Documentation and the monitoring in managing timber objects in Krzysztof Kluk Museum of Agriculture in Ciechanowiec and the Ryfylke Museum

Materials presented in the following publication are the summary of the implemented project **"Documentation and the monitoring in managing timber objects in Krzysztof Kluk Museum of Agriculture in Ciechanowiec and the Ryfylke Museum"** supported by a grant from Iceland, Liechtenstein and Norway through the EEA Grants and co-financed by the Polish funds and Podlaskie Voivodeship's budget.

Reviewers:
Prof. nzw. dr hab. inż. arch. Piotr Molski
Prof. nzw. dr hab. inż. arch. Robert Kunkel

Editor:
Anna Grabowska

Translation:
Traduco Beata Szczepanik-Bujas

Cover Illustration:
Łukasz Uszyński, Artur Warchala

Publisher:
Krzysztof Kluk Museum of Agriculture in Ciechanowiec
ul. Pałacowa 5, 18-230 Ciechanowiec, woj. Podlaskie, POLAND
tel. + 48 (86) 277-13-28, fax. + 48 (86) 277-38-57,
info@muzeumrolnictwa.pl

Composition and imposition:
Monika Herman

Printing and binding:
Mazowieckie Zakłady Graficzne
18–200 Wysokie Mazowieckie, ul. Ludowa 89, POLAND
tel. 086 275 41 31, tel./fax. 086 275 49 85
drukarnia@mzgraf.pl

ISBN 978-83-62374-06-9

Edition 300 copies

Contents

Introduction

One hundred and ten years pass in 2016 since the establishment of the first open-air museum in Wdzydze Kiszewskie, Poland. For over a century of tumultuous history, nearly forty open-air ethnographic museums have been developed and are still functioning. Along with the numbers of museums grows the sense of situation, when rural reality which lasted in its unchanged form for hundreds of years, slowly loses its life force. More often wooden cottages or the whole households are bought from their original owners by people from the outside of rural culture.

From a time perspective one can also see how the role of open-air museums changes, from the classic museums orientated for hoarding the exhibits, to units responsible for gathering the knowledge, education, teaching the folk crafts and cultivating the folklore. A new task is also to gather and promote the good practices in scope of renovating and modernizing the rural wooden building. In times when less and less often the traditional wooden buildings are raised and it's increasingly difficult to find craftsmen knowing and understanding the traditional technologies, open-air museums become very important knowledge centers dealing with repair methods for present and future (planning on buying the wooden cottage) users.

More and more responsibility and the number of tasks resting on open-air museums, need constant raising of standards related among others to maintenance of condition of the historic, wooden buildings. This task becomes even more difficult if we realize that the stock of wooden buildings in open-air exhibitions constantly grows, so the scale of actions takes on a new light because instead of few objects in a household there are tens of them.

Practical experiences of Krzysztof Kluk Museum of Agriculture in Ciechanowiec, confirm the need for raising the standards in scope of monitoring and documenting the technical condition and managing the stock of wooden building. The present publication, as a summary of research and implementation of the project carried out by Museum in Ciechanowiec together with Norwegian Ryfylke Museum, is the effect of these expectations. One of the measurable results of the project is a computer application, prepared for the needs of Museum of Agriculture in Ciechanowiec, which will make the work easier for the ones responsible for the technical condition of wooden buildings. The upcoming months, maybe years, will show if the intended effect was achieved and how relevant the experiences are to help other open-air museums in Poland.

The organizers of the project would like to thank all the people and institutions whose good will and cooperation allowed its implementation

Marcin Górski
Technical Coordinator of the Project

Dorota Łapiak

Management of wooden facilities in Krzysztof Kluk Museum of Agriculture in Ciechanowiec – Introduction to the project

The Museum of Agriculture was founded in 1962. Since 1969, the museum seat has been in the palace complex of the 2nd half of the XIX century, surrounded by a landscaped park, which includes a palace, coach house, barn, outbuilding and preserved in situ and technically working water mill.

Fig.1. Palace of the Counts Starzeński of the nineteenth century, Museum Headquarters, photo: A. Warchala.

In the park, there are located 48 objects of historic rural buildings from the border of Mazovia and Podlasie. The most interesting buildings are: the eighteenth-century church with a bell tower, nineteenth-century – curate's house, manor house, windmill *koźlak*, complete petty gentry farm and a so-called *Belarusian corner* with a cottage and a barn. Apart from them, the museum has a collection of cottages and outbuildings, court outbuildings, a forge, maneges with unique constructions of horse mills and small architecture objects — two chapels, a well with a crane, earthen cellar, cheese storage room, rick storage building, dovecote and an outhouse.

Fig. 2. View on the open-air museum, photo: Ł. Uszyński.

The museum is also the owner of 4 buildings, located outside the headquarters. At a distance of 7 kilometres from Ciechanowiec in the village of Winna Chroły, there is a preserved in situ wooden school, and 10 km from Ciechanowiec, in Drewnowo Ziemaki, there is a miller's farm, which includes a cottage and a windmill. Another windmill of this type (*koźlak*) is in Dąbrowa Łazy, 24 km from Ciechanowiec.

Fig. 3. The school in Winna Chromy, photo: T. Ołdakowski.

Fig. 4. Miller's farm in Drewnowo Ziemaki, photo: Ł. Uszyński.

Fig. 5. Windmill in Dabrowa Łazy, photo: Ł. Uszyński.

Although the museum owns 52 objects of wooden architecture, until 2015, it did not work out a uniform and modern system of documenting and monitoring the bio-technical, architectural and aesthetic condition of these facilities. This state of affairs was influenced, among others, by previous staffing problems in the Rural Construction Department, as a result of which at the beginning of 2011as many as 23 wooden buildings did not have a white monument evidence card. There was no documentation of previously carried out conservation works either. Also, when it comes to monitoring, we did not have professional "warning" procedures that developed for our facilities. In many cases, we looked for the information related to conservation works previously carried out reviewing documentation gathered in different years, which, unfortunately, was very time-consuming. We realized that in order to properly protect and secure objects of wooden architecture, we would need full information of repairs and conservation works carried out, and that we should create a database in which they would be archived.

Therefore, in view of the need to develop tools to facilitate the management of information about the historic resource of wooden architecture and that would allow to anticipate negative processes in the context of their degradation, in May 2014 in Krzysztof Kluk Museum of Agriculture in Ciechanowiec, a project "Documentation and monitoring in the management of wooden objects in Krzysztof Kluk Museum of Agriculture in Ciechanowiec and the Ryfylke Museum" co-financed from the funds of the EEA Financial Mechanism 2009-2014. Support has been granted from the EEA funds coming from Iceland, Liechtenstein and Norway, and national resources.

Fig. 6. Ryfylke Museum, Norway, September 2014, photo: G. Jakubik.

The project was realized in partnership with Ryfylke Museum, which has a total of 24 affiliates in 8 municipalities. Under its custody there are 70 historic buildings, most of which was left in its existing location. Resources of this museum cover a wide range, ranging from small collections and simple objects, and ending in furnished houses with large yards and gardens, cultivated fields or cultural landscape. Our partner also has a vessel sloop Ryfylke "Brřdrene af Sand". In addition to the architectural heritage of this museum, it is also focused on the preservation of musical heritage of the region and building social capital in the context of strengthening ties of immigrant population with culture and heritage of Rogaland district.

Fig. 7. Ryfylke Museum, Norway, September 2014, photo: G. Jakubik.

