritage List includes numerous examples of industrial heritage which embody important milestones that are of global significance in the history of industrialization as well as important examples that have helped to shape the history and development of individual states. Emphasis is placed on the international dimension, supra-national values, uniqueness, authenticity, and completeness (integrity).[38] The World Heritage List includes one of the iconic symbols of the Industrial Revolution – the iron bridge (1776) forming part of the Ironbridge Gorge World Heritage Site, alongside other monuments from coal mining and iron production in the Severn Gorge). Other World Heritage Sites are an ensemble of textile factories in the Derwent Valley (associated with the early mechanization of cotton-spinning in the 1870s, which was one of the milestones in the industrialization of textile production) and the warehouse of the former Liverpool Road railway station in Manchester (1830, part of the terminus of the line linking Manchester with Liverpool docks, the world's first rail line with regular passenger services). More recent examples include the Zollverein industrial complex in Essen (a monumental complex built in the 1930s, applying Bauhaus principles to industrial architecture, which has become a symbol of the Ruhr region) and the Rjukan–Notodden industrial complex in Norway (an example of the so-called Second Industrial Revolution in the early 20th century, combining what at the time was the world's largest hydroelectric power plant, factories producing chemical fertilizer to meet rapidly growing demand in Western economies, and a unique rail/canal transport system to connect remote but rapidly industrializing areas with global markets).[39]

The Czechoslovak Federative Republic signed the World Heritage Convention in 1990. The Czech Republic currently has 12 UNESCO World Heritage Sites, none of them from the domain of industrial heritage. The indicative list administered by the Czech Ministry of Culture currently contains the following nominations: the hand-made paper works in Velké Losiny; the heritage of fishponds in Třeboň; the Ore Mountains (Erzgebirge/Krušnohoří) mining landscape; Žatec, the town of hops; the mountain hotel and TV transmitter on the summit of the Ještěd mountain near Liberec; industrial complexes in Ostrava consisting of the Michal and Anselm coal mines, the Vrbice ventilation shaft, and the entire complex consisting of the Hlubina mine and the Vítkovice coking plant and blast furnaces.[40]

05.02.02. The European Heritage Label

This European initiative was launched in order to support and promote monuments connected with European history and integration. Preparatory work began in 2006, and the European Heritage Label (EHL) was codified in 2011 by a decision of the Council of Europe and the European Parliament. In 2006–2014 the EHL was held by the National Cultural Monument consisting of the Hlubina mine and the Vítkovice coking plant and blast furnaces.[41]

38) For more details see e.g. KUČOVÁ, Věra – MATĚJ, Miloš. Industrial Complexes in Ostrava to be nominated for Inscription on the UNESCO World Heritage List. Ostrava 2007, pp. 15–18.

39) World Heritage List. [retrieved 01. 02. 2017] URL http://whc.unesco.org/en/list.

40) Světové dědictví, NKP, chráněná území [online]. Národní památkový ústav [retrieved 31. 01.02017]. URL: Nemovité a movité kulturní památky [online]. Národní památkový ústav [retrieved 31. 01. 2017]. URL: http://monumnet.npu.cz/pamfond/list.php?hledani=1&KrOk=&HiZe=&VybUzemi=1&sNazSidOb=&Adresa=&Cdom=&Pamatka=&Nem=&CiRejst=&IdCis=&Uz=B&PrirUbytOd=3.5.1958&PrirUbytDo=31.1.2017&VybReid=&ReidProvOd=1.11.2010&ReidProvDo=31.1.2017

41) For more on the project see European Heritage Label / EHL [retrieved 2. 2. 2017]. In Creative Europe. URL: https://ec.europa.eu/programmes/creative-europe/actions/heritage-label_en; for information on the decision to remove EHL status from the Hlubina/Vítkovice National Cultural Monument, see European Heritage Label, 2014 Panel Report, 19 December 2014.

06. The preservation of industrial heritage

Varying degrees of importance are attributed to industrial heritage during evaluation; the overall value is always the sum total of all partial values (architectural, urbanistic, typological, technical etc.) in combination with the degree of originality and the technologies represented at the site. If heritage protection is granted, the degree of protection should depend on the value of each individual category; these values also guide the formulation of the principles which should be applied to ensure that the values are preserved – as well as determining how the monument should be managed going forward.

The evaluation should always rest on an objective assessment of heritage values, which will provide the essential guidance for determining the steps (interventions) that are necessary to ensure the preservation of the monument. From the perspective of heritage management there is an inversely proportional relation between new interventions and the preservation of heritage values: the degree of intervention should depend on the importance of the monument, so the higher its heritage value, the smaller the acceptable degree of intervention, and the greater the care that needs to be taken when finding a new use for it. Conversely, a monument with lower heritage value offers broader scope for smaller alterations, larger changes or even very substantial transformations.

Axel Föhl views monuments as carriers of information about the industrial past. It is therefore only possible to preserve them for future generations if interventions do not negatively impact upon the monument itself or the environment in which it is situated. Potential threats are present not only in building work or additions to the monument, but also in "clean-up" work in its immediate vicinity. However, it is only in exceptional and justifiable cases that it is practical to conserve a building or site to the fullest extent; the sheer scale of industrial buildings and sites is a major limiting factor, as it places substantial financial demands on maintenance work and other everyday operations. For this reason, it is essential to conduct objective and informed evaluations in order to select the most important examples of industrial heritage – i.e. "monuments" – which merit preservation in their authentic state. If a building has already been significantly altered (rebuilt, extended, etc.), it cannot be termed a genuine monument; rather it is an old building that has been put to new use.[42)]

When finding new uses for the most significant examples of industrial heritage, it is important to propose a use which:

- does not require major technical and structural changes and interventions,
- respects spatial limitations,
- retains the typological nature of the original monument (its composition, interior configuration, characteristic features etc.).
- respects the monument's heritage values – any architectural intervention should present these values and make them visible, rather than suppressing and concealing them.

The preservation of important examples of industrial heritage requires coordination and a shared approach by heritage management professionals, museums and cultural institutions, and private investors. In view of the wide scope and complexity of industrial heritage, it is necessary to apply a combination of approaches and forms of coordination, as well as involving various types of museums (acquisition plans, collection management, systematic depository provision and

42) FÖHL, Axel. Záchrana průmyslové minulosti – zkušenosti z Německa. Saving the Industrial Past – The German Experience. In *Průmyslové dědictví. Industrial Heritage.* Praha 2008, pp. 32–41.

Matlock Bath, Sir Richard Arkwright's Masson Mills, Working Textile Museum. Photograph Michaela Ryšková, 2011.

the creation of didactically informed exhibitions) and other cultural institutions. The most demanding cases are industrial agglomerations and energy/transport systems, which constitute highly complex entities whose internal structures have emerged over the course of time as a result of historical processes. If we are to preserve the most important examples and to demonstrate these structures and interconnections, we cannot view industrial heritage in terms of isolated individual items; instead we must evaluate, manage and protect these items with regard to their importance within the systemic entity as a whole. For this reason, it is necessary to seek out representatives of distinct developmental phases, technological interconnections and individual industries, while never underestimating the importance of monuments whose importance may be more opaque or those which are difficult to identify.

The preservation of industrial heritage

The Ruhr Valley (Germany), Emscher Park International Architecture Exhibition

The revitalization programme in the Ruhr region was based on an analysis of the industrial landscape which identified individual elements potentially playing a stabilizing (or destabilizing) role for the community as a whole, in conjunction with an assessment of historical former industrial sites possessing substantial heritage value. Some projects applied traditional museological concepts (applicable here in locations where original technical equipment had survived intact), while other projects focused on finding new uses for existing buildings – primarily their conversion for community use. Some monuments have remained unused; their function is to embody symbolic value for the particular location. However, practical experience has shown that many preserved winding towers have become popular sites for installing telecommunications equipment – a use which nobody could have expected when the revitalization programme was initially launched.

All decisions were based on a detailed survey of the landscape and terrain, buildings, and historical contexts. Industrial heritage was evaluated from the perspective of industrial archeology – not merely in terms of heritage management, but taking a more systemic approach and viewing the monuments as part of a complete cultural ecosystem. It is interesting that the stabilizing elements and factors identified by experts included items such as historic transport corridors (including bridges), a stable network of waterways, residential structures including their current inhabitants (workers' housing schemes), and established landmarks (e.g. spoil-tips, gas-holders, water towers, blast furnaces and winding towers). These individual positive elements of the industrial open-air museum (consisting of parkland and symbols of the landscape's industrial history) subsequently became the focus of individual projects to convert buildings and sites and to recultivate the landscape. Photograph Michaela Ryšková, 2016.

Essen, industrial landscape with the Zollverein coking plant and the Zollverein XII coal mine.

The preservation of industrial heritage

The Ruhr Valley (Germany), Emscher Park International Architecture Exhibition

Duisburg-Nord, Meiderich Hütte.

Essen, the Zollverein coking plant.

