

ADAPTIVE REUSE OF FACTORY CHIMNEYS – INDUSTRIAL HERITAGE SYMBOLS AND URBAN LANDMARKS

JANA HOŘICKÁ*, JAN PUSTĚJOVSKÝ

Czech Technical University in Prague, Faculty of Civil Engineering, Department of Architecture, Thákurova 7, 166 29 Prague 6 – Dejvice, Czech Republic

* corresponding author: jana.horicka@fsv.cvut.cz

ABSTRACT. Industrial heritage buildings and sites are seen as an important part of urban regeneration and sustainable development strategies over the last two decades for a number of reasons. Of particular note is the genius loci that accompanies them, but also the potential to attract artists and creative industries. In this sense, factory chimneys are a strong visual element and also an important symbol. At the same time, thanks to their distinctive proportions, they have also become an unmissable part of the urban structure of cities, in which they can assume a compositional and orienting role (a landmark), comparable with church spires or belfries with all due respect. In order to design adaptive reuse of the chimney, it is therefore necessary to place it in a context that is not only spatial but also symbolic, both in relation to its immediate surroundings and in a wider context. Often, however, the subject of the new use of the chimney is only raised when at least the material context of the chimney was irreversibly altered; in extreme situations, the chimney is the only surviving element of the original structure. However, the lost authenticity – the originality of the preserved building structure or technological flow – also opens up new meanings and other possibilities for the use of a solitary chimney in a transformed environment. The contribution introduces adaptive reuse possibilities of the industrial chimneys within the sustainable urban development, considering both industrial heritage values and specific chimney construction limits.

KEYWORDS: Factory chimneys, industrial heritage, adaptive reuse, sustainable urban regeneration.

1. INDUSTRIAL HERITAGE AND SUSTAINABLE URBAN REGENERATION

In general, a number of arguments was made as to why the adaptive reuse of industrial heritage is an essential part of sustainable urban regeneration, and as factory chimneys are an integral and visually distinctive part of industrial heritage, it is worth retrieving the most important of the arguments for an introduction. Considering society as a whole, industrial heritage carries cultural and historical values, that are of undisputable importance for understanding the history, continuity and social identification of the community. Considering particular cities, industrial heritage brings diversity to the urban fabric and contributes to the orientation and identification of the place. The architectural quality and uniqueness, unrepeatability that industrial heritage provides to projects developed within its context is important in terms of long-term sustainability. Quality of architecture is a basis for long-term resilience to moral obsolescence and need for improvements. Last but not least, in the case of tangible industrial heritage, it is about energy efficiency in terms of the life cycle of buildings, taking into account the embedded energy consumption and greenhouse gas emissions.

2. FACTORY CHIMNEYS IN WIDER CONTEXT

2.1. LEARNING FROM INDUSTRIAL HERITAGE

The contribution is based on research focused on factory chimneys, conducted in the Czech Republic, but considering European experience as well. Theoretical basis was drawn from international knowledge on industrial heritage in general, both because specific sources on the subject of factory chimneys were very limited and because chimneys are an integral and inseparable part of industrial heritage. The chimney never stood alone, it was always part of a wider whole, both in sense of material structure of the site and in sense of intangible links of energy or technological flow as well. Adaptive reuse principles are therefore based on experience with adaptive reuse of industrial heritage in general and in a broader context, while specific characteristics of chimneys are also considered. Compared to the first spontaneous attempts to reuse former production and storage buildings, which in the middle of the 20th century revealed the values of industrial heritage to the world and were realized almost without intervention in the original building structure, the range of current approaches to reuse is very diverse. In principle each project is different depending on the set of conditions and circumstances in which a particular building or site is located. Adaptive reuse process is affected with values of industrial heritage

as well as the structural and technical condition of buildings and site.

2.1.1. ADAPTABILITY

Adaptability, i.e. ability to accept a new function, different from the original one, is also important for the consideration of adaptive reuse of industrial buildings. Czech theoretical literature apply categorization of industrial buildings into two types – versatile and single-purpose [1]. Spatial structure of versatile buildings allows adaptation for almost any type of new use. These are represented typically with multistorey textile mills or machinery production halls. Spatial characteristics of single-purpose buildings, on the contrary, fully correspond to the requirements of the original function for which they were built, and their adaptation for other uses is difficult or impossible. Usually, these are only envelopes of technological equipment or, in the extreme case, building forms the production technology itself. In the sense, chimneys are typical representatives of this type, where building is a part of technological equipment rather than spatial structure in the true sense of the word.

