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CHARACTERISTIC OF TYPOLOGY OF INDUSTRIAL HERITAGE ARCHITECTURE FROM THE 18TH TO THE EARLY 20TH CENTURY IN THE CZECH REPUBLIC

Abstract. The present research work deals with the problem of industrial heritage architecture in the Czech Republic. Historical objects of industrial architecture (industrial heritage architecture from the 18th to the early 20th century) and whole industrial areas are integral to the city environment nowadays. It is noted, that society has changed the approach for comprehension of industrial architecture typology at the beginning of the post-industrial period. As a result, the industrial architecture has forfeited the functionality. Most significant industrial buildings from the 18th to the early 20th century are in devastated areas nowadays or objects with ineffective or inactive production. The methodology of present work assumes the analysis of general characteristics of industrial heritage architecture in the Czech Republic. The purpose of the present work is to identify and characterize the industrial heritage architecture from the 18th to the early 20th century in the Czech Republic according to the following criteria: functional characteristics, types of industry, size of the total area, location in the urban structure, number of floors, year of the construction, architectural style, arrangement and type of protection. The typical types of industry for industrial heritage architecture were selected from the Classification of Economic Activities (CZ-NACE). On the basis of results of the present research work the general conclusions have been developed.

Key words: industrial architecture, industrial heritage, classification of architecture.

Problem statement and relevancy of the research. Relevancy of the present research work is defined by actual problems of post-industrial cities in Europe as well as in the Czech Republic: new effective use of non-operating and non-effective industrial objects (adaptive reuse), protection of historical industrial architecture, development of city infrastructure etc. [1]. Moreover, it is reasonable to note an aggravating environmental situation because of "industrial component" that has a negative influence on health improvement, psychic and emotional state of people and demographic indices etc., including negative influence on social level of population, as well as economic and other indicators [1, 2]. So, it is important to make research on modern problems of industrial heritage architecture, including identification and characterization of industrial heritage architecture [2—5].

Overview of the last researches and publications. The problem of conservation and adaptive reuse of industrial objects as well as industrial heritage architecture is so relevant nowadays [5, 6]. There are many organizations and institutions which are connected with this problem: scientific and research centers in the leading educational and scientific institutions, committees, specialized organizations with competent professionals, social groups etc. For example, International Committee for the Conservation of the Industrial Heritage (United Kingdom), Research Centre for Industrial Heritage (CTU in Prague, the Czech Republic), International Visegrad Fund (the Slovak Republic) etc. [5—7].

Research in the field of relevant problems of industrial architecture, brownfields and industrial heritage, including the research of the urban environment in the modern industrial cities, carried out today by Prof. Ing. arch. T. Senberger, PhDr. B. Fragner, prof. Ing. arch. P. Urlich, CSc. and Mgr. L. Beran (CTU in Prague, the Czech Republic), Prof. O. Chemakina, CSc. (NAU, Ukraine), Prof. Ing. arch. H. Zemankova, CSc. (BUT, the Czech Republic), Prof. H. Benai, I. Lobov (DonNACEA, Ukraine), Sir N. Cossons ("English heritage", United Kingdom), Prof. Dr. M. Mende (BUA, Germany), Prof. M. Bevz (LPNU, Ukraine), Prof. M. Dyomin (KNUCEA, Ukraine) and others.

The purpose of the research: to identify and characterize the typology of industrial heritage architecture from the 18th to the early 20th century in the Czech Republic according to the following criteria: functional characteristics, industry, size of the total area, location in the urban structure, number of floors, year of the construction, architectural style, arrangement and type of protection.

The concept of research work assumes the following methodology:

— analytical method (work with special literature and actual scientific and research works);

— consultation with experts;

— grapho-analytical method (photography);

— analysis and systematization of the studied material.

The main part. New insights on the typology of industrial architecture. The first processes of industrialization began in England in the late 18th century with introduction of the first manufacturing plants. Soon industrialization has followed France and Germany and then in the late 19th century whole Europe. Industrialization

has made direct impetus for production on a large scale. Moreover, this has changed the world market [1, 6—14].