The preservation of industrial heritage – preserving original functions

Ovre Eiker (Norway), Hakavik power plant

This hydroelectric power plant was built in 1916–1922 to electrify the railway connecting Kristiania (today Oslo) with Drammen. Originally with three Pelton turbogenerators, in 1963 a fourth generator was added, taking the plant's total output to 14 MW. The plant continued to produce power with this equipment until 2015, when a modernization was launched. One of the options under consideration was to cease production and use the plant as a cultural centre; however, eventually it was decided to preserve the plant's original function instead. A compromise solution was found between preserving the plant in its authentic state and adapting it to new requirements; one of the turbogenerators was replaced by a new generator producing 4.9 MW with a horizontal Pelton turbine. The old transformers no longer in use will be preserved, cleaned and deposited in a protected location at the site. The removal of the original equipment and the installation of replacements has been documented in detail (including laser scanning) in order to preserve the most detailed information possible about the equipment itself and the modernization project. Photograph Ulf Ingemar Gustafsson.

06.01. Preserving original functions

Although many industries have experienced severe decline and many factories have been closed or production has been severely scaled down, certain specific types of industrial and technical monuments continue to perform the functions for which they were originally designed. This applies primarily to transport infrastructure, energy production facilities and water management structures. However, such monuments naturally have to respond to the demands placed upon them by the constant evolution of technologies and other forms of progress, which render existing components (or entire technological ensembles) obsolete, exceed the capacity of current buildings and equipment, and require new environmental criteria to be taken into account.

This constant adaptation to changing demands is associated with various degrees of intervention – from running repairs or the gradual replacement of obsolete machinery to more complete modernization projects, or in some cases major reconstructions with profound structural impacts. From the operational perspective, it is necessary to carry out a complete and objective technical and structural benchmarking evaluation[43] and to assess how the modernization will be conducted in order to meet new technical, operational and hygienic standards.

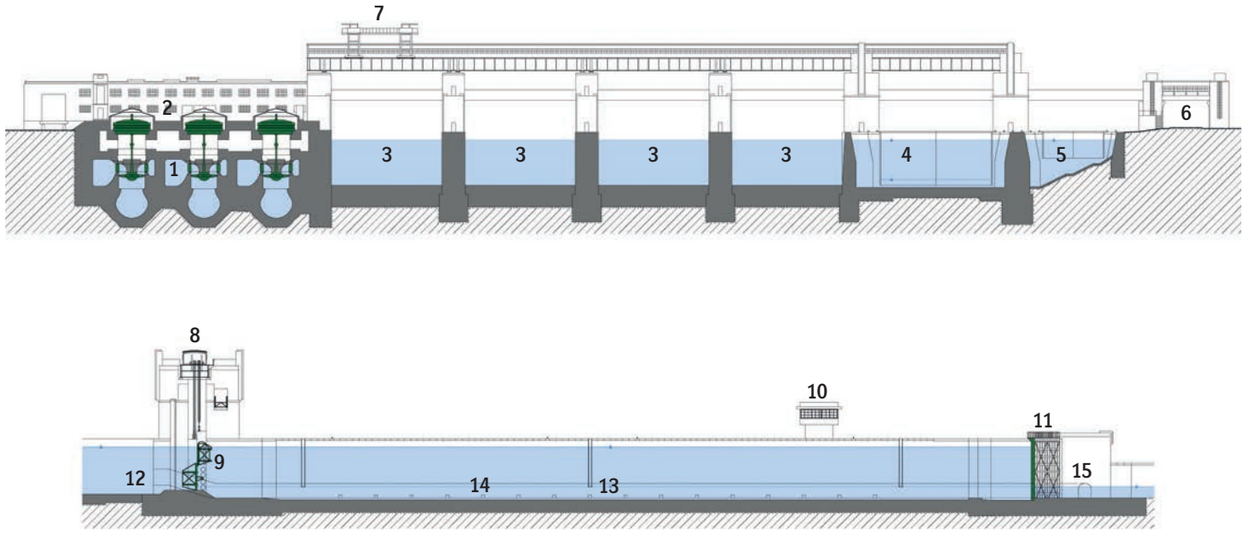
From the perspective of heritage management, it is necessary to clearly define the values and to identify the buildings and technical equipment which merit preservation. In view of the nature and size of technical monuments, it is essential to seek compromise solutions which will preserve the fundamental essence of the monument (its technological properties, key equipment, atmosphere, materials, typical form etc.). Possible types of compromise may involve preserving the ageing equipment (or key parts of it) in situ, moving the equipment to a different location (either within the original site or elsewhere), or carrying out structural alterations which enable the building to meet current operational requirements; if such alterations would substantially degrade the heritage values, then an appropriate new use may be found for the building. Renovations of buildings should reflect the existing architectural properties of the buildings, being based on the principle of synthetic addition or contrast.

43) HLAVÁČEK, Emil. *Architektura pohybu a proměn*. Praha 1985, pp. 124–125.

The preservation of industrial heritage – preserving original functions

Ostrava-Svinov, Svinov railway station passenger building

The railway station in Ostrava-Svinov was opened in 1847 on the Přerov–Bohumín section of the Emperor Ferdinand Northern Railway (Kaiser Ferdinands-Nordbahn). The passenger building in a Classicist style (combined with a water tower) was designed by the engineer Karl Hummel. In 1892–1893 a grand new neo-Baroque structure (designed by the architect Hartwig Fischel) was built abutting the original building, which was then used as a service area for railway personnel. The building gradually deteriorated during the second half of the 20th century; it continued to serve its original purpose, but by the 1990s it had fallen into serious disrepair. It faced a number of problems: structural issues connected with damp, numerous utilitarian alterations which had stripped it of all its former dignity, and a capacity which was no longer adequate for one of Ostrava's two largest railway stations. Plans were drawn up to demolish the station and build a replacement. Nevertheless, the passenger building was granted legal heritage protection due to its historical importance. The subsequent reconstruction – designed by the architect Václav Filandr – rehabilitated the original architectural forms and solved the problem of inadequate capacity by creating a transparent glass-walled extension where the new ticket hall was located. The vestibule of the historic passenger building now contains waiting rooms, and the adjacent parts of the building are used as a restaurant, shops and other passenger services. The first passenger building continues to function as technical premises. Photograph Michaela Ryšková, 2006.

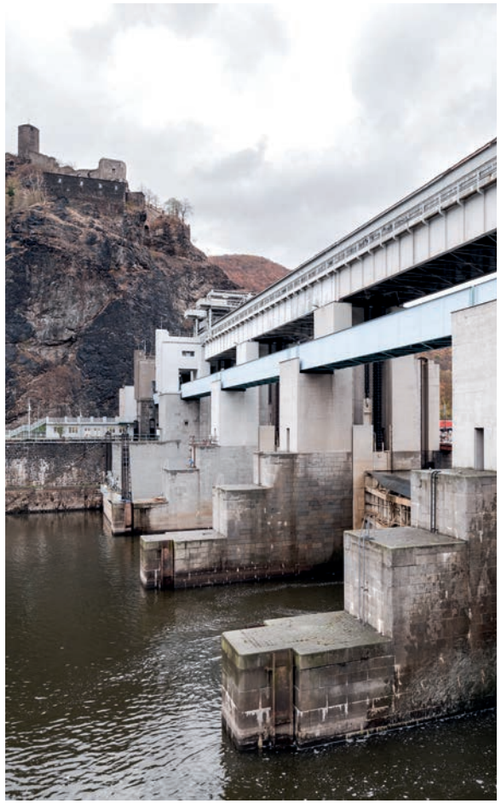


The preservation of industrial heritage – preserving original functions

Ústí nad Labem-Střekov, T. G. Masaryk river lock

Designed by the architect František Vahala and named after the first President of the independent Czechoslovakia, the lock was built in 1924–1936 in order to create a navigable route around the Střekov weir on the Labe River. It was one of the largest river locks in Czechoslovakia at the time, and one of the most technically advanced in Europe. It consists of two basins and a hydroelectric power plant equipped with three vertical Kaplan turbines producing a total output of 15 MW. Thanks to the generous dimensions of the original project, it has not been necessary to carry out a radical reconstruction; the alterations made to date have been relatively small-scale (a new control centre, replacement of the electromechanical lock system with a hydraulic system) or have involved the phased renovation of original elements (from the 1990s onwards). Both basins have been restored (including the replacement of the stop-gates, repairs and waterproofing of the walls, and repairs of the mitre gates), as has the weir (renovation of the horizontal structures and the suspended chains, repair of concrete surfaces and damage caused by floods in 2002), the footbridge and the fish channel.