Fig. 8. Ryfylke Museum, Norway, September 2014, photo: G. Jakubik.

In carrying out this project and using the experience of our Norwegian partner, we wanted to work together to develop modern standards of facilities management of wooden architecture facilities with respect to documenting and monitoring their bio-technical, architectural and aesthetic condition that will be compatible with the standards of protection of historic wooden buildings developed by the International Committee of the Wood ICOMOS. The project lasted 20 months. In the course of its implementation, we tried to identify in force in Poland and Norway's standards for documenting and monitoring the wooden objects. For this purpose, 4 expert reports have been made: about the operating methods of gathering conservation documentation, about functioning monitoring models of wooden objects, about the existing applications for monitoring and management of information about historical buildings and architectural ensembles and a report on information management with regard to historic buildings of the Ryfylke Museum. For the purpose of the project, a monument evidence card together with instructions for its filling was also designed.

The final effect of the implemented measures is a desktop application that, as a rule, is expected to improve procedures and standards for the management of wooden objects and their conservation, mainly in the Museum of Agriculture in Ciechanowiec, but also in the Ryfylke Museum. Thanks to the implemented project, documenting the objects that are to be transferred will be carried out in accordance with best practices. Faster and more accurate response to changes in wooden buildings will also be possible.

Fig. 9. Sylwester Czołomiej with his speech during the inaugural meeting, June 4 2014, photo: B. E. Murawska-Dereweńko.

In addition, prepared application will enable much safer archiving of data (in addition to a paper version, there will also be an electronic version, i.e. two independent sources and places), and their use will become much easier. It is worth noting that despite the fact that a Norwegian partner of our applies good standards for documenting and monitoring, they are also open to our experience and implementation in their institution the most interesting solutions.

In the project we also managed to involve eminent experts from the Faculty of Architecture at Warsaw University of Technology, Department of Wood Technology at the Warsaw University ofLife Sciences and Białystok Technical University Faculty of

Fig. 10 Representatives of the Ryfylke Museum in the Museum in Ciechanowiec, 3 June 2015, photo: S. Czołomiej.

As a result of the implemented project, consistent tools were created that allow us to anticipate negative processes and prevent the degradation of historic buildings. We hope that the implementation of the project will have long-term impact on the activities of our museum, because through the use of modern and tailored to our needs procedures and standards, management of wooden objects in our museum will be much more effective.

Fig. 11. Workshops during the seminar devoted to developing guidelines to a model for archiving information about wooden objects at the Museum of Agriculture, 21 April 2015, photo: A. Warchal.

Dorota Łapiak, mgr

Director of Krzysztof Kluk Museum of Agriculture in Ciechanowiec since 2002 graduate of the Higher School of Public Administration in Białystok, School of Finance and Management in Białystok, Postgraduate Museum Studies at the Jagiellonian University.

Roy Høibo

Management of buildings and building traditions at Ryfylke Museum

Introduction to Ryfylke Museum

Ryfylke Museum is the museum for the eight municipalities that were merged in connection with a municipal unification process in the 1960s to form the Ryfylke Region. Together these municipalities make up more than half of Rogaland County's land area, although they only have slightly over 7% of its population. This is a large, still difficultly travelled and rather bleak region that nonetheless offers great diversity and a rich cultural life. Ryfylke got its own museum in 1981, admittedly a slightly used institution. The new Ryfylke Museum was established on the groundwork of the old Rogaland Folk Museum.

Rogaland Folk Museum was founded in 1936. At that time 15 years had passed since the need of a folk museum had first been voiced in public. The goal was to build an open-air museum in Stavanger containing farm buildings from Jćren and Ryfylke, and urban buildings from Stavanger. The museum's first building was the ancient loft from Guggedal farm in Bråtveit. The reason stated for moving it to the museum was that it was "the oldest and the most distinctive loft still left in Rogaland". The oldest part of the loft was later dated to 1281. The loft was moved to Mostun in Stavanger about where Rogaland Art Museum is now located. The occasion was marked by having a wedding party parade from Kongsgård to the museum and with important speeches about the people of Rogaland, their character and their love of their home district through the ages.

The folk museum at Mosvatn was not a success, however. Its board lacked funds and was distracted by other business. The founder, board chairman and enthusiast Peder Heskestad was told of a unique group of buildings at Li farm in Suldal. With great enthusiasm, he immediately started up work on repairing the buildings' roofs. In the Ryfylke district voices were raised about establishing a Ryfylke museum as an alternative to the museum in town. Sand was seen as being suitable by the local press. But then World War II began and museum work stopped, except by a museum committee in Sauda that began collecting buildings and objects for a local museum.

Although the idea of a folk museum in Stavanger was still popular, actual museum work moved in completely different directions. After the war ended, efforts were instead aimed at preserving buildings in their original settings. These became the foundation of the museum as we now know it.

The first buildings bought on their original site stood on the cottar's farm Røynevarden high above Suldal Lake. These six buildings were in poor condition and difficult to reach. This was in 1947/48, and the road through Suldal was first opened in 1980. Now plans had changed from founding a folk museum in town to having rural museums in the countryside. This was a novel idea concerning museums in national circles also but gained strong support from the national Norwegian association for museums. The idea of preserving buildings in their original settings gained approval as being both culturally and historically correct and also economically sound, but many years were to pass before this became a common practice in museums.

What was worse was that the museum board started growing numbers of maintenance projects, some of them without a basis in written agreements. It appears that they found small flour mills especially attractive. After Ryfylke Museum was founded, some of these projects had to be stopped. But we still have mill installations in Kvednahola in Ritland/Vasshus and in Øystad, both in Suldal.

Fig.1. Li farm situated above Hyls Fjord is one of the old farms belonging to Ryfylke Museum.

We had now reached the 1950s and the idea of an open-air museum in Stavanger was as good as abandoned. Peder Heskestad worked with local interests in Nærbø to make Grødaland farm into a museum. The buildings on one of the Grødaland farmsteads were bought, restored and opened as a rural museum in 1952. The first buildings bought on their original site stood on the cottar's farm Røynevarden high above Suldal Lake. These six buildings were in poor condition and difficult to reach. This was in 1947/48, and the road through Suldal was first opened in 1980. Now plans had changed from founding a folk museum in town to having rural museums in the countryside. This was a novel idea concerning museums in national circles also but gained strong support from the national Norwegian association for museums. The idea of preserving buildings in their original settings gained approval as being culturally and historically correct and also economically sound, but many years were to pass before this became a common practice in museums as included in the museum. After the reorganization of Rogaland's museums, these buildings were transferred to Hå rural museum in 1983. After the rural museum was consolidated with Jær Museum, responsibility for the buildings was also transferred to that museum.

At this same time in the 1950s, the museum board had begun to look for a suitable farm in Ryfylke to serve as the main base for activities there. The two farms, both in Suldal, being considered were Hoftun, where the museum had carried out maintenance work, and Kolbeinstveit. The latter was chosen, seemingly because of the reasonable price. A contract on leasing was first signed. In 1959, the museum bought the buildings. Guggedal loft was returned from Stavanger and placed in the farmyard at Kolbeinstveit.

With this the museum now had a large and impressive farm at Nærbø in Jæren, a large and impressive farm with strong historic memories of local personages from Suldal in Ryfylke, and the cottar's farm Røynevarden near Suldal Lake. In addition to the farms, it also had several individual buildings and mill installations. This was an excellent collection but another large group of buildings was added before the new age brought professional personnel and public organization of developments. This was Viga farm in Hjelmeland, bought by Hjelmeland municipality in 1970 and transferred to the museum in 1975.