The professional community agrees on the aim of sustainable transformation of an industrial heritage building is a convenient combination of the requirements for the new use with its original spatial characteristics. The natural adaptive reuse represents a reasonable degree of intervention that does not damage the genius loci and preserves space for other future transformations that we cannot yet see today [2]. Applying a certain level of simplification, factory chimneys, which can only be adapted problematically by conventional methods, require a greater degree of creativity in the approach to adaptive reuse design. However, the creativity of architectural design in industrial heritage adaptation is seen in its sophistication and humility rather than in its expressiveness. However, presented research describes a wide range of possibilities of chimneys new use, which of course includes different approaches working with different degrees of intervention in the mass of the chimney body.

2.2. FACTORY CHIMNEYS IN URBAN STRUCTURE

Industrial heritage buildings and sites are seen as an important part of sustainable urban regeneration strategies over more than last two decades for a number of reasons. The genius loci that accompanies them is of particular note, same as the potential to attract artists and creative industries [3]. In this sense, factory chimneys are a strong visual element and also an important symbol. At the same time, thanks to their distinctive proportions, they have also become an unmissable part of the urban structure of cities, in which they can assume a compositional and orienting role (a landmark), comparable with church spires or bell-towers with all due respect. In order to design adaptive reuse of the chimney, it is therefore necessary to place

it in a context that is not only spatial but also symbolic, both in relation to its immediate surroundings and in a wider context. Often, however, the subject of the new use of the chimney is only raised when at least the material context of the chimney was irreversibly altered; in extreme situations, the chimney is the only surviving element of the original structure. However, the lost authenticity – the originality of the preserved building structure or technological flow – also opens up new meanings and other possibilities for the use of a solitary chimney in a transformed environment.

3. INITIAL CONDITIONS ANALYSIS

The first part of the research was focused on collecting the data and formulating a complex analysis of initial condition preceding the design process itself. As a result, initial condition analysis describes: locality, context and relations, site and surroundings, historical and architectural values, chimney parameters [4].

3.1. LOCALITY

Experience in the field of industrial heritage revitalization shows that the possibilities of new use are strongly influenced by where the building or site is located. As an example, consider the limited possibilities of using a hard-to-reach chimney in a vast industrial area on the outskirts of a large city. The potential of the site can thus significantly influence the potential for new use. From this point of view, we describe urban sites, where the site is part of a compact town or village, is directly connected to the surrounding buildings and can be linked to its surroundings. A specific site is an industrial zone, which may be part of a city or outside the urban structure. This is a larger area where there are usually several industrial estates and accessibility of the chimney is complicated. Sites and chimneys in the open countryside deserve special attention, as their accessibility and continuity with the surrounding area may not be straightforward, but they have the added value of an atmosphere of place.

3.2. CONTEXT AND RELATIONS

As well as location, context also fundamentally influences new use of the particular chimney, specifically its relation to the immediate surroundings. The chimney may be closely connected to or directly part of the building, which must then necessarily be involved in the consideration of the new use project. Stand-alone chimneys are usually either part of the site, so the new use of the chimney is part of the overall concept, or one of the few reminders of the production history after the demolition of the site, or in the extreme case, the last reminder.

3.3. SITE AND SURROUNDINGS

Significance of the chimney within the site will inevitably affect project of the new use. Not infrequently chimneys dominate the landscape, a town or a neighborhood, but there are also chimneys to be

find hidden in the grip of surrounding buildings, for example within a city block. A special situation arises in some locations where the chimney was dominant, but lost its role as a landmark due to the development of new higher surrounding buildings, eg. Pompeu Fabra University Poblenou Campus in Barcelona.

An integral part of the consideration of the chimney new use is the space under the chimney, because the chimney often remains untouched and preserved in the status quo, but the immediate surroundings are subject to change. The space under the chimney may or may not be as important for the interpretation of the production history as the chimney itself. The surroundings of the chimney may be preserved in a clearly legible form, as inanimate fragments of the original structure or only in trace. It is not an exception that nothing of the original context of the chimney remains, then the cultural and historical significance of the chimney is crucial.

3.4. HISTORICAL AND ARCHITECTURAL VALUES

The shape, the structural and material design of the chimney, i.e. its typological characteristics and the closely related historical development of chimneys [5], are also important for the approach to the design of the new use. Simply put, a brick chimney in its historical form from the second half of the 19th century offers different possibilities and inspiration compared to a chimney from the second half of the 20th century. However, not only Czech practice also shows that the decision to preserve the chimney itself is usually not motivated by its historical or architectural value, but primarily by its symbolic significance, which is why even an ordinary chimney is often preserved.