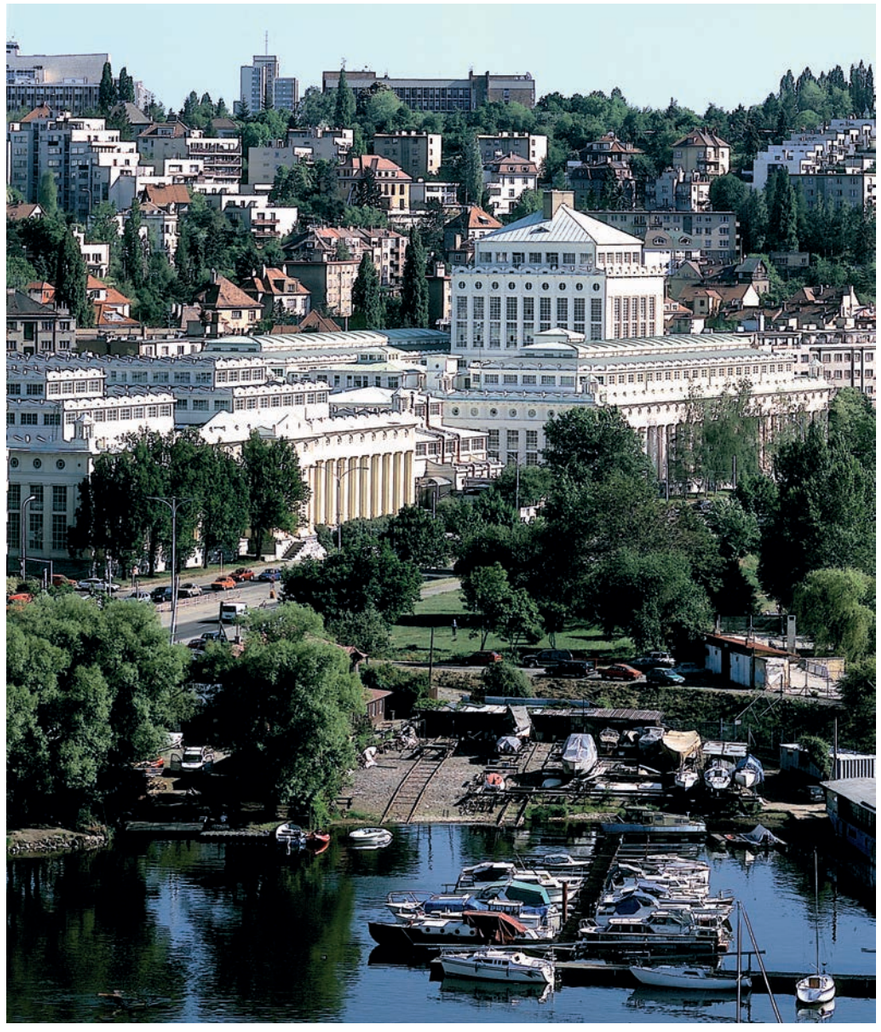
Longitudinal section of the power plant and a lock chamber. Legend: A – longitudinal section of the power plant turbine hall, longitudinal view of the weir fields and lock chambers; B – longitudinal section of the large lock chamber; 1 – three Kaplan turbines made by Českomoravská-Kolben-Daněk; 2 – three AC generators producing 6.5 MW (probably built by F. Křižik or Škoda Plzeň) producing a total output of 19.5 MW; 3 – four weir fields; 4 – large lock chamber; 5 – small two-part lock chamber; 6 – railway line; 7 – track for a rail-mounted crane used at the weir fields and the large lock chamber; 8 – covered bridge and engine hall for the electrical motors opening the wicket gates; 9 – two-part Stoney wicket gates suspended on Gall chains; 10 – lock chamber control centre; 11 – water-retaining mitre gate at the lower end of the lock chamber, operated by hydraulic cylinders; 12 – inflow to the bypass channel with hydraulic gate; 13 – bypass channels for filling and emptying the lock chamber; 14 – connecting channels between the lock chamber and the bypass channel; 15 – outflow from the bypass channel with hydraulic gate. Diagram Radek Míšanec, 2018, scale 1 : 700.



The preservation of industrial heritage – preserving original functions

Ústí nad Labem-Střekov, T. G. Masaryk river lock

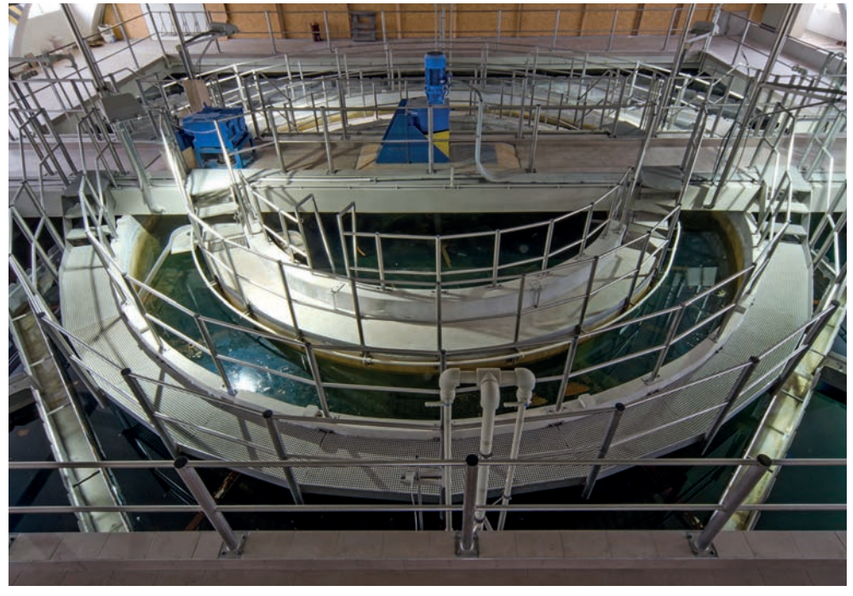
Historical postcard and current situation. Photograph Viktor Mácha and private collection of Miloš Matěj.



The preservation of industrial heritage – preserving original functions

Prague- Podolí, water treatment plant

The water treatment plant in Prague's Podolí district was built to replace the Káraný water works, which in 1914 itself had replaced the older Vinohrady and Prague water works. By the early 1920s the capacity of the Káraný plant had become insufficient to cope with the growth of the Prague conurbation, so the city again turned to the Vltava River as a source of drinking water. The Podolí water works (now the northern part of the site) were built by the Prague building contractor Karel Kress in 1925–1929 to a design by Antonín Engel. The complex included a filtering station, a reservoir on an island in the river, an engine hall with pumps, and an office building. The filtering station was one of the largest reinforced concrete structures in Czechoslovakia at the time of building. In 1956–1965 the plant was expanded (using the original architectural concept) to include a new filtering station (today the southern part of the site). The monumental neo-Classicist complex of the two connected filtering stations is one of Prague's most prominent landmarks on the right bank of the Vltava. In the 1990s the plant was modernized, and the Prague Waterworks Museum was installed in the older filtering station. Although the plant was closed down in 2003, it is still able to operate, and it is used as a backup water source – so the museum is combined with the site's original function. Photograph Jaroslav Beneš, Prague Water and Sewerage Corporation (PVK) archives, collection of photographs.



The preservation of industrial heritage – preserving original functions

Hillesvåg (Norway), Ullvarefabrikk

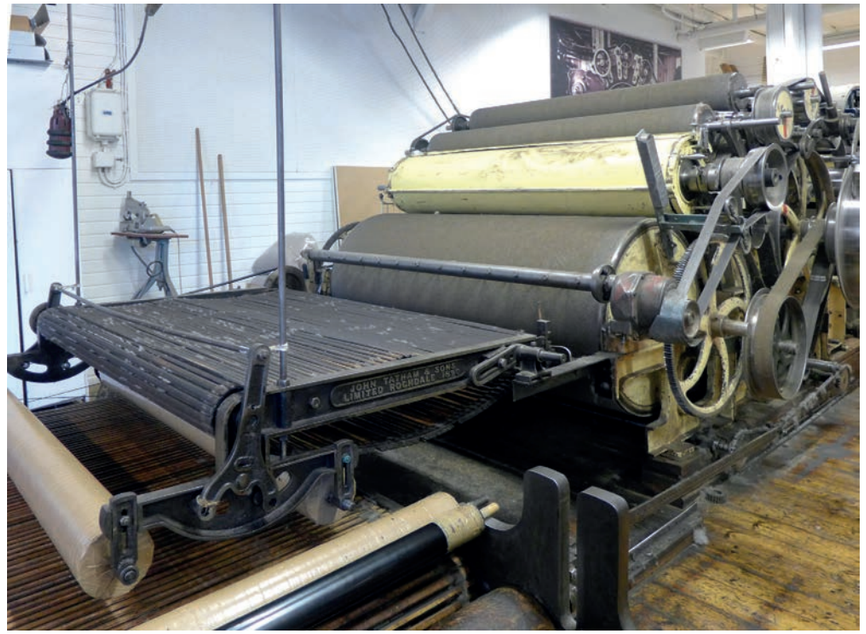
The preservation of industrial heritage – preserving original functions

Hillesvåg (Norway), Ullvarefabrikk

One of Norway's ten eco-museums is this wool spinning mill established in 1898 by Mikkel Myhr and run for four generations as a family business. Although woolworking had a long-standing and strong tradition in Norway, the Hillesvåg spinning mill is one of the few woollen factories that has remained in operation. It produces yarn for manual and mechanical knitting and carded wool yarn for manufacturing. Visitors can see the real production process in its entirety, from the unloading of the wool bales to the finished and dyed yarn. The machinery from the late 19th and early 20th century has remained in situ and can be seen in operation during the factory tour; the operation and maintenance of the machines is partly funded by state subsidies. Photograph Michaela Ryšková, 2016.

The preservation of industrial heritage – preserving original functions

Hillesvåg (Norway), Ullvarefabrikk



The preservation of industrial heritage – preserving original functions

Stockholm (Sweden), K. A. Almgren Sidenväveri & Museum

This museum was opened in 1991 in the former building of K. A. Almgren, a producer of silk goods. It documents not only the company's own history, but the Swedish tradition of silk production which reaches back to the mid-18th century. The company itself was established in 1833. The factory site, consisting of buildings dating from the 19th century, is now mainly used as a residential complex and offices. The museum occupies two floors of a factory building dating from 1862; it includes a fully functional silk-weaving workshop that has been preserved as it was when production (already considerably scaled back) finally ceased in 1974. On display in the museum are Jacquard looms, spinning frames and finishing machines. A professional silk-weaver demonstrates weaving techniques to visitors and produces silk items for (among other customers) the Swedish royal family. The museum is an example of how to deal with aspects of industrial heritage which are becoming uncompetitive and obsolete in the face of modern technologies; the solution preserves the original building and machinery while also ensuring that the production process is not lost. From the perspective of heritage management, it is an example of how maximum effect can be achieved at minimal cost, with the assistance of a very powerful genius loci. Photograph Michaela Ryšková, 2018.