The museum now was responsible for about 50 larger and smaller buildings. In the mid-1970s, the museum shared one employee with the Ullandhaug Farm Trust, but had no caretaker and scanty resources for engaging other workers. After being reorganized as a regional museum in 1981, the museum staff was increased, first to one full-time employee and soon two, but even now with resources that only allowed for hiring craftsmen for single projects or for limited periods. It was not until 1990 that the museum was able to employ a full-time craftsman.

Fig.2. vGuggedal loft is one of the two log buildings from Rogaland listed in the survey of preserved wooden buildings from the Middle Ages. It is now at Kolbeinstveit, one of Ryfylke Museum's major sites.

At the time of reorganization in 1981, the museum office was moved from Stavanger to Suldal. This was because the museum's largest collections were located there. The office was first housed in Suldal's agricultural department and later as a tenant in the so-called Rasmussen warehouse at Nordenden in Sand. The museum eventually bought the larger Nesa warehouse in the same area. After being restored, this building was taken into use in 1991. But the museum still lacked a proper workshop, nor did it have suitable storage and archive facilities. It took many years of work before good and suitable office, workshop and storage facilities were built alongside the Nesa warehouse. This was finished in late fall of 2008 and officially taken into use in January of the next year.

One of the needs that now were met was office space for the increased of number staff members. By the end of 2012, the museum's staff numbered 18 permanent employees.

In addition to maintaining the antiquarian buildings and presenting public activities in them, the museum was now able to assume new tasks. These were the acquiring of a new museum building in Sauda, Håkon's Street 51-53 in Åbøbyen, to house urban industrial culture; documentation of the greatest hydroelectric development project in Norway, the Ulla-Førre installation; the documentation of immigration and development of Ryfylke as a culturally diversified society; the restoration and management of one of the last Ryfylke coasters, "Brødrene af Sand"; the documentation of fruit and berry cultivation in Hjelmeland; publications on sheep husbandry and mountain pasturage, building traditions and folk music etc. etc., as well as extensive research on local history. Then there was cultivation of tomatoes on Finnøy, integration of the museum and the library on Rennesøy, and nothing less than a lobster museum on Kvitsøy. In Sauda the museum assumed responsibility for the buildings at Jone farm in Hustveit, and for Li farm in Suldal.

It is obvious that as time passed, the museum had become a complex organization even though only a sample of its many activities has been listed above. It also became an organization that spread out over a relatively large area. The feeling of having too little time, too few colleagues and too little money has always been present. It has never been possible to fulfill all expectations or to begin working on all duties. It has been necessary to prioritize. This has often resulted in choosing projects that awaken strong local interest and have available funds. The development of Ryfylke Museum has had to balance between satisfying local, regional and national concerns. Here the determining signals have often been strongest concerning national projects, since it is the State that contributes most funding to the museum management. We have tried to show that this can lead

to neglect of priorities based on local and regional characteristics. If the museum is to reflect national diversity, it must also be allowed to choose a profile for its engagement that is built on knowledge of the district the museum is to serve.

The development of the museum has also balanced between the building of the institution, its collections and presenting information. It has been necessary to spend time and effort in increasing staff, obtaining buildings, material and equipment, developing competence and establishing a good working environment. In the balancing act between collecting, preservation and research on the one side, and external activities on the other, the internal sector has not always been the most regarded. A museum's success is often judged according to the number of tickets sold, while we find necessary precondition for occupying a serious role in society is the maintenance of a high standard of collection management, not the least concerning the preservation of buildings. We can still rejoice over the fact that the number of guests has developed well, thanks to an extensive program of varying exhibitions, guided tours, different events, activity days, lectures, cafés, song evenings, meetings and children's Christmas parties.

Fig. 3. During restoration work on Viga farm we were able to use three permanent employees and two project craftsmen in addition to two more who were hired to help with technical solutions. Planning and management were done by the head of the Buildings Department (not present in the photo).

Documenting and supervising historic buildings at museums

A tool for professionalizing museums has been the establishment of national networks of museums having common interests. Our museum has been involved in starting a network for traditional crafts and building preservation at museums. At one of the first meetings of this network we had the issue of documentation of buildings placed on the agenda.

The discussions held in the network and the knowledge we had about the museums, gave reason to believe that work on the documentation of buildings themselves and of our handling of the buildings was not good enough.

A survey among network members showed that several museums had some kind of system for documentation, but that the majority of those who responded felt that these systems functioned poorly. The survey also showed that the systems were incomplete and that they were not adequately adapted to electronic and digital media.

One of the main problems seemed to be that the available external documentation systems were poorly adapted to the needs of museums and were thus seldom used in daily museum work. There was thus an obvious need to work on developing tools for more satisfactory building documentation. The purpose of a documentation system was as follows:

- Creating source data based on observations, surveys, interviews, writings, photos and drawings.
- Collecting existing source data such as literature, archive sources and old photos.
- Organizing the source data by means of systematization and archiving.
- Making data available by means of a comparison of data in presentations, reports and research-based work.
- Instruction and learning.

The goal of the documentation work is furthermore to create research data and to create a basis for knowledge-based learning, to establish data as security documentation in case of a building being damaged or lost and, finally, to establish data as a basis for further maintenance.

Good documentary work will lead to increasing the buildings' importance and significance and to enhancing the scientific basis for their protection. It will raise awareness about the value of the buildings as being unique historical objects and increase general respect for authenticity.

In its Norwegian context work with the documentation of buildings will undergo different phases:

- The first phase concerns external documentation. This means documentation of the house at its place of origin. We need to understand this from a situation in Norwegian outdoor museums, where most houses have been moved from their place of origin. The purpose of such documentation may be to build knowledge, acquire complementary knowledge or more knowledge about the buildings. The documentation includes environmental documentation, landscape, etc.
- The second phase concerns the documentation that takes place at the museum. These are records of the internal handling of the buildings at the museum and include survey reports, reports on the conservation work and maintenance reports. Such records can allow for a check on the maintenance of the buildings at a later time.
- The third phase is what may be called supplementary documentation. This concerns providing information on buildings that are incompletely documented or absolutely un-documented.
- In addition to these phases documentation on the different level of ambitions is required. Aims of the documentation can be described as follows.

The basic level is descriptive in which we document materials, form and construction. Contextual data are also included in this basic description concerning age, geographical location, information related to social conditions or persons, and data about the use of the house. Inclusion of characteristics of types of cultural references and comparisons may also be required to be part of the basic documentation.

The next level would involve a more analytical description. Included here would be data that appear in the course of specific analysis and studies, such as scientific research. Examples of this are analyses of growth rings and investigations of materials.

The most ambitious approach would involve a comparison of all available information in order to exploit the effect of different source combinations and of a total effect.

There is reason to emphasize the need for pre-understanding and for a satisfactory horizon of understanding.

With *pre-understanding* we mean the knowledge already present in the person who carries out the documentation. It is important to have knowledge of sufficient width and depth so that one can recognize, observe important details, track marks, find meaning in what one sees and interpret the details into a whole. This visual ability is thus very important in the work of building documentation.

With *horizon of understanding* we mean the perspective and the experience in relation to which one considers the information in order to make the information meaningful.

In summary, this means that documentation is a both important and comprehensive work. The work requires good knowledge and appropriate tools. A vital goal for the work on the documentation of the buildings in Norwegian museums is that this will provide support to upgrading the level of documentation work regardless of one's original footing. Where little has been done before, it is important to start off with basic documentation. Where some documentation work has already done, one can go further and formulate higher goals for the work.