3.5. CHIMNEY PARAMETERS

As already mentioned above, the adaptability of the original spatial structure – i.e. its ability to accept a new use different from the original one, to be adapted, to be modified – is absolutely essential for the implementation of an adaptive reuse. Due to their original function, particularly flue gas extraction, chimneys have very specific spatial parameters that are not comprehensible for conventional adaptive reuse design. In particular, lack of usable spaces with a scale and proportions compatible with human scale, and also limited accessibility, are problematic. The basic internal space available is the chimney flue, whose properties can be described by two basic dimensions - height and diameter. The internal diameter, especially at the base of the chimney, plays a crucial role when searching for new uses. If it is sufficient, it allows the design to enter the interior of the chimney and offer an unusual spatial perception.

The space open for new use is then offered outside the chimney body. The possibilities for new use can be greatly expanded by the presence of related spaces and structures, especially the boiler house itself if it is in contact with the chimney (sometimes including

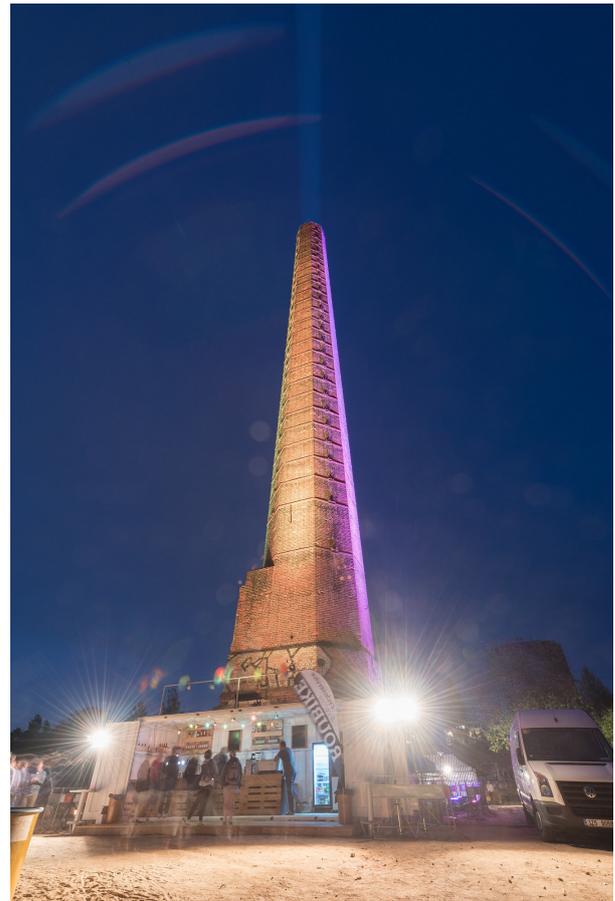


FIGURE 1. Former sugar factory in Prague – Modřany (CZ), the chimney became a symbol of community activities preceded the site development process. Photo © Martin Vonka.

underground spaces). The external space under the chimney can then be seen as a separate spatial unit. The exterior space defined by the presence of the chimney plays an unquestionable role in composing the related spatial (but also broader urban) structure and can become an important support or crystallization point of development – a carrier of identity (Figure 1).

Last but not least, possibilities for reuse are also determined by the structural and technical condition of the chimney and its structural parameters. These affect how the mass of the chimney can be intervened in or whether it is possible to put more loads on the chimney structure.

4. NEW USE POSSIBILITIES

The second part of the research resulted in formulation of an overview of new use options to inspire not only owners but all those who make decisions about the future fate of factory chimneys [4]. The new use of factory chimneys can take many forms, beginning with sole preservation of a chimney body without intervention, through completely utilitarian functions or reversible and artistic interventions, to irreversible changes in form and use, i.e. adaptive reuse. The level of intervention in the original building structure,

which is the intersection of the requirement to preserve authenticity, cultural value, and the possibilities of adaptability that chimneys have quite narrow, is an important issue, as in case of other objects of industrial heritage. A proposal for a new use can therefore be interpreted as a search for an optimal, appropriate level of intervention in a specific context. Therefore, the overview was organized in scale of the intervention. Most of the new use options presented in the contribution do not require significant intervention in the body of the chimney or represent reversible intervention that can be removed in the future.

4.1. NO INTERVENTION

The most common and legitimate solution is to preserve the chimney in a more or less authentic form without assigning it a new function and without significant intervention in the building structure. The city of Tampere presents its industrial history also with preserving the silhouette of chimneys in public spaces, especial those close to Tamerkoski rapids banks.