It is reasonable to note that industrialization was important for the global development of architecture. Industrialization (i. e. industrial revolution) meant a qualitative leap for the industry, technology, transport, telecommunications, atomic engineering, development of radio and television, automation etc. [11, 13, 14, 15]. In addition to the major social changes, industrialization like a process of change from manufactory and craftsmanship to factory production and development of industry have influenced the creation of new typological type of buildings — industrial architecture (production halls and multi-storey buildings) [11—17].

The industrial era introduced global changes that has occurred all European industry, which meant new goals and new means to achieve them. Moreover, industrialization has already taken place in various different areas of industry: textile (weaving, wool, cotton etc.), sugar and flour-milling industry, brewing, distilling, starch industry, glass industry and the production of porcelain, paper, woodworking, iron and steel industry, construction, chemical and coal industry etc. Each industry area for manufacturing was requiring new concepts and technologies [18].

The consequences of industrialization were also reflected in the typology of industrial architecture and their new features, such as [17, 18]:

— versatility and variability of buildings;

— unification and standardization of building components as well as whole buildings;

— indoor environmental quality;

— requirements for fire safety.

As the general requirement for the construction of the industrial buildings was distribution of mechanical energy the building for the machines — industrial architecture began to be used not only for workpeople, but also for a new era devices (Fig. 1). So, for the industrial architecture of the industrial era is typical elimination of dependence on classical supporting construction e. g. open layout of the floor plans, continuous windows on the facades (Fig. 2) [17]. The new demands on the architectural design solutions meet mainly by supporting pillars in a more or less regular grid, supporting ceilings or roofs, simply called "skeletons" (Fig. 3) [18, p. 214].

The first buildings of a new era "had a massive stone or brick covering and wooden skeleton in the interior" [18, p. 214]. With the new innovative materials and technologies come new solutions without wood in supporting construction — wood was replaced by iron construction (Fig. 4, 5) [1, 17, 18]. This design was suitable throughout the century. But so soon typology of all industrial buildings was waiting for new changes. First of all, changes of the material of construction. The last decade of the 19th century was the period of reinforced concrete: it was built a large number of multi-storey industrial buildings with monolithic reinforced concrete system of supporting constructions (Fig. 6) [18].

Soon industrialization had the first results: e. g. decrease of production costs, development of new products and internal changes in society, including thinking and lifestyle of mankind. The maximum progress in the production during the period of industrialization was in the late 20th century (adoption of the aforementioned innovations, development of new materials and modernization of manufacturing processes) [13, 14].

It is reasonable to emphasize, that the result at the beginning of the post-industrial period is the changes in the typology of industrial architecture. In addition, the old industrial infrastructure gradually loses its functionality, e.g. [2, 5, 10, 17, 18]:

— industrial buildings as well as industrial areas become unsuitable for future use: effective use of industrial buildings for future manufacturing is not possible;

— implementation of new environmentally friendly technologies for future production is not possible;

— ineffective technologies of production;

— the possibility of a partial operation of the industrial building.

The modern typology of industrial architecture has new standards that are not compatible with the architecture of industrial heritage, i. e. with the industrial architecture from the 18th — early 20th century [2, 6, 19].

As a result of further development, more technological and automated electronic devices was introduced into manufacturing; moreover, made from new materials. Buildings are becoming more compact. It was significant to note that the industrialization had a significant impact on technical and scientific progress, automation, new technologies, new trends in production and distribution etc.