06.02. Retaining maximum authenticity / “time capsules” / musealization in situ

Heritage management in the domain of industrial heritage should focus on selecting and preserving the most important examples of the process of industrialization in the main manufacturing industries, mining, transport and storage, while preserving their heritage values to the maximum possible extent. This may be achieved by preserving technical equipment and buildings in their authentic state and at their original locations, which are thus transformed into museum-type institutions; the principle of the “last working day” can be selectively applied (see chapter 03. Evaluation of industrial heritage). This type of solution preserves not only the material and functional essence of the monument, but also its atmosphere – its genius loci. Risks inherent in this approach include the addition of exhibits without clearly distinguishing them from the original setting, the imposition of an artistic vision on the setting, and overly enthusiastic attempts to create a clean, tidy environment (thus detracting from the raw power of the original setting).

The preservation of industrial heritage – musealization in situ

Völklingen (Germany), Völklinger Hütte

This ironworks was built near Völklingen in the early 1880s. The company soon built its own steelworks using the Thomas process (1891) and a coking plant (1897). By the end of the 19th century it had grown to become the largest iron and steelworks in Germany, and it retained a dominant market position until its closure in 1986 (a result of the crisis that hit the steel industry in the second half of the 1970s). Immediately after closure the works were granted heritage protection, and the complex has been a UNESCO World Heritage Site since 1994. Covering an area of 6 hectares, the site is an integrated ensemble representing the technological flow from coke production to the use of the coke in iron production; it has been preserved in its authentic state without radical reconstructions or interventions.

The former coking plant and six blast furnaces (including their auxiliary facilities) have been open to the public since 2000. Ideas on how much of the site should be publicly accessible, and on the best methods of conserving and stabilizing the site, have changed over the years. Initially only part of the site was opened to the public; there were no plans to open up the coking plant, and the guided tour route focused on one blast furnace (the other furnaces were to be left to become “controlled ruins”). However, this original concept was later revised; the tour route was expanded, and visitors can now see the site without a guide.

The supporting steel elements and structures have been painted and repaired by replacing parts that have reached the end of their service life (girders, the metal floors of the furnace top platform, parts of the railings, etc.); there has been no attempt to conceal these replacements. Metal elements in highly exposed locations have been treated and painted (e.g. at the contact points between the floors and metal structures of the blast furnace, where rainwater can collect). Everything else has been left untouched as far as possible along the entire tour route, and has merely been treated to conserve it (original structures and details, “artistic” fragments, rust stains and remnants of peeling paint on outer metal surfaces). The overall impression – both visual and haptic – is one of a unique genius loci. The ironworks site is used for numerous events and exhibitions, mostly held in the former storage building and the bellows control centre. The exhibition spaces extract the maximum possible effect from the contrast between the clean, new elements (exhibition panels, suspended lighting, benches, wooden flooring etc.) and the raw brutality of the industrial environment. Photograph Miloš Matěj, Michaela Ryšková, 2007.

The preservation of industrial heritage – musealization in situ

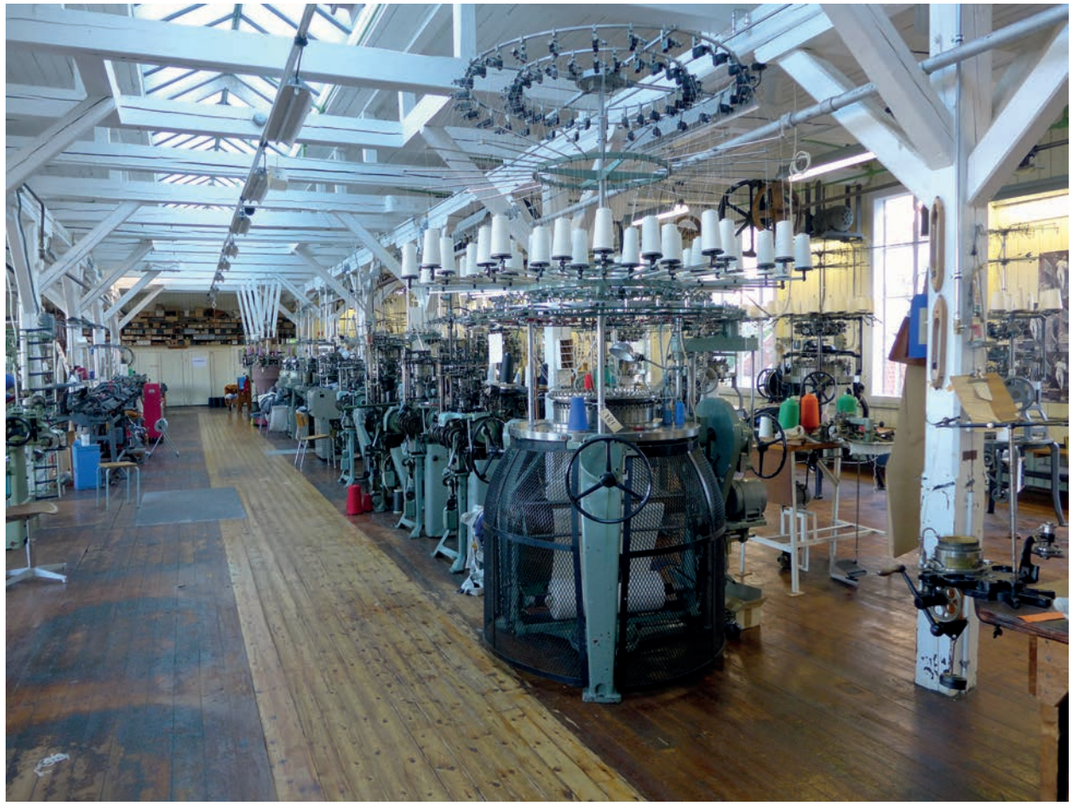
Beringen (Belgium), Vlaams Mijnmuseum

The buildings and winding towers of this coal mine (built 1919–1928) remained intact after the closure of the mine, and have been opened to the public applying the principle of the "last working day". The tour route passes through the bathrooms (with a unique system of separate shower cabins), the lamp store, registration room and pit-head building, continuing past the engine hall, pit-head building and other operational and administrative buildings. Adjacent to the site are workers' housing schemes and the Church of St. Theodard (1939–1943). Photograph Michaela Ryšková, 2009.

The preservation of industrial heritage – musealization in situ

Salhus (Norway), Norsk Trikotasjemuseum

In 1994 the Norwegian government drew up a list of 31 large industrial and technical sites that were considered to be of national importance. In 1997 new sites were added to the list – one of them a weaving mill in the village of Salhus, north of Bergen. The mill represents textile production, an important part of Norway's traditional industrial base. The mill was the most important employer in the small village. It was established in 1859, but it was only at the end of the 19th century that it began to grow substantially; workers' housing was also built at this time. The mill was closed down in 1989. The establishment of a museum at the mill maintained a degree of continuity, as some of the former employees still work there. Complete machinery has remained in situ at the former factory – including weaving looms of various ages and structural types, which are maintained in a functional state so that visitors can see them in action. Photograph Michaela Ryšková, 2016.



The preservation of industrial heritage – musealization in situ

Bethlehem (USA), Bethlehem Steel Works, National Museum of Industrial History

A new approach to preserving large industrial buildings and sites is demonstrated by this blast furnace complex consisting of five blast furnaces, an ore bridge, furnace charging technology, bellows, blast stoves and cast houses. It is conceived as a monument to the steel industry, offering a characteristic panorama when viewed from a distance as well as providing a new type of urban space acting as a setting and backdrop for various events, including a podium for concerts and theatrical performances. The monument is only accessible via a ramp over the ore bridge in order to ensure that all its technologies remain intact and do not lose their historical value. The tour route is connected with the National Museum of Industrial History, located in one of the former production halls, which uses real artefacts and easy-to-understand models to explain the development of steam engines and machinery for textiles and metalworking. With reference to the local tradition of iron and steelmaking, models explain technologies of coke production, pig iron production, steelmaking and forming. Photograph Miloš Matěj, Michaela Ryšková, 2018.

The preservation of industrial heritage – musealization in situ

Oberhausen (Germany), LVR Industriearchäologischer Park – St. Antony-Hütte

This is an important archeological site representing the early phase of iron production, which in this location dates back to the 1740s. In 1758 the first charcoal-fuelled blast furnace in the Ruhr region began production at the site. The blast furnace was closed down in 1843, followed by the foundry in 1877. Most of the structures at the site were demolished and cleared shortly after production was discontinued, though some auxiliary buildings were converted for residential use. An archeological survey lasting four years uncovered foundations (dating from several different periods) from the blast furnace, cupola furnace and foundry. The site has been opened to the public as the first German "industrial archeology park". 3D animations and visual reconstructions are used to make the archeological finds "come alive", giving visitors a clear idea of the configuration of the site and the production processes used here. The archeological finds are protected from the elements by a self-supporting roof (covering an area of 1 000 square metres) designed by the Essen architectural studio Ahlbrecht, Felix, Scheidt, Kasprusch. The former office building now houses an exhibition of archeological surveys. Photograph Michaela Ryšková, 2016.