It is important, however, that all material collected by means of systematic documentation provide the basis for qualified analysis of the buildings. The more knowledge we have about a building, the better starting point we will have for an analysis of origin, recent changes, functions and usage.

Creating sources and assembling knowledge in building protection

"Byggeskikk", the Norwegian word for "building traditions", is an easy word to write. The pioneer sociologist Eilert Sundt (1817-1875) was one of the first to do so. On his travels around Norway, he noticed that while houses in one district could resemble each other, they could differ greatly from other districts. He visited Ryfylke about 1860, and detailed how the three-room farmhouse had been formed by combining an older house and a guestroom. It seems as if buildings' shapes interested Sundt more than who had built them.

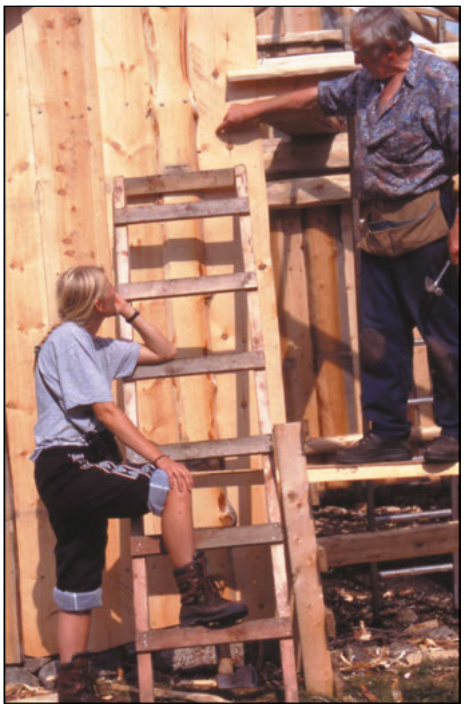
Since then we have understood the importance of studying the actions that have created the buildings in order to understand why they have developed as they did. Building traditions deal as much or perhaps even more with the action-borne knowledge that creates buildings and that is personified in the body of the one doing the work. This is knowledge that is transmitted through interaction between the older and experienced craftsman and the younger one who is eager to learn. Knowledge about materials, tools, working methods and shaping of buildings in detail as well as in the larger context, was something that was developed and transmitted from the experienced craftsman to the novice as a tradition. The result was, however, not unaffected by changing styles, availability of materials and personal abilities and interests.

After a time traditional craftsmanship became unmodern. House-building became more standardized and industrialized. New materials were taken into use while tools and working methods became more rational and efficient. The history of prefabricated houses can be set as far back as the late 1800s, but it was only when the postwar housing shortage and the need for rapid and cheap housing arose that the production of prefabricated houses really started. Their golden age was from the 1960s and on.

There were those who soon realized that vital knowledge could be lost. In 1985, the county planning authority invited us to participate in working out a county plan for heritage sites. In the recommendations submitted by the steering group in 1987, we pointed out that protection of cultural heritage also should include protection of old crafts. We recommended that the county municipality ought to establish workshops in cooperation with the State and the municipalities, to provide the necessary professional assistance. Quite specifically, the group proposed that two antiquarian workshops be started as a short-range measure, one at Ryfylke Museum in Sand, to help both Ryfylke and North Rogaland, and one at Godalen Upper Secondary School in Stavanger to help South Rogaland. Nothing happened in the short range, however, but seen in retrospect this was an important basis for the establishment of a building protection project at Ryfylke Museum in 1994.

On a national level the Registry of Crafts was established at Maihaugen in Lillehammer in 1987. This was to be part of the work of protecting traditional crafts and knowledge that was about to disappear. An important part of the work was to be a nation-wide register of craftsmen. The grounds for doing this was that the competence held by one person could be spread out to a larger district. The Registry of Crafts later changed its name to the Norwegian Handicraft Development with the additional title Center for Intangible Cultural Heritage. The Center has been assigned responsibility for implementing UNESCO's Convention of 17 October 2003 concerning Protection of Intangible Cultural Heritage with emphasis on craftsmanship.

The convention was ratified by Norway on 1 January 2007. Traditional craftsmanship is defined as being a vital part of intangible heritage. The convention's radical perspective is that traditional craftsmen and the transmission process in itself are given priority ahead of the forms and products resulting from the work. This means that good conditions for the process of transmission must be assured. Action is more important than product, craftsmanship more important than the building.



Fot. 4. Nauka poprzez działanie. Ważną częścią tej metody pracy jest posiadanie młodych rzemieślników, pracujących obok doświadczonych rzemieślników.

Jon Bojer Godal has been an important contributor to the understanding of the visual part of craftsmanship. In an article in *Folk i Ryfylke* 2006, Ryfylke Museum's Annual 2006, he wrote:

> *Craftsmanship is primarily expressed in the craft. This can be divided as process and product. The product is permanent, but the process is transitory and no longer visible when the product is finished. The product depends on this transitory substance of action, pattern of action, skill, perception, comprehension and understanding for what is done. The process also includes tools, equipment, workplace and raw material that only indirectly and partially are visible in the finished object. No matter how many words and how much can be said and written, craftsmanship in its primary form of expression is process and product.*

It has still been necessary to find the correct terms for what is done. The expression "action-borne knowledge" was arrived at as a result of attempts to find better terms than "experienced knowledge" or "silent knowledge" then used in professional literature. The correct term arose at a meeting at Maihaugen in 1993 and while Jon Bojer Godal brought the child to be christened, it was Magne Velure who blessed it. Godal himself calls this a "knowledge-philosophical concept" that expresses something about the connections that allow us to do something. He distinguishes between aptitude and awareness. Action-borne knowledge is, first and foremost, an aptitude.

In order to acquire action-borne knowledge one must mimic the one who can, just as children mimic adults. Or as we do when we try to reconstruct transmission of traditions: Combine tradition-bearers and craftspeople in a working situation, and have a third person document what takes place. In this way a situation arises in which knowledge is transferred through interaction while the process is being documented. A working situation like this also creates a good basis for the transference of oral tradition linked to traditional building. This concerns professional terminology and designations, as well as narratives that can function as "pegs" in the acquisition of knowledge.

In Rogaland the need for protecting and transmitting traditional knowledge was quickly realized as being vital to credible building protection. But even if the idea was sown, raising necessary funds to realize it was not easy. At Ryfylke Museum we managed to establish a project in 1994 that we called Project Building Protection in Ryfylke. The project was well-supported by the County Governor, the district funding office for Rogaland, Suldal business development and Rogaland County Municipality. It was a project with extensive and ambitious goals, but its beginning was humble. At this time the museum had only one permanently employed craftsman. The project allowed for engaging one employee in a 50% position and part-time hiring of craftsmenas instructors. The project began at the beginning of 1995 and lasted until 2001. During this period ten far-reaching documentation projects were completed according to the model proposed by Jon Bojer Gordal at the Norwegian Crafts Development.

Action-borne knowledge can only be preserved by keeping it alive. It is still important, however, to document what we do when we work on the restoration and care of old buildings. That is the only way we can be sure that real knowledge about what is done can be saved and about why things were done as they were done when there the need next arises for doing maintenance work on a building.

Documentation includes the condition before work is started, the work processes underway and the finished result. But it also includes searching in other sources for information about the building, such as can be found in archives, literature, old photographs and among people who can contribute their recollections. We use photos and films, surveys, drawings, notes and interviews. These are important source materials for information on building heritage and traditional craftsmanship, and in that way a basis for the spread of knowledge that is the duty of every museum.