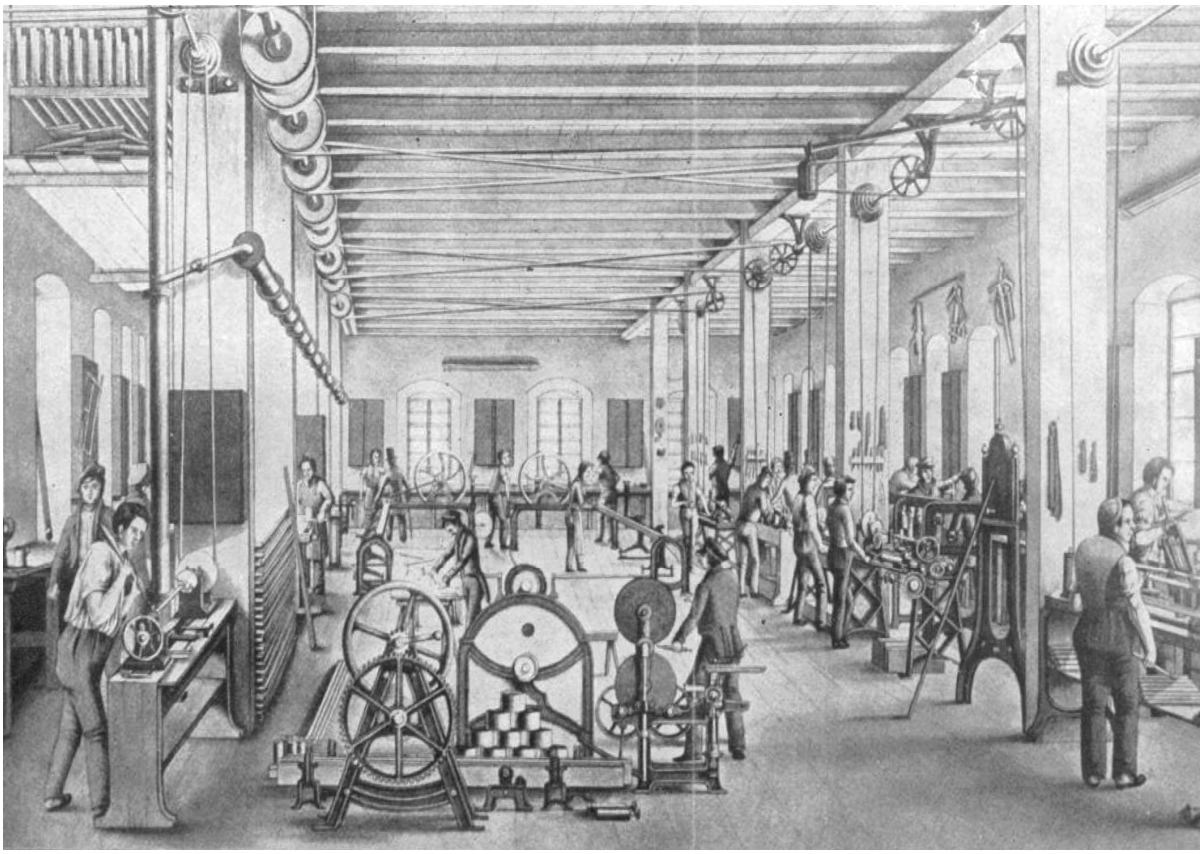

Fig. 1. Distribution of mechanical energy: manufacturing workshop of Bracegirdle machiny factory in Jablonec, 1840 [14]

Fig. 2. Facade of the first mechanical weaving factory in Bohemia called "Továrna Mastných", Lomnice nad Popelkou (author's photo)

Fig. 3. Public Transport Museum in Prague in the Střešovice Depot (foto autora)

Fig. 4. Cast-iron columns in the first mechanical weaving factory in Bohemia called "Továrna Mastných", Lomnice nad Popelkou (author's photo)

