MUNICIPAL PUBLIC LIBRARY IN OPOLE AS AN EXAMPLE OF SELECTED MODIFICATIONS OF A CONSTRUCTION SYSTEM OF THE HISTORICAL SITE

Nowadays, existing development is more and more often used by adjusting it to its new function on the principles of sustainable development. Current needs concerning the use of existing structures often impose the necessity of performing some technical operations related to the adjustment of the structure to its new tasks [3]. The manner and the extent of adaptive changes results from an adopted design solution which has to meet performance criteria of a new function. Existing spatial layout, which is especially a historical monument will be a serious limitation during the further forming the structure. While analysing created system of adaptive changes dependency it is possible to recognise general principles concerning composing the elements of the structure system and the general architectural form of the structure. A precise task completion by the structural system in relation to architectural values will cause that the object remain consistent as a complete architectural work.

A large part of scientific research which describes the problem of adaptation of construction objects distinguishes an apparent division of the subject area into architectural and structural issues. This division was not made by chance but it was based on the coexistence of two parallel engineering sciences which permeate each other in their common area such as the construction object. Despite the necessity of permeating the architectural aspects, architecture and the structure remain continuously separate at their poles, give open space for discussion on, among others, what does the art of space forming mean? It has an influence on undertaken scientific research in which by raising the subject from the architectural point of view there is a limit which causes that technical aspects concerning the material of architectural form which is the structure are not undertaken. The research on the modifications of structures selected by an architect [4] in which test criteria mainly having taxometric character for the representative examples of structures were adopted may be the example. Despite the description of adequate directions of modifications which allow to distinguish the type of interference in structures being transformed (here the concrete ones) in terms of performed changes only the percentage share of changes related to technical parametres of the structures by default was determined. While pursuing the goal of the research which was intended to indicate possible development trends concerning modifications of adapted construction objects having a selected structure we can find the wide scope

mgr inż. Mirosław Łotarewicz, Department of Civil Engineering and Construction Processes, Faculty of Civil Engineering and Architecture, Opole University of Technology

of aspects which describe a function, composite role of a structure or a prerequisite to perform the modification of the structure. In terms of the research concerning the modification of construction objects from the construction and building point of view we meet a wide research field for all multifaceted technical issues: from the basics of designing, through technology and organisation of construction, exploitation, including construction failures, to possible rebuilding, or a demolition. The limit of the mentioned problem is more precise because concrete spatial conditions which have an influence on the final technical solution are rarely researched. It also has to be taken into consideration that this problem is considered against the background of a concrete space of the structure each time. Lack of information in the research on solutions of the analysis of differentiated "form-structure" composition configurations will show an incomplete image causing blurring the relations of the system such as the construction object. Distortion of those information can lead, in an extreme situation, to creation of solutions which are divergent in respect of functioning of a building components.

The process of architectural and construction designing involves the implication of aspects of function, architectural form, and a structure as a material. This action is strictly oriented to newly constructed construction objects and begins from defining a usable area according the needs of its use. The aspect which starts the designing process is strongly determined in the system not only by an internal space in which a function of a building will be realised, but also is related to outside part of the structure which is included in an urban layout which is a multi-layered system of impacts. The result of fulfilment of the criteria for use is the architectural form included in the shape of the object which becomes real. The next stage of the designing process is to assume the layout of the structure which meets the basic requirements [2] related to the guarantee of a carrying capacity and stability for the object form being realised.

In the event of adaptation of the construction object the designing process is reveres through the change of orientation of guidelines for the design. Existing layout of the form with the structure of the object which meets consistent performance criteria for the initial function is the starting point. Contrary to new objects, spatial conditions described by the guidelines for use being implemented by a new function are imposed on the initial layout. In order to be able to adopt an optimum design solution the analysis has to balance the guidelines concerning the conditions of a new function against the limits resulting from existing layout form and, and hence the structure of the object. In the event when the structure is permeating and there is a collision with a new usable area then it become the main restriction for the conditions of the function.

The concept of this investment involved to inscribe the new space layout which included very extensive utility program in the existing small building with adjacent land (Fig. 1b). This disparity between spatial disposition sizes and set needs has implemented the necessity of going with the new space beyond the structure of the first object. The object was not only converted but also expanded with a new, explicitly contrasting part (Fig. 2).

a) b)