In 2005, Ryfylke Museum was granted funds on behalf of the Building Network (the network of museums doing much of the work on building protection) from ABM Development (now the Arts Council Norway) for a project called "Creating sources and assembling knowledge in building protection". The project led among other things to a Handbook for Documentation of Buildings that gives guidance on how one should proceed in the work of documenting building protection.

At Ryfylke Museum we now began to feel we were rather good at this. We also got more employees. We had eventually created a building department with increased capacity and high competence. We were given a commission to carry out a pilot project on building preservation at the museums of Rogaland for the Ministry of Culture.

We were now among the foremost in this country concerning building protection and our self-confidence was so great that we invited the annual conference in ICOM's Committee for Historic Buildings to Ryfylke in 2009. ICOM, the International Council of Museums, is the world organization for museums. The Committee for Historic Buildings, DEMHIST, is an under-committee.

Fig. 5. In our work of gathering local information about old crafts, we are completely dependent on having the cooperation of those with these skills, and to learning from them by working together. Bjarne Østebø was one of our fine tradition-bearers.

Among the things we showed these foreigners was the result of our work in restoring the cottar's farm at Røynevarden. We thought that this little site high above Suldal Lake would be suitably exotic and besides, we could show exemplary illustrations of good restoration work.

We know much more now than when we started the project Building Protection in Ryfylke in 1995, but we will never be over-qual ified. In the olden days youngsters followed their fathers or masters for years. We have difficulties in finding master craftsmen. In many cases the tradition has become weak or is about to disappear. During the years we have worked with this, many of those we have had as tradition-bearers have passed away. And that always means shorter periods of learning or transmission of traditions. But over time we have built up our experience, and we have built up an environment whose members can support each other in the development of the craft. We know of no better method and hope that our own work, in collaboration with others in the networks that have been established, helps action-borne knowledge, which is that part of the intangible cultural heritage made up of traditional crafts, continue to be a sound foundation for the work of preservation and maintenance of historic buildings.

Organizing building management

It must always be the responsibility of the head of each institution to ensure that the museum has the necessary systems, skills and aids for running a systematic documentation work. But in practical work, it is important that craftsmen and curators arrive at a good cooperative understanding of responsibility and tasks.

The craftsman is the one who comes in close contact with the building materials, construction and tracks of those who have gone and worked before. But the craftsman has traditionally had a subordinate role at the museum.

At Ryfylke Museum we believe that craftsmen should have a central role both in working with basic documentation and survey reports and, not least, in working with maintenance documentation. This requires allowing craftsmen sufficient time for necessary training and documentation of the work, including the introduction of a scientific mindset that includes pre-understanding and self-reflection.

Curators and conservators are those who traditionally have led work on building protection and who have been responsible for documentation. But they have not always possessed the necessary fundamental knowledge for documentation and analysis of materials, structures and tools tracks. It would be useful if close collaboration between craftsmen and academic staff could be realized and thus allow for an overlap that ensures the best possible documentation of the object itself, of the state of its condition and of the sources for building history.

Based on the conditions of the single museums, we believe that the director should delegate primary responsibility to one specific person for doing documentation, for working out plans and goals and for maintaining control of the documentation work.

We have also said something about the terminology to be used in working with building protection. We believe it is important that standardized terms, i.e. the words that appear in official dictionaries, be used. These designations should be used in working with data recording. These vary from place to place, even within relatively short distances, and are important elements in the knowledge we should be caring for. We therefore strongly recommend that museums carrying out documentation work ask about local terms and take these into use in their work.

Efforts to build up a systematic tool for documentation of buildings have led to a handbook that is now being adopted by a number of museums in Norway. We also have a joint system for electronic registration where basic information may find its place.

By using this system, we hope that the next generation of museum workers will discover more answers to questions about buildings at museums than our generation did when we started.

Documentation systems

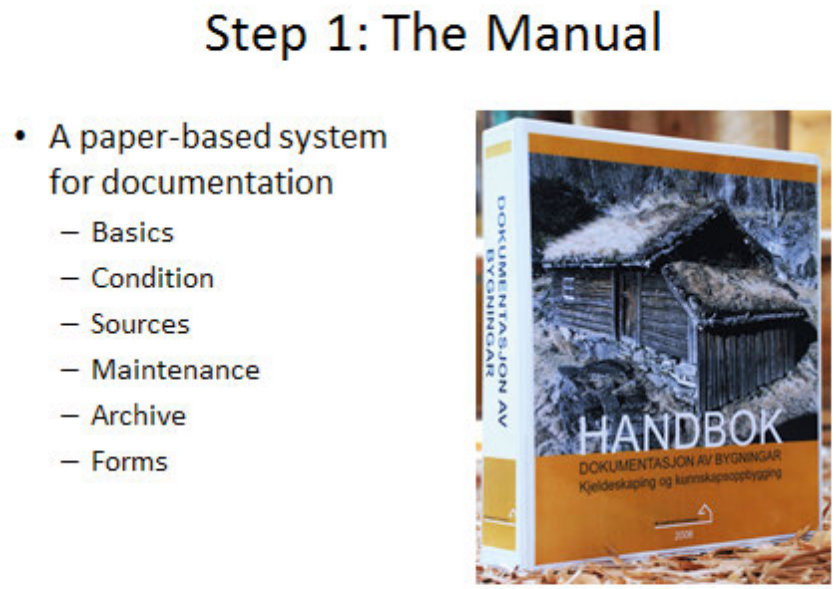
During the last 10 years Norwegian museums have undergone immense structural reforms. In the late 90´s, there were about 400 independent museums in Norway; the exact number is unknown. After a reform strategy initiated by the Ministry of Culture was implemented, only about70 museums that remained and that received governmental support. One consequence was that many small museums were united into larger museums, most often on a geographic basis.

One of the aims of this reform strategy was to build a viable economic fundament for the museums. The other main aim was to strengthen their professional capacity. A tool for achieving this was to organize the museums into professional networks.

At present there are 25 active networks, one of which is the network for building preservation. It was established 2004. Ryfylke Museum has led this network from its very beginning. The most important activity within the networks are the meetings, or seminars, at which people from different museums come together to exchange knowledge and information. The meetings are held at the different member museums. The most important topic we have directed our attention towards is the need for better documentation of the museums' buildings and of what we are doing with the buildings at those museums.

The manual

This leads us back to the first step in our history of documentation – the hand book, or the manual that we worked out for the network in 2008. It is a paper-based first attempt at offering a systematic method for documentation.



The elementary level in documentation work concerns establishing what is called basic documentation and registration of condition. This means the determining of the most important information about materials, form and construction and, in addition, about age, location, social and personal relationships and usage.

The next level has to do with obtaining context data about usage, age, location and also social and personal historic relationships. Here we search through other available sources in order to understand the building and to describe the work using scaled survey plans, photographic documentation and the sources for building history in archives and in oral tradition. At this level it can be useful to conduct special surveys such as tree-ring dating (dendrochronology).

The sum total of basic documentation, context data and potential special surveys can establish a basis for conclusions about origin, building history and usage that in their turn can allow for an evaluation of existing documentation and for qualified assessments of the state of condition, maintenance status, risk evaluations and precedence of remedial measures.

This interaction between practical understanding, an aptitude for visual observation and scientific systematics means that we will acquire better knowledge about buildings and thus a qualified basis for presentation.