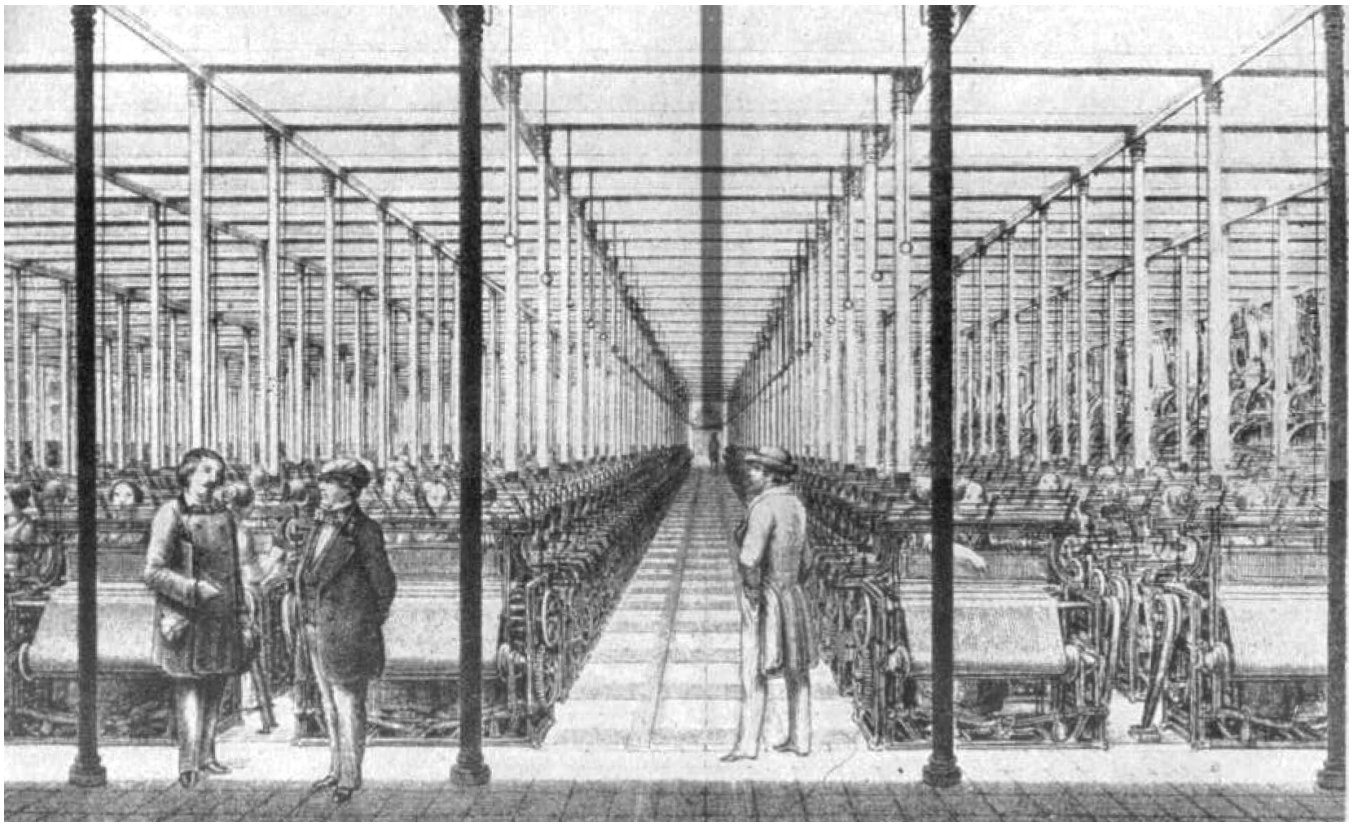

Fig. 5. Mechanical wool weaving mill Johanna Liebig & comp. in Liberec, late fifties of the 19th century [14]

Fig. 6. Interior of weaving mill Vonwiller in Žamberk, Ústí nad Orlicí [18, p. 217]

Classification of industrial heritage architecture. The main factor, that has direct influence on industrial building is functional purpose — the original functional purpose [9]. Another important factor for the new opportunities in adaptive reuse of the industrial object is operating conditions.