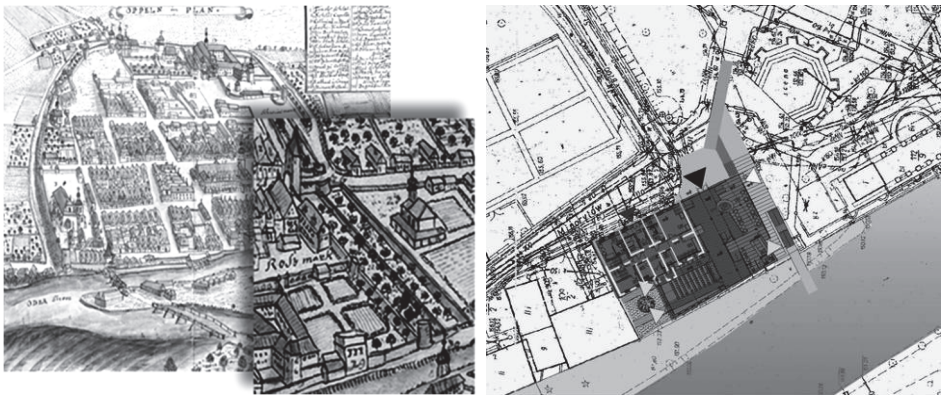

Fig. 1. The investment area: a) the map of Opole from 1750 (the source: Collection of the museum in Opole), b) inscribed structure old building in the concept of the library land development (author: A. Zatwarnicki)

For the extension together with the conversion of the building to the Municipal Public Library in Opole the spatial disposition was existing tenement house together with an adjacent land [1]. The investment area also involved the backyard of non-existing building which borders were directly adjacent to the waterfront of Młynówka (Oder River fork) which runs along the line of the old city walls in the corner is turning to the north to not existing already Krakow Gate (Fig.1a)

Fig. 2 The facade of the library building (source: Photo by author)

Adaptation of the existing residential building to the library has forced the change of existing residential function into the reading room and the exhibition gallery, among others. Change of the category of use led to the change of the diagram of impact of the main lifting configuration of existing structure, both of partition walls and ceilings. Internal walls, despite the role of the support

system for the ceilings formerly served as the usable area for residential premises. The new function, included in the inside of existing building has created the need of open the space not only towards the internal layout but also towards the part of the library which is extending. In the utility program for the library the common usable area has to fulfil its new objective, involving, among other things, connecting readers who meet in a place which satisfies the social need of the mass culture. Existing structure became collisional towards the space of the new functional layout. Implemented technical solutions often require to work out a compromise related to the occurrence of structural elements having apparent architectural form. Looking at the other side of this dependence, the modified space will also have limitations resulting from the layout structure which separates the adjacent land outside the building. Despite the deterministic character of the function conditions, in the event of adaptation of the objects including the structure which is conservatorially protected, the usable area will remain under the influences of the architectural form and the layout of the structure related to it. The front wall having a rich architectural decoration and a historic character, saved during the conversion, can be a good example. Guidelines given by a conservator have restricted the manner of conversion of the whole layout through the requirement of protection of historical and artistic values of the facade. It has generated not only the dependencies for the external form of expanded parts, but also conditioned the converted layout of the inside of existing building, among others, guidelines concerning designed levels of floors in usable rooms towards existing windows related to the structure of a wall and an architectural detail in the form of a ledge above and under windows and bands with fronts were developed. Inasmuch as the transfer of the assumptions concerning the form to the system of expanded front of the building may be considered legible, the guidelines concerning he form related to the structure of existing wall connected with the structure being converted is not so obvious. In this relationship the features of the structural layouts which are possible to be implemented will decide. In the conversion being analysed the historical front wall has been stripped of the transverse structure part which was maintaining its steadiness and replaced with a new support structure which initially was in conflict with the space for new rooms. Change of the system to the slab and column construction has significantly eliminated the restriction resulting from the established form of the main supporting structure but it did not resolve the problem of choosing the manner of connection of the columns of the support layout with a detached external wall. In this case it was necessary to answer the following question: in what extend of the work of the new layout the existing structure of the wall has to function?

The possibility of including saved structure made of brick to the system moving vertical loads can be determined on the basis of the assessment of the technical condition and carrying capacity resulting from adopted slenderness of the wall, among others, from nodal connection with stiffening system. Regardless of a co-operation manner it is important to ensure stiffness towards horizontal impacts, including wind pressure on the external surfaces of the walls. The outer wall, without the transverse supports, will be forced to cover the deficit of stiffness by starting the co-operation with the new support system, becoming a self-supporting structure. The horizontal division of the building by ceilings has limited

the slenderness of the structure made of brick and the additional supplementation of the ceilings with the new rims have provided the proper support for the wall along the contact edge. The pillars, together with the fragments of the ceilings have created the system of frames inscribed in vertical planes in the transverse system describing the direction of possible structural conversions (Fig. 3a). Starting with the premise of the elimination criterion of the structure elements form limitations, oriented to expansion of the disposition of usable space, the designed support pillars should be placed to the supported wall as close as possible. They can also touch the wall directly to form a pilaster (Fig. 3b) or be "hidden" in its thickness. Unfortunately, in each of the cases being considered they will implement a secondary vertical division of the historical wall from its external side in the manner which is less (Fig. 3d) or more apparent (Fig. 3c). For technical reasons total covering of the pillar structure in the existing wall is impossible. For this purpose unstructured masking finishing elements are very often used.