An example of this approach is the preservation of the torso of the chimney and the preservation of the so-called controlled ruin. Of course, the chimneys that are listed are also preserved without assigning a new function and without significant intervention in the building structure. However, it is not always the case that the chimney alone is subject of conservation; most chimneys are part of listed buildings or sites. As the conservation of industrial heritage is usually aimed at preserving the technological flow as authentically and completely as possible, chimneys are therefore an integral part of the protected whole.

4.2. UTILITARIAN USE – NECESSARY INTERVENTION

The new use also includes the restoration of the original use, i.e. the state in which the chimney is used again for its original purpose. In such a case, there may not even be significant intervention in the building structure, but only possible modifications to ensure the restored function, for example by lining. Another possibility is represented with various forms of utilitarian use, in which the specific parameters of the chimney are utilized. A viable solution is the use of the chimney flue in a figurative form, e.g. as ventilation for garages or gastronomic facilities, which necessarily requires technical modification of the flue. There are several such examples in the Czech Republic, but this form of use was not always the primary reason for the preservation of the chimney, or rather, the decision to preserve it was preceded and the assignment of this function only supplemented it.

4.3. UTILITARIAN USE – REVERSIBLE INTERVENTION

The situation is quite different in the case of the utilitarian use of a chimney as a carrier of technical equipment, i.e. typically technology for receiving



FIGURE 2. The flowering chimney in Česká Skalice (CZ), an original advertisement of the manufacturer of substrates and fertilizers. Photo © Martin Vonka.

and transmitting signals, which is unfortunately not infrequently the only accepted reason for preserving a chimney. Such an intervention typically takes a form of a steel gallery suspended from the chimney shaft at the required height, which is not very beneficial to the aesthetics of the chimney. However, both European and a few Czech examples show that such a device can be made less conspicuous without affecting the aesthetic appearance of the chimney, even if the cabling is hidden inside the chimney. Among other things, advertising can also be placed on the chimney, which, depending on the creativity of the authors, may take a different form than a simple sign (Figure 2).

4.4. CREATIVE NEW USE – REVERSIBLE INTERVENTION

Other forms of chimney reviving is the creative use of the chimney's interior space, either for various activities or again for artistic intervention. This includes simply making the interior of the chimney accessible, for example as part of a guided tour or the installation of a periscope, as well as use for sporting activities such as abseiling. In addition, the accessible space inside the chimney can be occupied by an art installation, physical or light. A specific creative event, limited in time but repeatable, is the smoking of the

chimney. Chimneys can also be used outside their mass in a similarly creative way. Art installations, physical or light, that are suspended from the chimney structure are one example. The base climbing on the steel ladders with which chimneys are often equipped (including belay, of course). Similarly, the chimney body can become part of the structural system of related architectural interventions, such as lightweight roof structures, staircases, footbridges, etc. An interesting example could be seen and/or experienced in Szczecin (PL), where the 250 m high chimney became a bungee jumping facility. Last but not least, there can be an artistic shift in form of colorful paint or graffiti on the surface of the chimney body.

4.5. INTERVENTION TO THE INCOMPLETE CHIMNEY BODY

The new use may also involve a chimney in a significantly altered, typically partly demolished chimney body. This can take the form of an artistic intervention or an artistic modification, for example. Alternatively, the structure could be rebuilt – replicated – and presented in its original state. A more significant artistic shift is the addition of a new construction, visually different from the original material, to the original contour of the chimney, e.g. Hamburg HafenCity Information center or Nedaclo distillery chimney in Bergen op Zoop.

4.6. ADAPTIVE REUSE – IRREVERSIBLE INTERVENTION

As the level of intervention in the chimney structure increases, we are reaching a new use of chimneys that can be described as adaptive reuse. A logical variant of adaptive reuse is the conversion of a chimney into a look-out tower, which can take a number of architectural forms. Depending on the characteristics of the particular chimney, an access can be fitted to the outer casing of the shaft or to the interior in case of a sufficient dimension; similarly, the design of the viewing platform depends on the parameters (especially the diameter) of the chimney.

Sufficient spatial parameters of the interior of the chimney may also allow its active use. As already mentioned above, the specific characteristics of the chimney require a special and individual approach when looking for a new use, and thus conventional adaptive reuse solutions cannot be applied. Ensuring the accessibility of the interior can also be problematic. The use of flues, flue pipes and inspection openings is a natural option, but these do not always have a sufficient profile. In addition, depending on the original technological design, they are most often located below the surrounding ground level. Fortunately and surprisingly, the design of most chimneys allows rather dramatic interventions – new openings – in the chimney shaft.