Experience shows that most museums have such information about their buildings. This is not the case, however, with the documentation of the buildings' condition after they are moved to the museum site or have become museum property. Documentation in connection with maintenance, moving, alteration or demolishing is inadequate at many museums. In view of the goal of caring for buildings in museums, documentation of the work being done on such buildings must be considered to be just as important as the actual work itself carried out on them.

The handbook also explains about methods for work in reconstruction, documentation and transmission of the knowledge about work processes, or action-borne knowledge.

The handbook's last section contains a recommended key for archives in building history, a bibliography and an HSE plan (Health, Safety and Environment).

Basic documentation and registration of condition

Basic documentation collects information not only on identity, localization and ownership circumstances, but also on physical conditions such as size and function, and on possible administrative registrations, established protection status, special history etc. This type of information is found in local archives, in photographs, in public registration records, on the Internet, in telephone catalogs or can be accessed through interviews with informants.

By registering physical condition we will obtain complete information on the present condition of the building. In order to make such registration more readily understandable, we recommend systematizing the work in the following way:

1. We divide the building into separate elements (ground plan, foundation, construction, walls, windows, doors, roof etc.) and carry out the work by stages. The numbers of stages depends on the size of the building. We have reckoned on a 32 stages as being the maximum for doing this work.
2. The following information shows a the minimum of what should be noted at each stage:
   a. Dimensions of length, breadth and height.
   b. Description of visible construction.
   c. Description of materials.
   d. Description of surface treatment (color, wallpaper, marks of tool use etc.).
   e. Visible damage, or marks of wear.

This means that the same steps will be repeated at each stage, except in cases of work with more complicated constructions such as outdoor facilities, terrain or gardens, and will be of great use in systematizing the work on both simple and more complicated constructions.

Every questionnaire form in the handbook is set up to suit the separate stages of the work, but their basic composition is always the same. Each form consists of three sections:

1. The main section

Mål □ Konstruksjon □ Material □ Overflate □ Skade □ ellers □			
Objekt:		GAB nr.:	
		Grd.nr.:	Byg.nr.:
Side:	Rom:	Kommune:	
Bygningselement:			

Texts in this section:

- Measurements. Construction. Material. Surface. Damage. Other.
- Object Title no. Property no. Building no.
- Side of building. Room. Municipality.
- Construction element.

This main section allows for a specification of the type of survey that is being done and for whether focus is being placed on damage, measurements or construction etc. The headings have only a support function so that sketches can more easily be entered into an advanced system. Information that has been gathered about several relevant groupings can also be noted at the top.

Identification of the surveyed object is an important feature of the registration survey: address, title and property number, registration number, municipality and possible construction element. All such information must be placed here.

2. The mid-section

The mid-section has been thought of as being an adaptable work sheet for sketches, drawings, notes, keywords, memos or for detailed information. Anything that can help in the understanding of the building, the construction element or of other relevant matters can be noted here This main section allows for a specification of the type of survey that is being done and for whether focus is being placed on damage, measurements or construction etc. The headings have only a support function so that sketches can more easily be entered into an advanced system. Information that has been gathered about several relevant groupings can also be noted at the top.

3. The bottom section

Texts in this section:

- Project: Scale: Date:
- Photograph and/or other references: Name: Registration no.:

The third text section resembles the bottom section on scale drawings, even if the scale in this instance does not have the same importance. The registrar can choose whether or not to use such a scale. This section is meant to be used not only by the institution or the person who does the documentation but also to provide references to photographs, drawings or other documents that can aid in understanding the building, and to the date when the form was filled out as well.

The form can be used according to need. If necessary, several forms can be filled out for each stage in the work process. The structure of the form is replicated. This makes it easy to use the worksheet for information that might not correspond to the title on the form should that prove necessary. It is then simply a matter of crossing out whatever is irrelevant.

This opening for individual solutions is the basis for each separate stage. In this way we can create a safeguard allowing us to deal with both complicated challenges and surprises, and to gain extra space for supplementary information.

Cameras are important pieces of equipment that should be used during the entire process in addition to pencils, measuring-tapes and worksheets, either to illustrate the method of work or to give a basis for follow-up control. This applies to every stage of the work except for the first one.

All worksheets are then collected and placed in a loose-leaf binder in the same order as the work was done. When the final work stage has been completed, we will have a complete survey of the building's measurements, construction, damage, surfaces and material as a basis for future decisions and evaluations.

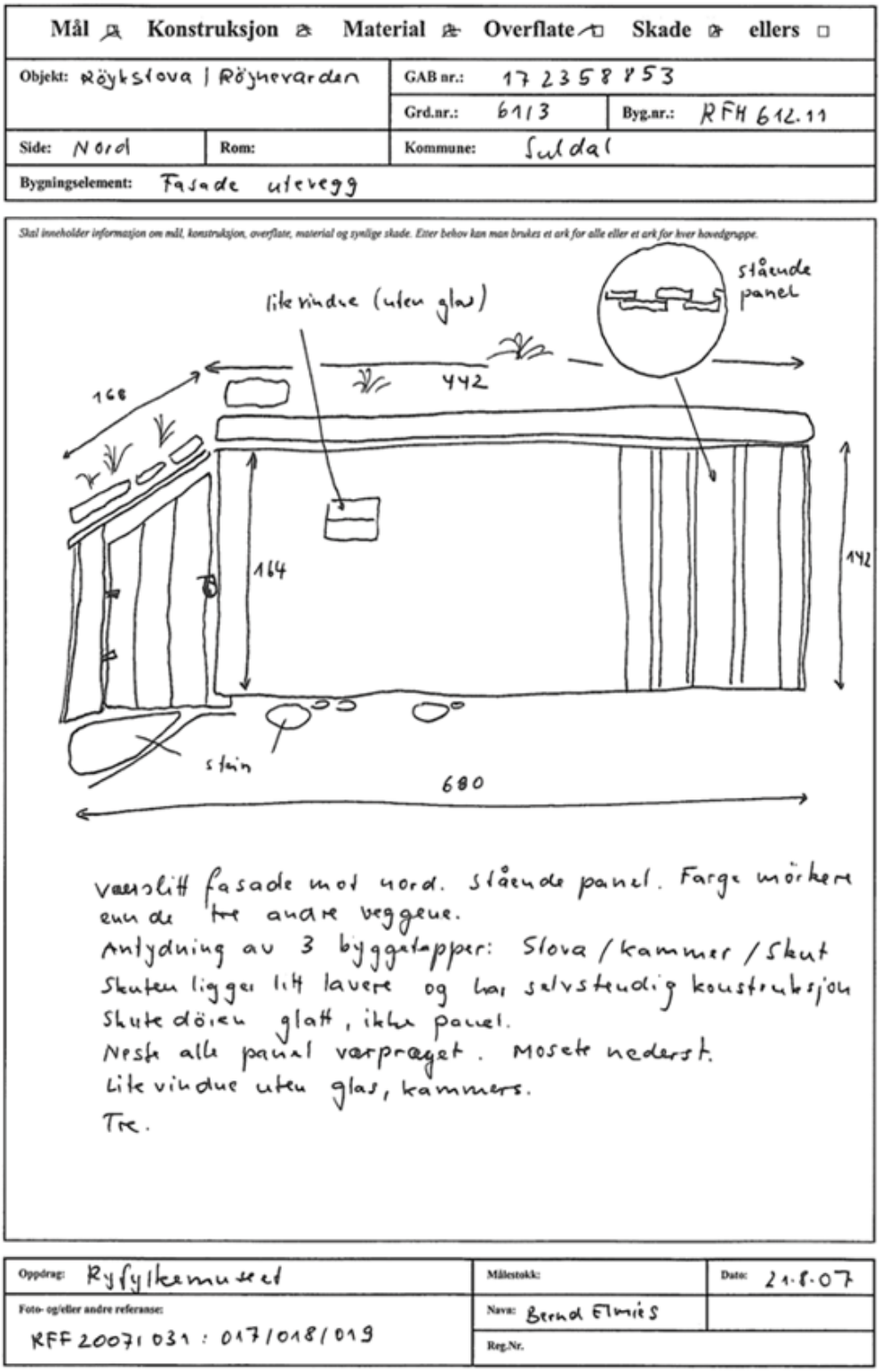


Fig. 6. An example of a fully filled-out form for registering a facade.