The preservation of industrial heritage – musealization in situ

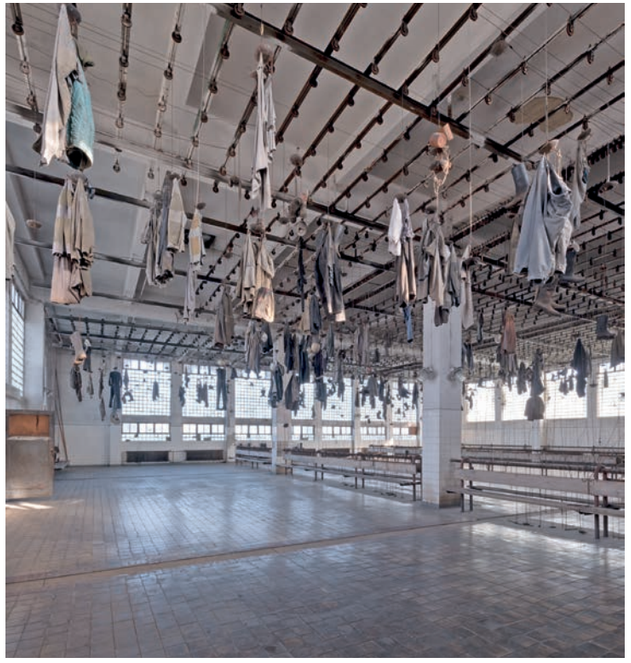
Crimmitschau (Germany), Sächsisches Industriemuseum – Tuchfabrik Gebrüder Pfau

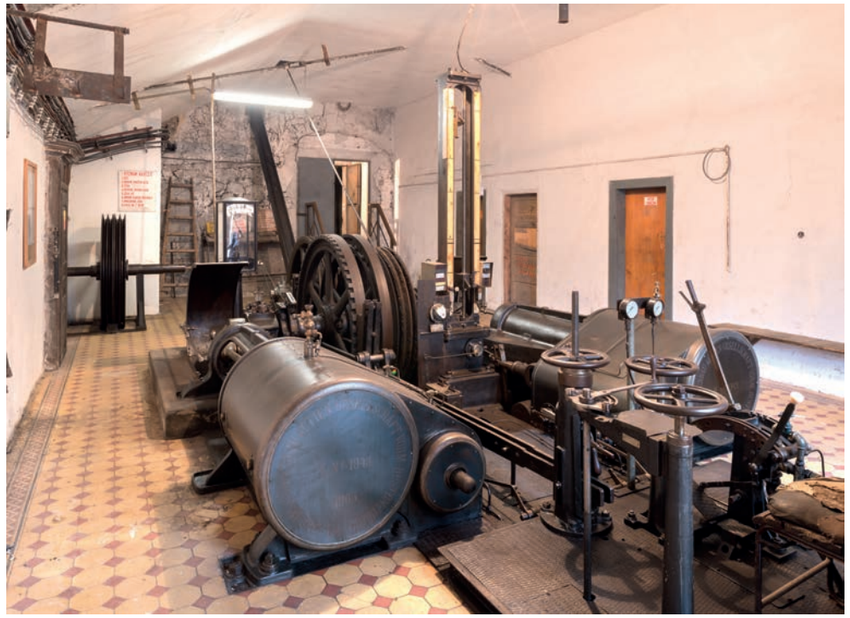
A woollen goods factory established in 1885. The complete technological flow for woollen goods production has been preserved, from the entry point (raw wool) to the finished product. The process is demonstrated using functioning equipment that was present at the site when the factory closed down in 1990. The application of the "last working day" principle is based on machinery from various periods, including relatively modern pieces. The gradual rehabilitation of the exterior does not detract from the raw industrial atmosphere of the interiors or the impression that production has only recently ceased.Photograph Miloš Matěj, Michaela Ryšková, 2015.

The preservation of industrial heritage – musealization in situ

Vinařice u Kladna, Mayrau mine

The former Mayrau coal mine (established in 1877) exemplifies a very high degree of authenticity, having been preserved by applying the principle of the "last working day". The mine was closed down in 1998 and the shafts were plugged. The engine halls contain the engines that were used at both shafts: a (still operational) Ringhoffer Smíchov steam winding engine (1905), a Koeppe-system steam engine made in Prague by MAG Ruston (1905) and located in the older part of the same engine hall, and a Škoda electric drum winding engine (1932) in the other engine hall. The decision to turn the mine into a museum was taken already in 1980; the museum was finally opened to the public in 1994. The Mayrau open-air mining museum is now run by the Sládeček Local History Museum in Kladno. Photograph Viktor Mácha, 2017.





The preservation of industrial heritage – musealization in situ

Vinařice u Kladna, Mayrau mine

Steam winding engine with Ruston friction disc (1905) and Škoda electric drum winding engine (1932). Photograph Viktor Mácha, 2017.

06.03. Transfer

Transferring a monument to a different location always represents an extreme solution, which (like the preservation of the maximum degree of authenticity) is only practically viable in exceptional cases. It is a solution that can be applied if a monument faces the threat of destruction – often due to radical changes in the environment where the monument is situated. Although the item itself is salvaged (rescued) by the relocation, it nevertheless loses part of its value by being removed from the original setting in which it functioned – a setting which it helped to create and shape. Nevertheless, the option of transfer is sometimes justified; the systematic transfer of items to salvage depositories (or museum collections) is a uniquely effective way of illustrating and presenting the historical development of a particular industry or technology.[44)]

The preservation of industrial heritage – transfer

Rožnov pod Radhoštěm, Wallachian Open-Air Museum

Immovable monuments are only transferred to a different location in rare cases, primarily when creating open-air ethnographic museums. In the 1970s, one part of the Wallachian Open-Air Museum (the part known as the "Mill Valley") began to acquire several small-scale technical structures connected with water power. A fulling mill, sawmill and flour mill (probably dating from the mid-18th century) were moved to the museum from Velké Karlovice. The equipment of the hammer mill was brought to the site from a hammer mill in Nemílkov near Klatovy and was installed in a new building constructed as a replica of an original building in Ostravice. The site also has an oil press from Brumov featuring original 17th-century technology. Another part of the museum site (the "Wallachian Village") has a forge (originally from Lutonina) and a German-type windmill (originally from Kladník near Lipník nad Bečvou). Technical structures also form part of other open-air museums. In 1977 a building from Oldřetice was moved to the newly established Veselý Kopec museum, on the site of a former water mill that had been destroyed by fire. Another former mill site was used for a similar purpose in the North Bohemian village of Zubrnice; in 2004 a mill was moved to the site from nearby Homole u Panny. A collection of village buildings from the central Vltava region at the open-air museum in Vysoký Chlumec includes a water mill from Radešice and a sawmill (including machinery) from Dolní Sloupnice near Chrudim, as well as several forges. Similar examples outside the Czech Republic include the Astra open-air museum in Sibiu (Romania), as well as other museums in Germany, Switzerland and Scandinavia. The photograph shows the mill from Velké Karlovice in the "Mill Valley" part of the Wallachian Open-Air Museum. Photograph Michaela Ryšková, 2018.

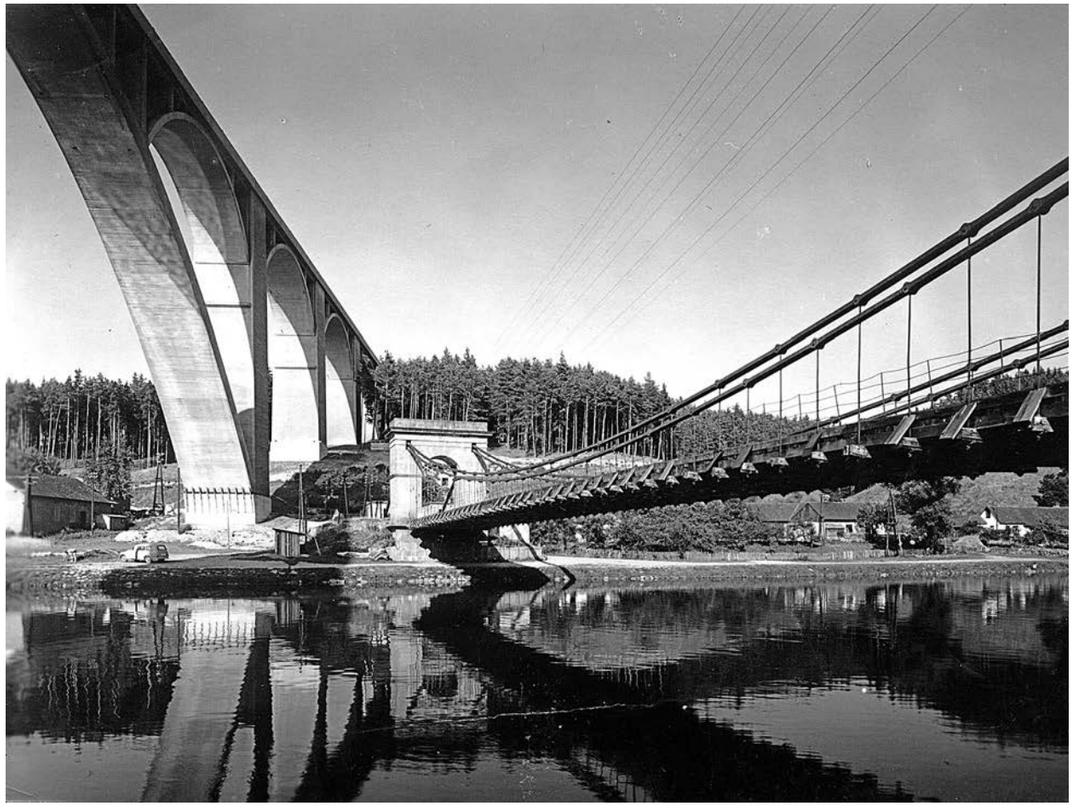
44) The concept of the salvage (rescue) of industrial heritage from the perspective of museology is the focus of a separate methodological publication – MERTOVÁ, Petra. *Methodology for the Evaluation and Protection of Industrial Heritage through Museology.* Ostrava 2019.