Access to the interior of the chimney at only one (ground) level is relatively simple. If the entire chim-



FIGURE 3. Collage of architecture (ENSA), Paris – Val de Seine (F), the staircase inside the chimney body.

ney space is to be used “at height”, the situation is complicated by the need for vertical communication – staircase, ladders or lifts. Due to the compatibility between the spatial characteristics of chimneys and the spatial requirements of vertical communications, this is a so-called naturally compatible use (Figure 3). However, if the interior is to be actively used and does not have sufficient dimensions, it is necessary to extend the communication (staircase, lift) to the exterior. There are also few examples of various adaptive reuse projects, rather marginal both in Czech Republic and in Europe, such as atypical gallery, office, warehouse or an air raid observation tower that is quite exceptional.

4.7. ADAPTIVE REUSE – ADDITIVE INTERVENTION

Of course, the adaptability of factory chimneys can be increased by extending the spatial structure – by adding new volumes, for example in the form of an extension to the base of the chimney or by hanging new volumes on the chimney body.

4.8. SITE AND CONTEXT INTERVENTION

Specific examples are represented with projects where the chimney is reused as part of an adaptive reuse of a building or a site. One possibility is that the chimney was a physical part of the building and is either retained as is or given a new function as part

of the adaptive reuse project. In this way, it is integrated into the usable spatial structure of the related buildings – thus its interior can be accessed from adjacent spaces or, conversely, it can serve as a circulation for related spaces. Another possibility is when the space under the chimney, originally an exterior space, becomes part of the interior of the new building as part of the adaptive reuse of the site, and the chimney is physically connected to it (Figure 4).

Slightly outside the new use categories is the restoration of the demolished chimney, but this should not go unmentioned. It is not quite common in the Czech Republic; more examples of such projects can be found in European context. The restoration of a chimney can take various forms, from the most descriptive replacement with a replica, to a simple relocation of the chimney from another site, to a new, equally strong construction or installation, to an artistic reminder of the existence of the chimney in a less physically determined form, such as water, greenery, light.

5. CONCLUSIONS

The results of the research are by no means surprising. Although chimneys can be classed as attractive objects of industrial heritage, primarily because of their proportions, they were long the subject of interest to more amateur enthusiasts, unlike the classic typologies – textile mills, breweries, lime kilns, railway stations, etc. In terms of urban development, they are landmarks, aesthetically attractive and inspiring elements of the urban landscape and symbols, often preserved as the only reminders of the industrial history of the locality. Their preservation has a symbolic significance that is often considered more important than their historical, architectural or structural value. Motivations for preservation or even legal protection are, at least in the Czech Republic, often quite banal, e.g. a stork's nest on the top or a mobile communication antenna suspended on the chimney body. For many of the reasons mentioned above, heritage listing or other means of protection does not play a very significant role in the decision on new use, and in extreme cases it may be considered by the owners as a complication in the process of adaptive reuse. Rather, the physical surroundings, but also the immaterial context of the chimney, are essential to the new use, as is a creative approach to design. The range of options for new use is wide, but the representation of each option in practice is uneven, with utilitarian and no-intervention forms predominating, and fewer examples of creative and adaptive reuses. A number of chimneys are still in a various state of decay, one could say they are suffered, and are awaiting their fate, which among other things motivated us to create the overview of possibilities of new use (above), which should serve as an inspiration not only for owners but also for all those who make decisions about chimneys.



FIGURE 4. Breda shopping centre in the former brewery estates in Opava (CZ), the chimney has become part of the shopping mall interior. Photo © Martin Vonka.

ACKNOWLEDGEMENTS

The research results presented in this paper were achieved with financial support of NAKI II project DG16P02B011 – Documentation, registration, presentation and proposals of smokestacks conversions as an endangered group of heritage of industrial monuments in the Czech Republic.

REFERENCES

- [1] E. Hlaváček. *Architektura pohybu a proměn: minulost a přítomnost průmyslové architektury*. Odeon, Praha, 1985. 167 p.
- [2] B. Fagner. Adaptive re-use. In J. Douet (ed.), *Industrial heritage re-tooled: The TICCIH guide to industrial heritage conservation*, pp. 110–117. Routledge, Taylor & Francis Group, 2016.
- [3] M. Baum, K. Christiaanse (eds.). *City as loft: Adaptive reuse as a resource for sustainable urban development*. GTA Verlag, 2012.
- [4] J. Hořická, J. Pustějovský. Nové využití továrních komínů. In *Tovární komíny. Nové využití ikon průmyslového věku*, pp. 52–70. CTU Prague. ISBN 978-80-01-06682-9.
- [5] M. Vonka. *Tovární komíny: funkce, konstrukce, architektura*. CTU Prague, 2014. 224 p. ISBN 978-80-01-05566-3.