Fig. 7. Registration work in practice. Sven Hoftun, Ryfylke Museum's master craftsman, demonstrates the process for the delegation from Ciechanowiec.

Other sources for information about buildings

The handbook gives a detailed description of working methods used in surveying buildings, photo registration, building archaeology (determining usage marks, tool marks, surface treatment etc.) and of the various sources for information on buildings in literature, photographic collections, and in work with oral sources (informants).

A separate chapter deals with documentation of buildings in connection with maintenance work, moving, alternations or destruction of buildings. This includes planning, budgeting, calculating consumption of materials, documentation of the work process and reporting. The handbook is concluded with a chapter on re-building, documentation and transmission of action-borne knowledge.

The commercial system

While we were waiting for a tailor-made computer-based system for use in museums, we bought a commercial system to handle our needs for managing, operating and maintaining museums buildings. Different systems are available, and although many of these are good, their costs vary. We chose a system called "Facilit".

PRIMUS

The dominant documentation system for Norwegian museums is called "PRIMUS". It is a system for registering and cataloguing different types of museum collections, including buildings. It does, however, have a weakness in being a static system, while we need a dynamic system in building management.

Based upon our manual (the Handbook) and other sources, we have participated in the development of a new module in "PRIMUS" suited to building management. The project has been carried out by a computer company owned by Norwegian Museums, "Kultur IT", with a demo version having been released in the spring of 2015. This is going to become our main program for handling our building collection. Its main advantage is that it will be easy to connect the various collections to one another, whether these are photos, objects, buildings etc.

PRIMUS is a system for documenting basic information about buildings, for evaluating condition, for surveying and registering defects, for reporting and for distribution of tasks. The system allows not only for filling out pre-determined categories but also for free-text descriptions and marking of defects on photographs.

Categories to be filled out have the following content:

- Purpose (evaluation of condition according to reported defects or systematic inspection).
- Description of the object (free-text).
- Date and time.
- Description of condition (free-text).
- Condition level.
- Level of consequence.
- Recommendation.
- Annexes.
- Photograph.

The most important categories in this display image are the following:

- Type of defect.
- Description (free text).
- Date and time.
- Position (location).
- Priority level.
- Annexes.
- Photograph.

Registrations made using Primus can be uses as the basis for a great number of reports.

The most important categories in these reports are:

- Complete information about the object (including all basis data).
- Report on damage/defects.
- Condition survey.
- Treatment (finished tasks).
- Tasks (registered).
- Remarks.
- Comments.
- Recommendations.
- Analyses.

All these reports can be opened as PDF-files

The system gives a good summary of all the existing tasks. These tasks can then be distributed among the staff and given priority at the same time. The display image for tasks (see below) allows for choosing among (see left-hand menu):

- All tasks.
- New tasks.
- Tasks in process.
- Finished tasks.
- Planned tasks.

The individual staff worker can choose ”Mine oppgaver” (”My tasks”) and filter these according to high, low or medium priority (see central dialogue box). PRIMUS is installed for work on stationary PCs in the museum’s main office and on tablets or smartphones in the field.

The system will be an important and useful tool for surveying, controlling and reporting on the museum’s building collection. It will be a tool both for the centralized management of the building collection and a basis for better organization in planning, leading and completion of tasks. As soon as it is operative it will replace the commercial system FACILIT.

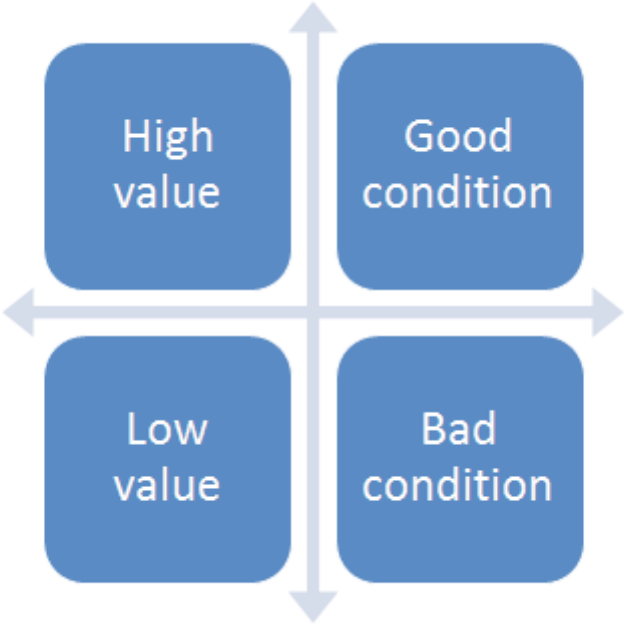
Priority of museum buildings

There are around 5000 historic buildings at Norwegian museums. That is a large number. It is obvious that all these buildings cannot receive the same attention. We have therefore worked at finding a system for assigning priority to the buildings in the collections.

Step 1 concerns identification of the building's technical condition and assessment of the cost of restoration. There is a separate standard procedure for analysis of protected and listed buildings. This standard is an adaptation of the European Standard EN 16096 "Condition survey and report of built cultural heritage".

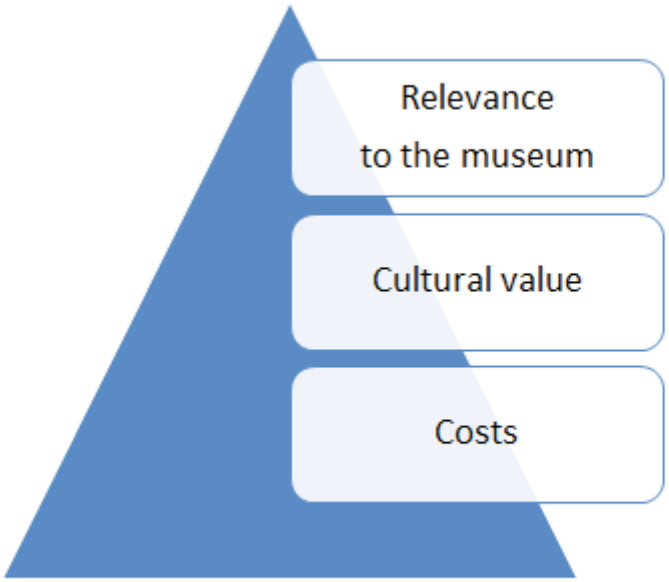
Step 2 concerns conducting an analysis of its authenticity, its cultural and historical value, including story-telling value, its architectural value, its value as a source of knowledge, its symbolic value and its value as a basis for adding experience to visitors.

Step 3 concerns assessment of its relevance for the museum. Does the building support the museum's goals and plans? Is it suitable for guided tours, education, exhibits and events of different kinds? How can it be used by the museum?