It is reasonable to research the present typology of industril hertitage architecture and classify it for next stage of the present research work. Classification of industrial heritage architecture is the first "unification" basis for future logical processes in the frame of choicing of the most suitable method for conservation of object.

According to the **functional features** all industrial buildings divided into:

— ***single-purposed:***

- single-purposed industrial buildings with internal technology that can not be removed;
- single-purposed industrial buildings without any internal technology;
- single-purposed industrial buildings in the form of framework ("skeleton");
- technological devices without the architectural covering.

— ***multy-purposed:***

- multy-purposed industrial buildings with internal technology that can not be removed;
- multy-purposed industrial buildings without any internal technology;
- multy-purposed industrial buildings in the form of framework ("skeleton").

— ***combined*** **[11]:**

- single-purposed and multy-purposed industrial buildings;
- brownfield.

Classification of industrial architecture according to **branches of industry** is reasonable associate with the general state Classification of Economic Activities. Consequently, all industrial buildings are divided into the following six types [1, 9, 16, 17]:

— ***mining and quarrying:***

- mining and quarrying include the extraction of minerals occurring naturally as solids (coal and ores), liquids (petroleum) or gases (natural gas);

- extraction can be achieved by different methods such as underground or surface mining, well operation, seabed mining etc.

— ***manufacturing:***

- this section includes the physical or chemical transformation of materials, substances, or components into new products, although this cannot be used as the single universal criterion for defining manufacturing (see remark on processing of waste below;
- the materials, substances, or components transformed are raw materials that are products of agriculture, forestry, fishing, mining or quarrying as well as products of other manufacturing activities;
- substantial alteration, renovation or reconstruction of goods is generally considered to be manufacturing.

— ***electricity, gas, steam and air conditioning supply:***

- this section includes the activity of providing electric power, natural gas, steam, hot water and the like through a permanent infrastructure (network) of lines, mains and pipes.
- the dimension of the network is not decisive;
- also included are the distribution of electricity, gas, steam, hot water and the like in industrial parks or residential buildings).

— ***construction:***

- this section includes general construction and specialized construction activities for buildings and civil engineering works;
- it includes new work, repair, additions and alterations, the erection of prefabricated buildings or structures on the site and also construction of a temporary nature.

— ***transportation and storage:***

- this section includes the provision of passenger or freight transport, whether scheduled or not, by rail, pipeline, road, water or air and associated activities such as terminal and parking facilities, cargo handling, storage etc.;
- included in this section is the renting of transport equipment with driver or operator;
- also included are postal and courier activities.

— ***other.***

According to **arrangement with the urban structure** following types of industrial heritage architecture have been defined:

— in the urban structure of the city;

— on the edge of city (suburban areas);
— outside the city;
— on the agglomeration territories.

Concerning the **number of storeys** [9, 17]:

— multi-storeyed:
  - two-storeyed;
  - multi-storeyed;
  - combined.
— manufacturing halls (one-storeyed).

According to the **construction epoch** all industrial buildings studied in the present research work are divided into:

— industrial;
— post-industrial.

All industrial heritage building are divided into following **architectural styles**:

— classicism;
— eclecticism;
— art nouveau;
— "incoming modern";
— functionalism.

All industrial buildings can be classified according to the type of **planning configuration** (arrangement):

— compact;
— interlocked;
— combined.

Depending on the **type of heritage preservation and cultural value** all industrial buildings are divided into following groups [9]:

— immovable heritage;
— movable heritage (excluding furnishings and historic library funds);
— conservation areas:
  - heritage reservations;
  - zones and buffer zones.
— cultural properties with international status:
  - European Heritage Label (EHL);
  - UNESCO World Heritage List.
— without preservation.

Conclusions. The typology of industrial heritage architecture from the 18th to

the early 20th century in the Czech Republic have been to identified and characterized according to the following criteria: functional features (11), branches of industry (14), arrangement with the urban structure (4),number of storeys (5), construction epoch (2), architectural style (5), planning configuration (arrangement) (3), type of heritage preservation and cultural value (9).