Fig. 3. The support structure of the historical wall: a)the design stage, b)the pilaster pillars, c) the visible side surface pillars, d) the hidden side surface pillars (source: Photo by author)

Fig. 4. Historic wall in the reading room (source: Photo by author)

Through the analysis of the way of conversions from the direction of the structures layout forming criteria, in this case, a barrier of technical possibilities concerning connecting both structures will emerge, among others, because of the necessity of ensuring a proper co-operation of the foundation in place of the local difference of the settlements. Displacement of the foundations of the new construction will work for the mutual benefit of structural systems which transfer the impact to the subsoil. Entering the new structure into the usable area in such a manner to move the line of pillars outside the historic wall towards the inside part causes a complication for both kinds of aspects: the first causes a difficulty in its adaptation to the location of the architectural pillars of utility solutions, and the second one results form technical limitations of application of a ceiling bracket of the possible length to the wall. Considering this relationship towards the exposure of the saved wall, this manner of conversion has lesser invasive impact on the preserved structure layout. It should be emphasized that in the same building, in its expanded part where there are no influences related to the conservation of the historical and artistic value of existing building, the external wall will mainly be the supporting structure without the necessity for a continuation of the layout of the converted part of the building (Fig. 5). The selection of a circular cross section for the supporting pillars means the attempt to leave the tenacious features of "fading away" architectural form.

In case of closed technical possibilities of conversions, the results of interferences in the historical wall which gradually is disappearing inside the object can be balanced by extending the influence of the values resulting from the saved form. For this reason, the drawing of the wall of the historic wall from the inside was revealed during the conversion, exposing the material of the original structure created in the historical stages of the building (Fig. 4). Archaeological research carried out at the initial stage of the construction confirmed that the bricks from the exposed tower which was demolished by the end of the 19th century were used in the construction of the 3rd and 4th tiers of the tenement Then the front wall obtained eclectic decoration of the front.

The contemporary architectural form of the expanded part of the building has been balanced by the implementation of historical elements related to the closest vicinity of the building to the inner space, including views of the Monastery of the Franciscan fathers, a historical park at The Freedom Square or the Młynówka river fork. The system of the defensive walls, together with the angle tower, which is the testimony of the old defensive technologies has been connected to the architectural form in the form of terraces, shaped in the common space, located at the levels where viewing platforms of already existing urban walls were formerly located (Fig. 6). Solutions concerning the form, through forming the space after the outlining the historical buildings can serve as a link

with he history of this place, can have an impact on the extension of architectural values of the buildings being converted which often remain unrecognised.

Fig. 5 Columns in the expanded part of building (source: Photo by author)

Fig. 6 View of the library building from the side of the old tower (source: Photo by author)

CONCLUSIONS

The reversal of the direction of the designing guidelines causes the necessity of identification of a relationship between the form of the structure and the assumptions concerning the utility of the new function in the adaptation of the construction objects. The designer's pursuit for achieving a wide spatial disposition may result in the gradual disappearance of the original structure of the object. In case of the structure having historical and artistic values, the usable area will be restricted by the influences of a conservator aiming to maintain the original form.

In this case, forming the new construction has a significant role. The exhaustion of the technical possibilities in the resulting composition of structures can be balanced by measures related to the exhibition of non-constructional values of the building and its surroundings.

REFERENCES

[1] Baran W., Łotarewicz M., 2011. Analiza obliczeniowa konstrukcji podporowej zabytkowej ściany przebudowywanego budynku. Przegląd Budowlany 4, s. 32-36.

[2] Norma Polska PN-EN 1990:2002 – Eurokod. Podstawy projektowania konstrukcji.

[3] Opałka P., 2013. Problemy Projektowe i realizacyjne adaptowanych obiektów i zespołów historycznych. Praca doktorska. Politechnika Śląska Gliwice.

[4] Pallado J., 2014. Przekształcenia struktur betonowych. XXIX Ogólnopolskie Warsztaty Pracy Projektanta Konstrukcji, Szczyrk, s. 513-538.

[5] Żórawski J., 1973. O budowie formy architektonicznej. Arkady Warszawa.

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SUMMARY. The article concerns the issues of selected construction changes driven by the change of the manner of the use of a residential building to the municipal library. Because of the fact that the new usable space permeates the original form of the object, the relationships are being created which are the canvas for the criteria of the conversions being made. In case of the extension with the conversion of the building into the Municipal Public Library in Opole, an analysis of the construction requirements leading to preserve the historical and artistic values of the building in its new layout has been made. Realised manners of the conversions in the analysed building are a compromise between the disappearance of the authentic walls of the old building and implemented measures aimed at preserving historical values related to the exhibition of the remaining parts of the building. The impact on the lifting configuration forming in the vicinity of the old wall was presented in the analysis. The manner in which the guidelines for the systems of the structure are being transferred to the newly expanded part where the gradual loss of its impact occurs has been recognised. In order to bring balance to the strongly deterministic impact of the new function the decision was made to restore the historic edge of the city walls which are the testimony of passing defensive architecture. Its purpose was to highlight the old urban layout in a place specific for a city.

Key words: building adaptation, modification of a construction system, structure form