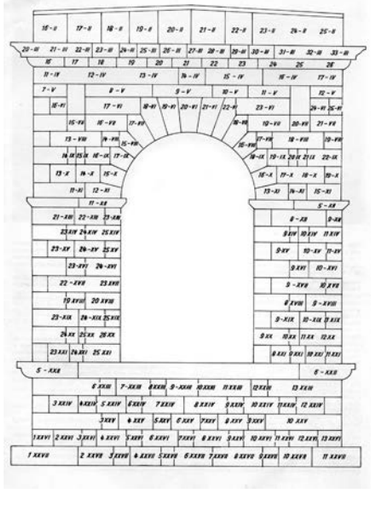
The preservation of industrial heritage – transfer

Rožnov pod Radhoštěm, Wallachian Open-Air Museum

Sawmill and fulling mill moved to the site from Velké Karlovice (top and middle) and a tail hammer originally from Nemílkov.

Photograph Michaela Ryšková, 2018.





The preservation of industrial heritage – transfer

Stádlec, chain bridge

The most important example of the relocation of an immovable technical monument in the Czech Republic is the transfer of the Empire-style chain bridge built in 1847–1848 by the building contractor Vojtěch Lanna over the Vltava River near the village of Podolsko, on the road between Písek and Tábor (part of the main route from Bavaria to Galicia). In 1960 the bridge was dismantled as its original location was to be submerged under the planned Orlík reservoir; it was moved to the village of Stádlec on the Lužnice River, where it was reassembled and ceremonially reopened in 1975. It continues to serve its original purpose, though weight and size restrictions apply to vehicles crossing it.

Photograph National Heritage Institute, General Directorate, photographic archive, Vladimír Hyhlík and Eva Dvořáková.

The preservation of industrial heritage – transfer

Bochum (Germany), Deutsches Bergbau-Museum, winding tower of the Germania mine

This double strut-framed winding tower was built in 1943–1944 to a design by the architects Fritz Schupp and Martin Kremmer. It remained in operation until 1971 before being dismantled and transferred to the mining museum in Bochum. With a height of 71.4 metres, the tower became one of the city's most distinctive landmarks, and it also has a viewing platform for visitors. Photograph Miloš Matěj, 2006.

The preservation of industrial heritage – transfer

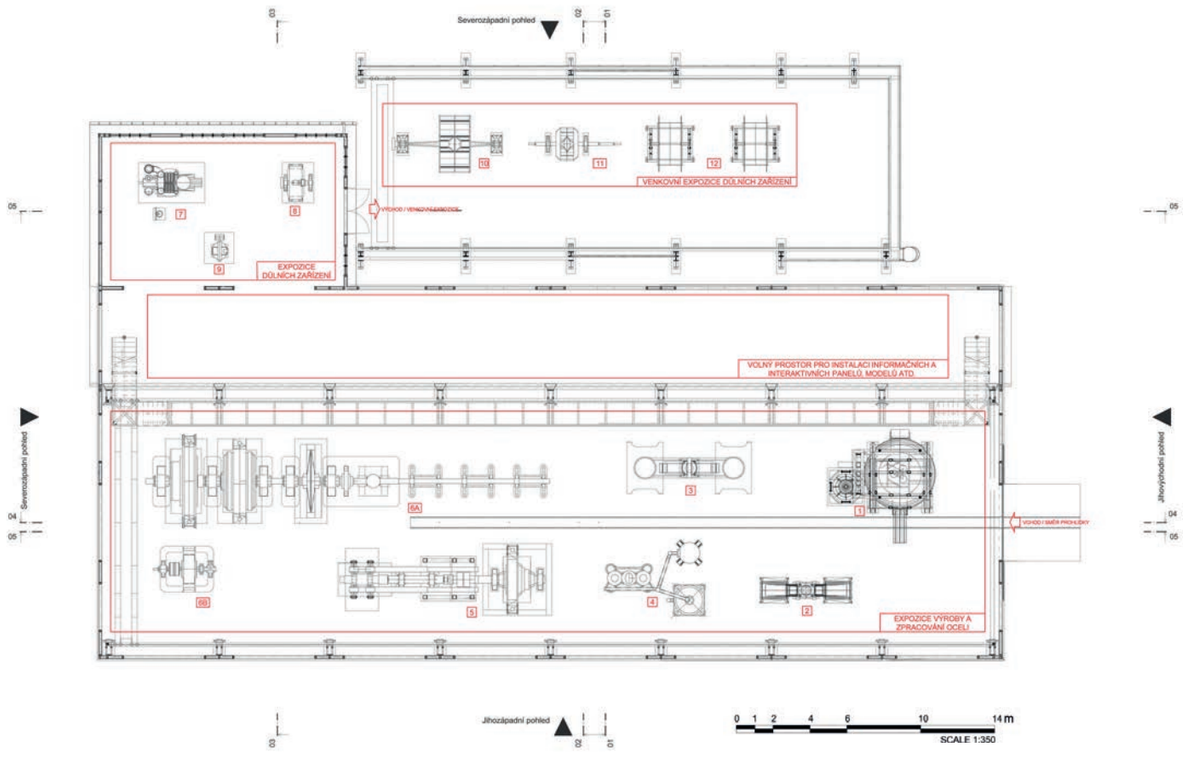
Roubaix (France), La Manufacture des Flandres, Musée Atelier du Textile

This museum of textile production in Roubaix was established in the former Craye textile factory. It has an extensive collection of functioning weaving looms of various ages and structural types, as well as other textile manufacturing machinery brought to the museum from local factories after closure. Photograph Michaela Ryšková, 2013.

The preservation of industrial heritage – transfer

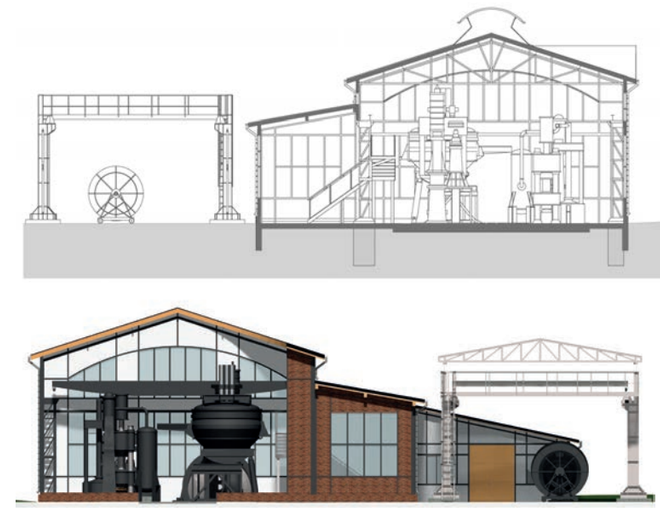
Ostrava, concept for a salvage depository for machinery from the Vítkovice ironworks