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Prospects for further research. The following is suggested to consider modern industrial architecture in required with different architectural concepts and manufacturing technologies.

References

1. Морозова, Е. Б. Архитектура промышленных объектов: прошлое, настоящее и будущее [Текст] / Е. Б. Морозова. — Мн.: Технопринт, 2003. — 316 с. — ISBN 985-464-349-2.

2. Маслов, Н. В. Градостроительная экология [Текст] / Н.В. Маслов. — М. : Высш. шк., 2003. — 284 с.: ил. — ISBN 5-06-004643-5.

3. Яргина, З. Н. Эстетика города [Текст] / З. Н. Яргина. — Москва: Стройиздат, 1991. — 366 с. — ISBN: 557-1-486-58753-3.

4. Семенова, И. В. Промышленная экология [Текст] / И. В. Семенова. —Москва: Академия, 2009. — 528 с. — ISBN: 978-5-7695-4903-8.

5. Oleg Fetisov. Problém konverzí průmyslových areálů v urbanistické struktuře na různých úrovních (na příkladu dolu Gorkého ve městě Doněck) [Текст] / O. Fetisov, A. Altukhova // Člověk, stavba a územní plánování 7. — Praha: České vysoké učení technické v Praze, 2013, — С. 312—320. —ISBN: 978-80-01-05225-9.

6. Zemánková, H. Tvořit ve vytvořeném: nové funkční využívání uvolněných objektů [Текст] / Helena Zemánková. — Brno : Vysoké učení technické v Brně, 2003. — 157 с. — ISBN 80-214-2365-X.

7. Fragner, B. Industriální stopy : architektura konverzí průmyslového dědictví v České republice 2000-2005 [Текст] / B. Fragner. — Karlínská studia, Praha, září—říjen 2005 = Vestiges of industry : architectural conversion of industrial heritage in the Czech Republic / [texty naps. — V Praze : Výzkumné centrum průmyslového dědictví ČVUT, [2005]. — 167 с. : il. (část. barev.). — ISBN: 802395440-7.

8. Dvořáková, E. Industriál - Paměť - Východiska [Текст] / E. Dvořáková, B. Fragner, T. Šenberger, P. Frič. — Praha : Titanic, 2007. — 243 с. : il. (převážně barev.). — ISBN: 978-80-86652-33-7.

9. Dvořáková, E. Nové využití technického a průmyslového dědictví [Текст] / E. Dvořáková // Zprávy památkové péče 2013/73. — Praha : Národní památkový ústav, 2013. — C. 171—178. — ISSN: 1210-5538.

10. Beran, L. Průmyslové dědictví : sborník příspěvků z mezinárodního bienále Industriální stopy [Текст] / L. Beran. — Praha : Výzkumné centrum průmyslového dědictví Českého vysokého učení technického v Praze, 2008. — 335 c. — ISBN 978-80-01-04067-6.

11. Munce, J. F. Industrial Architecture [Текст] / J. F. Munce. — London : Iliffe Books Ltd., 1961. — 232 c.

12. Манту, П. Промышленная революция XVIII века в Англии [Текст] / П. Манту. — Москва: Государственное социально-экономическое издательство, 1937. — 448 с.

13. Purš, J. Průmyslová Revoluce: Vývoj Pojmu a Koncepce [Текст] / J. Purš. —Praha : Academia, 1973. — 733 c. : ил.

14. Purš, J. Průmyslová Revoluce V českých Zemích [Текст] / J. Purš. — Praha : Státní nakladatelství technické literatury, 1960. — 164 c., [32] c.: ил.

15. Urlich, P. Dějiny 19. a 20. Století: Architektura - Umění - Filosofie - Věda a Technika [Текст] / P. Urlich, O. Ševčík, P. Škranc. — Praha: České vysoké učení technické, 1997. — 127 c. — ISBN: 80-01-01705-2.