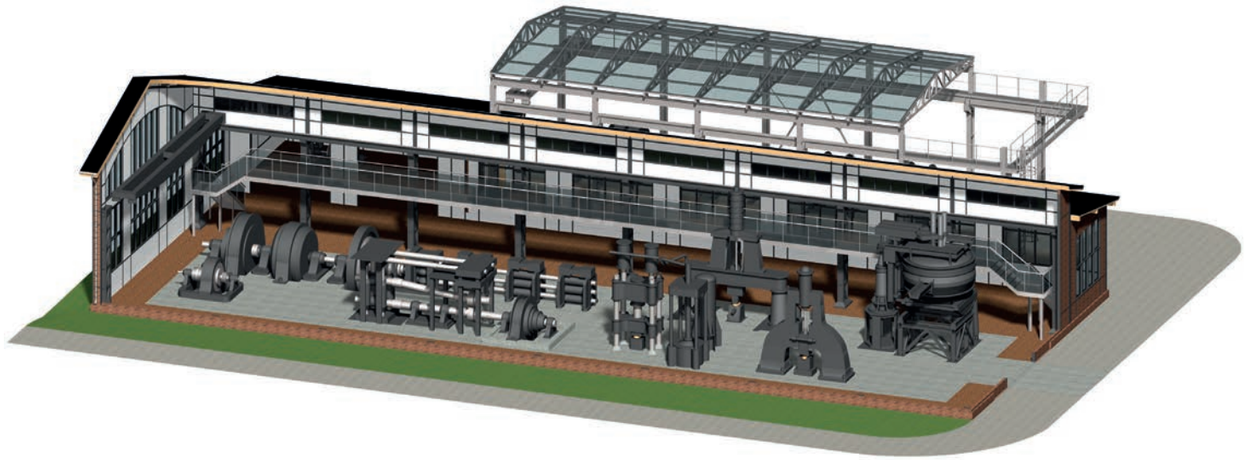
Already during the 1990s, in connection with the first heritage management surveys carried out at the Vítkovice ironworks, the company museum identified machinery and equipment of major technical value which was to be preserved after the closure of the works. Currently, the only viable way of salvaging this valuable machinery and equipment appears to be relocation to a salvage depository at the mechanical workshops of the Michal mine in Ostrava-Michálkovice; the mine complex is run as a museum by the National Heritage Institute. However, due to limited capacity, the number of items relocated in this manner will have to be reduced. The aim is to create a display presenting the technological flow of metallurgical production following on from the production of pig iron, i.e. an electric steel furnace and subsequent forming operations (exemplified by a hammer, a press, a rolling mill, and a seamless tube mill). In view of the location of the mechanical workshops, a small steel furnace (no. 3) has been selected to represent the steel production process (including part of the furnace platform). The most valuable items in the ensemble are a steam hammer used at the Vítkovice forge (made in 1898 by Märkische Maschinenbauanstalt), a 1.7-tonne steam hammer made in 1902 (Wulkan), and an 800-tonne steam hydraulic press made in 1908 (Davy Brothers). From the perspective of the overall concept, it would be desirable if the technological flow of metallurgical production (steelmaking and forming) could also be illustrated by a universal rolling mill and the unique Stiefel seamless tube mill – which has been dismantled and temporarily reassembled on the premises of the current owner of the tube works (Třinecké železárny, a. s.).



Ostrava, concept for a salvage depository for machinery from the Vítkovice ironworks

Diagram of possible locations of machinery at the mechanical workshops of the Michal mine. Steel production and processing machinery: 1 – electric arc furnace no. 3; 2 – Wulkan steam hammer (1902); 3 – steam hammer; 4 – 800 t steam hydraulic press; 5 –Universal rolling mill; 6A – "450" rolling mill, 6B – starter motor of "450" rolling mill. Mining machinery: 7 – Parsons turbine; 8 – electrical engine; 9 – AEG electrical engine; 10 – Quibal ventilator; 11 – ventilator; 12 – cable drums. Proposal for locations of machinery, Radek Mišanec, 2016.





The preservation of industrial heritage – transfer
Ostrava, concept for a salvage depository for machinery from the Vítkovice ironworks
Proposal for locations of machinery, Radek Míšanec, 2016.

The preservation of industrial heritage – transfer

Ostrava, concept for a salvage depository for machinery from the Vítkovice ironworks

Ostrava, Vitkovice, electric arc furnace no. 3 at the old steelworks and Universal rolling mill at the hot rolling plant. Photograph Miloš Matěj, 2014. More photographs are on page 83.

The preservation of industrial heritage – transfer Gräfenheinichen (Germany), Ferropolis
This museum of open-cast coal mining was established in 1995 on the edge of a lake created when a surface mine was flooded. It includes five extraction and filling machines from the second half of the 20th century. The machines are arranged around an arena which regularly serves as a venue for cultural and community events (music festivals etc.). Photograph Miloš Matěj, 2016.

06.04. New uses / conversion

Finding new uses for (not only industrial) buildings which have lost their former function is nothing new. Radical technological changes, or economic crises of various magnitudes, have always been an integral part of the development of specific industries and the economy in general. These processes lead to the opening of new industrial facilities and the closure of obsolete ones – whose premises (if they are not demolished) are often re-used for new purposes. Multifunctional buildings in particular have generally proved highly adaptable to new uses without the need for radical changes – as in the case of numerous textile factories whose large, well-illuminated interior spaces can usually be re-purposed without significant problems. Some monofunctional buildings have also been successfully adapted for new use – including former ironworks or mills. However, the industrial crisis which began in the West during the 1960s and 1970s (and hit parts of the Eastern bloc around two decades later, due to its economic isolation) meant that a large number of industrial buildings and sites (indeed far more than ever before during the industrial era) lost their original functions within a relatively short timespan. The consequences of this process of de-industrialization are comparable

The preservation of industrial heritage – new uses / conversion

Ruprechtov, windmill with Halladay turbine

Smaller buildings with pre-industrial technologies are relatively easy to adapt for new functions. Former mills in particular are quite often converted for residential use. One example is the windmill in Ruprechtov, which is unique because the sails were replaced by a Halladay turbine produced in 1882 by the Wichterle & Kovařík engineering works in Prostějov. When the mill was nationalized after the Second World War, it was no longer used and it fell into disrepair; the milling machinery was destroyed. The mill has been rehabilitated by a residential conversion which respects its architectural and technical values. The milling machinery has not been replaced, but the turbine has been reconstructed on the basis of surviving fragments and documentation; it was reinstalled in 1995. It is apparently the only example of this type of turbine in the Czech Republic. Two more Halladay turbines in Sivice and Tvarožná near Brno are no longer in existence. Photograph Michaela Ryšková, 2016.

with the changes which accompanied the emergence and development of industry; they have not only industrial and economic effects, but also impact greatly upon society. To give an idea of the scale of the process, Neil Cossons states that during the 1980s, in Greater Manchester alone there were almost a thousand former textile factories lying unused.[45)]

However, this process does not only affect isolated buildings and sites; it also exerts a powerfully transformative force upon cities and entire industrial agglomerations, shaping the industrial landscape, its structure, systemic interconnections, focal points, and physical appearance. The industrial landscape, a city or a part of the city formed during the course of industrialization are also deprived of their original functions, and have to seek new purposes. There are numerous reasons for preserving and re-utilizing former industrial buildings and sites, including cost savings (materials and energy) and the quality of the original buildings (architectural value, quality of materials and execution, better climatic comfort in buildings made from traditional materials, etc.). Additional reasons include the buildings' importance to their immediate environment (preservation retains a diverse and varied environment, yet also one which is already structured, well-established and "lived") and their importance to the overall urban structure (retaining focal points, landmarks, and broader interconnections within the urban landscape). Large-scale development projects can pose a risk if they seek to exploit the location of industrial sites, which in the early phases of development were on the edge of urban areas but have since "shifted" closer to city centres as cities have expanded. The complete demolition of an industrial site and its replacement by new buildings has the effect of substituting a complex and varied embodiment of the past with a single unified new layer. By contrast, the appropriate re-purposing of factory buildings (whether for industrial use, services, residential use or other uses) helps to preserve the structure of the urban fabric and adds a new layer without erasing the older layers which co-exist, overlap and reflect different phases of development.[46)]

The initial wave of enthusiasm for the rescue and re-utilization of old factory buildings – which accompanied the first such conversion projects in the 1970s and 80s – opened up the question of how much intervention is acceptable and what types of intervention are appropriate in such cases. The answers to these questions should be based on the assessment of the heritage value of a particular building or site. That does not necessarily mean imposing stricter conditions. On the contrary; a thorough knowledge of the sum total of industrial heritage and monuments enables an objective distinction to be drawn between unique buildings and sites (which require very sensitive treatment, striving to attain the maximum possible degree of authenticity, as outlined above), less important buildings and sites (which are open to various compromises), and entirely ordinary buildings which are merely "old" rather than particularly important (where retaining the original atmosphere and genius loci depends on the intentions of the investor and the sensitivity of the architect). If heritage management experts possess a thorough knowledge of the sum total of industrial heritage and monuments, this means that they do not need to demand the strict preservation of authenticity in buildings which do not merit this level of attention. In terms of their overall effect, alterations should in general terms respect the original operational, technical and typological features of the building in question; the alterations should not play the dominant role, and they should not attempt to overlay or conceal the overall character and atmosphere of the building with their own new forms of expression. If a conversion project does not follow these principles, it cannot be considered a case of salvaging industrial heritage; instead it is merely a new use for an old industrial site.

45) COSSONS, Neil. Průmysl včerejška, odkaz zítřku? In *Průmyslové dědictví. Industrial heritage.* Praha 2008, pp. 14–30, here p. 15.
46) ŠENBERGER, Tomáš. *Rekonstrukce výrobně-technických staveb k novým účelům.* Praha 1995, pp. 28–30.

The preservation of industrial heritage – new uses / conversion

Liverpool (England), Albert Dock

The conversion project at the Albert Dock complex in Liverpool was one of the largest and most prominent projects of this type in the 1980s, and it played an important role in fostering a general acceptance of the notion that former industrial buildings and sites (including transport infrastructure and storage facilities) represent a valuable segment of cultural heritage in their own right. The Albert Dock complex was built to a design by the architect Jesse Hartley in 1839–1846. It was the first structure of its type which avoided using timber as a building material (in order to prevent fires), and in 1848 it also saw the first use of hydraulic cranes to move goods inside warehouses. The docks were closed down in 1972, and in the 1980s they were repaired and reconstructed. The Albert Dock is now the site of the Merseyside Maritime Museum and a branch of the Tate Modern Gallery; other buildings have been converted for services and as residential units. The re-opening ceremony was held in 1988. Similar examples include the Musée d'Orsay in Paris, a conversion of a former railway station passenger building. Photograph Miloš Matěj, Michaela Ryšková, 2008.

The preservation of industrial heritage – new uses / conversion

Bocholt (Germany), LWL-Industriemuseum – Textilwerk

The former spinning mill of the Herding company was built in 1907. Its current appearance is the result of rebuilding work following the Second World War (the factory was partially destroyed during the war). Production resumed in 1950 and continued until 1973. The Herding company – which also ran the neighbouring weaving mill – was one of the most important companies in the local area. In 2004 the building became part of the LWL-Industriemuseum, which had been running a textile museum in the town since 1984. Reconstruction work began in 2009, and was completed (including the exhibitions) in 2016. The new use of the spinning mill as a combined museum and community centre displays exceptional sensitivity to the original environment and its atmosphere; entirely ordinary, utilitarian industrial spaces are elevated to a new level by architectural interventions which create a highly attractive setting for cultural and community events. Photograph Michaela Ryšková, 2014, 2016.

The preservation of industrial heritage – new uses / conversion

Ostrava-Moravská Ostrava, power station no. III and power plant of the Karolina coking plant / Triple Hall
The power plant of the Karolina coking plant (1905) and power station no. III (1907, expanded with the addition of a new hall in the 1920s) are the last remaining structures from the large complex of the former Karolina coking plant and the Sophienhütte ironworks, demolished in the 1980s. In 2014 the site was converted (to a design by the architect Josef Pleskot) to create a complex known as the "Triple Hall". The former power station no. III (a hall with dual naves) is used as a public multifunctional indoor space, and the Karolina power plant is used as an indoor sports centre. Photograph Michaela Ryšková, 2016.

The preservation of industrial heritage – new uses / conversion

New York City (USA), High Line

A railway line was built in 1929–1934 by the New York Central Railroad to transport goods and raw materials to factories and warehouses on Manhattan's West Side; the line was raised above ground level to ensure that potentially hazardous rail transport was not routed through city streets. Operations ceased in 1980. Out of the original 21 km, a section totalling 2.33 km has been preserved between Gansevoort Street and 34th Street; a project in three phases (2002–2014) has transformed it into a park. Self-sowing plants and trees have been allowed to grow, returning a natural element to this urban space. When planning the park, priority was given to plant species that had already established themselves during the period when the line was no longer operational. In general terms, the project embodies three aspects of sustainability as formulated by its authors Ricardo Scofidio and Matthew Johnson (which can also be applied to other similar examples of transformation projects at former industrial buildings, complexes and technical structures). Economic sustainability takes into account not only the funding of the conversion itself, but also the funding of its subsequent operation – especially in the case of newly created public spaces. Only economically sustainable projects can ensure regular maintenance, renovation and utilization. Social sustainability concerns the revitalization of space, which is "re-inhabited" as a result of the conversion project. The third aspect is ecological sustainability, based on the recycling of original buildings, structures, and materials – and in the case of the High Line, also plants and ecosystems. Photograph Michaela Ryšková, 2017.

The preservation of industrial heritage – new uses / conversion

New York City (USA), High Line

The entrances from West 34th Street and Gansevoort Street with the Whitney Museum of American Art.

The preservation of industrial heritage – new uses / conversion

Zlín, Baťa / Svit, office building no. 21 and factory buildings nos. 14 and 15

The large complex of the former Baťa factories was split up and sold off to different owners during the privatization of the Svit company in the 1990s, and it continues to be used for production and storage. The site has been opened up to the public thanks to two model reconstruction projects. Office building no. 21 was opened in 2004 as the headquarters of the Zlín Regional Authority. The conversion project emphasized the value of authenticity, retaining as many original features as possible on the eighth floor and preserving the original architectural character of the entire site. In 2013 the former factory buildings nos. 14 and 15 were reconstructed to create a space for the Regional Library, the Regional Art Gallery and the Museum of South-Eastern Moravia. The exterior renovation work preserved the cableway systems used for transport between the buildings – the last surviving elements of the factory's internal system for transporting semi-finished goods between different points in the technological flow. Photograph Michaela Ryšková, 2018.

The preservation of industrial heritage – new uses / conversion

Zlín, Baťa / Svit, office building no. 21 and factory buildings nos. 14 and 15 (bellow).

The preservation of industrial heritage – new uses / conversion

Kladno, Vojtěch ironworks, Bessemer steelworks

The former Bessemer steelworks at the Vojtěch ironworks in Kladno is an example of the growing number of high-quality conversion projects at former industrial sites thanks to enlightened owners and skilful architects. The building is the last remaining hall of the original triple-nave Bessemer steelworks, built in 1875 and one of the oldest structures at the Vojtěch ironworks site. It also embodies a milestone in the development of steel production; in 1879 it saw the first use in continental Europe of a Thomas converter to produce steel. The building was later used as a bellows centre and a forge. It has been reconstructed for the Jiko Metal company to a design by Ivan Sládek. Photograph Viktor Mácha, 2017.

The preservation of industrial heritage – new uses / conversion

Bílý Potok, Karl Bienert Jr. spinning mill / Jizera Mountains Technical Museum

This spinning mill, established in the mid-19th century, made vigogne yarn (spinning together a mixture of cotton and wool). In 1913 it was rebuilt following a fire to a design by the architect Heinrich Zieger. The mill remained in operation until 2001. The current owners initiated the process which led to the declaration of cultural monument status, and they have undertaken a phased process of rehabilitation. The new purpose found for the spinning mill demonstrates the wide range of potential uses offered by former multi-storey textile factories, which do not need substantial structural changes in order to be converted for new functions (whether industrial or non-industrial). The ground floor of the main mill building and the adjacent areas are now the site of a workshop specializing in repairing historic internal combustion engines. The upper floors contain a museum with exhibitions of aviation and textile manufacturing (the textile exhibits have been borrowed from the Department of Textile Technologies at the Technical University in Liberec and from a private collection). The site is also used to present equipment that has been relocated there from other factories following their closure. Photograph Michaela Ryšková, 2016.

The preservation of industrial heritage – new uses / conversion

Łódź (Poland), Israel Poznanski / Manufaktura, hotel Vienna House

The Israel Poznanski company was one of the leading producers of linen and cotton goods in Łódź, a city that was nicknamed "the Polish Manchester" for its textile industries. After closure, the Israel Poznanski factory was converted into a multifunctional centre called Manufaktura (at a cost of around 200 million EUR), which was opened in 2006. Covering a 27-hectare site, the centre includes a shopping mall and cultural/community venues; it has preserved the original configuration, layout, forms and external appearance of the buildings. Details and atmosphere have been preserved to varying degrees in the different buildings, but overall one of the most distinctive symbols of the city and its "place memory" has been preserved while finding viable new uses. However, the original interior structures have not been preserved (with occasional exceptions). A different approach was taken to the former spinning mill, which was the last building to be converted and represents an excellent example of how the demands of heritage management can be successfully combined with commercial use. The original metal structural skeleton has been preserved, and the interior layout has been adapted in accordance with this structure. An atrium has been inserted into a long tract of the building, and the elliptical ceiling structures strikingly accentuate the reception area and the corridors on the individual floors. The exterior has been rehabilitated and complemented by the addition of a block superstructure containing a swimming pool. Photograph Michaela Ryšková, 2017.

The preservation of industrial heritage – new uses / conversion
Łódź (Poland), Israel Poznanski / Manufaktura, hotel Vienna House

Ústí nad Labem-Střekov, T. G. Masaryk river lock. Photograph Viktor Mácha, 2018.

07. Literature and sources (selection)

07.01. Literature

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Praha-Bubeneč, old waste water treatment plant. Photograph Továrna, industrial real estate management company.

Appendix
List of National cultural monuments in the domain of technical and industrial heritage (as of 2017)

Charles Bridge, Prague

Horse-drawn railway from České Budějovice to Linz

Stone bridge, Písek

Chain bridge, Stádlec (Tábor district)

Water mill, Slup (Znojmo district)

Dobrošov fort, Náchod

Michal coal mine, Ostrava

Hlubina coal mine and Vítkovice blast furnaces and coking plant, Ostrava

Třeboň pond system

Hand-made paper works, Velké Losiny (Šumperk district)

Television transmitter on the summit of the Ještěd mountain, Liberec

Jeroným mine, Čistá (Sokolov district)

Háj power plant, Třeština (Šumperk district)

Tower of Death, Ostrov

Les Království dam, Dvůr Králové

Former waste water treatment plant, Prague-Bubeneč

Windmill, Kuželov (Hodonín district)

Larisch & Sons textile factory, Krnov

Hammer mill, Dobřív (Rokycany district)

“Slovak Bulleť” locomotive, Kopřivnice museum

Ensemble of mining monuments, Březové Hory hills

Water sawmill with machinery, Penikov

Bechyně bridge

Canals in the Šumava mountains (Plzeň/South Bohemia Regions)

Jáchymov mint

Mauritius mine, Hřebečná

“Dlouhá stoka” channel with Kladský and Nový ponds

Janata mill, Buřany

Harrachov glass-cutting shop with machinery

Winternitz automatic mills, Pardubice

Glassworks, Tasice

Ironworks, Stará Huť

Windmill, Velké Těšany

Agricultural toolmaking shop, Karlovice

Hydroelectric power plant, Poděbrady

Tatra automobiles

Blatná

Notes

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