16. Ким, Н. Н. Промышленная архитектура [Текст] / Н. Н. Ким. — Москва: Стройиздат, 1979. — 175 с.

17. Hlaváček, E. Architektura Pohybu a Proměn: Minulost a Přítomnost Průmyslové Architektury [Текст] / E. Hlaváček. — Praha : Odeon, 1985. — 167 c.

18. Šenberger, T. Skelety industriálních budov [Текст] / T. Šenberger // Zprávy památkové péče 2013/73. — Praha: Národní památkový ústav, 2013. — C. 214—217. — ISSN: 1210-5538.

19. Bartek, F. Průmyslové Stavby [Текст] / F. Bartek. — Brno : Ediční středisko Vysokého učení technického, 1989. — 277 c.

20. Odvětvová klasifikace ekonomických činností [Электронный ресурс] : Český statistický úřad. — Электрон. дан. — Praha. — Режим доступа : http://www.czso.cz/csu/klasifik.nsf/i/odvetvova_klasifikace_ekonomickych_cinnosti_(okec). — Загл. с титул. экрана.

Аннотация

Фетисов О. Характеристика типологии архитектуры промышленного наследия XVIII - начала XX века в Чешской Республике. *Данная исследовательская работа посвящена проблеме архитектуры промышленного наследия в Чешской Республике. В настоящее время исторические объекты промышленной архитектуры (архитектуры промышленного наследия XVIII - начала XX века) и целых промышленных районов являются неотъемлемой частью городской среды. Отмечено, что в обществе изменили подход к осмыслению промышленной архитектурной типологии в начале пост-*

индустриальной эпохи. В результате промышленная архитектура утратила свою функциональность. Наиболее значимые промышленные здания XVIII - начала XX века в настоящее время находятся в опустошенных областях или являются объектами с неэффективным или неактивным производством. Методология настоящей работы предполагает анализ общих характеристик архитектуры промышленного наследия в Чешской Республике. Выявлена и охарактеризована архитектура промышленного наследия XVIII - начала XX века в Чешской Республике в соответствии со следующими критериями: функциональными характеристиками, типами промышленности, размерами общей площади, нахождением в структуре города, количеством этажей, годом постройки, архитектурным стилем, расположением и типом защиты. Типичные виды промышленности архитектуры промышленного наследия были отобраны из классификации видов экономической деятельности (CZ-NACE). Общие выводы были разработаны на основании результатов данного исследования работы.

Ключевые слова: промышленная архитектура, промышленное наследие, классификация архитектуры.

Анотація

Фетісов О. Характеристика типології архітектури промислової спадщини XVIII - початку XX століття в Чеській Республіці *Дане дослідження присвячене проблемі архітектури промислового спадщини в Чеській Республіці. В даний час історичні об'єкти промислової архітектури (архітектури промислової спадщини XVIII - початку XX століття) і промислових районів є невід'ємною частиною міського середовища. Зазначено, що суспільство змінило підхід до осмислення промислової архітектурної типології на початку пост-індустріальної епохи. В результаті промислова архітектура втратила свою функціональність. Найбільш значимі промислові будівлі XVIII - початку XX століття знаходяться в спустошених областях або є об'єктами з неефективним або неактивним виробництвом. Методологія даної роботи передбачає аналіз загальних характеристик архітектури промислової спадщини в Чеській Республіці. Виявлено та охарактеризувано архітектуру промислової спадщини XVIII - початку XX століття в Чеській Республіці у відповідності до наступних критеріїв: функціональних характеристик, типів промисловості, розмірів загальної площі, знаходження в міській структурі, кількості поверхів, року зведення, архітектурного стилю, розташування та типу захисту. Типові види промисловості для архітектури промислового спадщини були відібрані з класифікації видів економічної діяльності (CZ-NACE). Загальні висновки були розроблені на підставі результатів даного дослідження роботи.*

Ключові слова: промислова архітектура, промислова спадщина, класифікація архітектури.