The higher the value of the building, the more relevance it has for the museum and the higher priority it receives, despite its physical condition.

On the other hand: it might be better to conduct preventive maintenance on buildings that are in relatively good condition, rather than to use available resources on extensive restoration of buildings which are in very poor condition.



Relevance to the museum, which is to say how well the building supports the museum's goals and plans, confers the highest significance.

Conclusion

In this day and age, and to an ever-increasing degree, knowledge of historic building methods, materials and tool usage will continue to fade away. If museums are to conduct reliable building protection, it is essential that they develop and use suitable methods for documenting and control of the buildings for which they are responsible. New technology allows for this being done in an efficient and understandable way that can be utilized by those who have need of this information. In Norway we now have a system of this kind in the data program PRIMUS developed in cooperation between selected museums and "KulturIT", a principal provider of programs for museums.

Documentation work must not appear to be merely an extra task and something of a balancing item in the work of restoring and maintaining historic buildings. Much of this documentation must be done by those who work most closely on the practical work with buildings, by the craftsmen. One challenge for museum leaders, therefore, is to develop good cooperation between the practical and the academic professions at museums.

This is still not enough. As a consequence of museums' own needs and in complying with the UNESCO Convention on Immaterial Culture, museums must include knowledge of working methods, of action-borne knowledge, in their activities to a much greater degree than has been done up to now. Museums are the only institutions that can assume responsibility for discovering, documenting and transmitting traditional knowledge in the building trade. At the same time, this knowledge is absolutely vital to all understanding of historic buildings and to their maintenance, restoration or also to their possible reconstruction in a reliable way.

Historic buildings and knowledge about them are important elements for comprehending the life and work of those who lived in and used these buildings. The buildings themselves, however, the materials used to build them, the tools that were used and the work methods used to construct them are also a foundation for knowledge about building crafts. Museums must also accept responsibility for preserving and transmitting this part of history.

Roy Høibo, Professor, PhD

Was born 1948, has been manager and later director of Ryfylke Museum 1981-2015. He holds a PhD in ethnology as well as degrees in history and Norwegian. He has written numerous books, articles, exhibition texts, lectures and reports. Høibo was granted competence as Senior Curator in 1987 and as Professor in 1999.

Krzysztof J. Krajewski

Analysis of the state of wood in a historic building, as a basis for monitoring and management

Introduction

Wood as a material inherently environmentally friendly is easy to handle, readily used in construction and thus always present in the monuments of material human history. Under appropriate storage conditions, wood retains its durability for long centuries, however maintaining safe conditions in a long-term existence of the facility is extremely difficult. The susceptibility of wood to the devastating impact of abiotic and biotic environment poses a serious threat to this material. Destruction of wood leads to irreversible loss of the historic substance of the building. These phenomena must be prevented through the best prophylactic methods.

Analysis of the behaviour of wood in historic facilities of wooden architecture is an important factor in ensuring their sustainability. It is also a necessary condition for the preservation of the monument for future generations. The wooden construction of the facility, on the one hand, is a set of elements constituting the substance of the building which often serves as a base for sights of another kind, like paintings, woodcarving etc. Monitoring tasks of historic buildings must therefore take into account a number of interrelated issues.

Purpose and scope of the study

The aim of this paper is to present the most important information concerning issues related to knowledge and practice of conducting technical inspections of the wood of wooden structures in historic buildings. The study includes a collection of the most important information about how assessment of historical buildings is conducted through conventional methods including the possible use for this purpose of instrumental diagnostic methods with varying degrees of sophistication.

The essence of monitoring the technical condition of historic buildings

Among the various purposes of monitoring and managing the documentation of historic buildings, there must be procedures for monitoring technical condition of the wood in buildings (preventive measures), as well as procedures for rescue operations. The creation of an efficient system for controlling the technical condition of the facility and the conditions which prevail in it is a matter difficult to achieve, because monitoring the technical condition of wood in constructions is only one of many elements that should be controlled. The law on protection and conservation of monuments[1] defines the concept of conservation and research works:

– conservation works are action to protect and preserve the substance of the monument, inhibiting its destruction processes and documentation of these activities,
– conservation research is an effort to examine the history and function of a monument, determine materials and technologies used, determine the state of conservation of the monument and prepare a diagnosis, project and programme of conservation works, and if necessary, the programme of restoration works.

Existing provisions[2] on the conduct of research and conservation works in buildings included in the register of monuments, define, among others procedures for issuing permits to carry out these works, however, they do not regulate issues of monitoring technical condition of antique wooden facilities, leaving these issues to be developed in a different mode.

[1] The Act of 23 July 2003 on the protection and conservation of monuments, Official Journal of 2014 (1446) (as amended).

[2] *Regulation of the Minister of Culture and National Heritage of 14 October 2015 on carrying out conservation, restoration works, construction works, conservation research, architectural activities and other activities with relation to monuments from the register of monuments and archaeological research and search for monuments,* Official Journal of 4 November 2015, item 1789.

Effective protection of monuments requires action aimed at, among others, checking the state of preservation and purpose of monuments. Conducting research and conservation works of a monument entered in the register must be approved by the provincial monument restorer, and the person carrying out these works must possess appropriate qualifications and licenses. In accordance with good conservation practice and experience in this field, monitoring should be subject to the conditions of the internal environment (climate) of spaces in historic buildings. Their unexpected change may indicate the emergence of degradation threats of the facility. Professor Jerzy Ważny[3], in his numerous publications in the field of construction mycology[4], emphasized that among many factors determining the extent of fungus in buildings, the most imported is the increased absolute humidity of the wood (over 20%) and high relative air humidity (above 70%). An extremely important factor in reducing the risk of mould growth is to ensure effective ventilation of interiors and the construction of building envelope. For this reason, operations consisting in documenting and tracking changes in the substance of the facility, including monitoring of the climate in the building, documenting the scope and nature of conservation work carried out, etc. deserve special attention and fuller introduction to the standards of protection of monuments.

Conducting inspections in historic facilities

Systematic monitoring of construction facilities that are not monuments is done routinely in accordance with the requirements of the Act – Building Law[5]. Building regulations require conducting periodic and ad hoc inspections of the technical state of installation and construction of facilities. In the case of uninhabited wooden facilities registered as historic monuments, there have not been issued any separate requirements for determining the scope and frequency of inspections of the technical condition of the wood in their construction. In practice, however, hitherto applied forms of conducting conservation research are used. Depending on the situation, they may be routine periodic inspections or, if relevant, they may have the nature of a research (expertise), whose purpose is to determine the best ways to counter identified threats. Each inspection, regardless of whether it is carried out periodically or it is in a form of an expertise, should include activities aimed to reveal or rule out the presence of factors of degradation of wood in historic buildings. Implementation of the practice of systematic mycological and construction inspections would give a possibility of early noticing signs of moisture and mildew, and thus introducing early preventive actions. As we know, preventive activities are more effective than those that combat negative effects, because without incurring large expenditures they serve to protect facilities against adverse events. Systematic approach to the examination of historical facilities and collecting and analysing data from the monitoring system of climate change in the facilities, is an important element of the prophylactic system. Procedures to be followed during visual inspection of the facilities are generally unified[6]. Zygmunt Stramski[7] shows in his works practical comments on defungusing works in the construction industry, with particular emphasis on the principles of compiling mycological and construction opinions. Evaluation of the building is usually carried out usually in the form of a visual inspection on the outside and inside the facility[8].

During external visual inspection, it is absolutely essential to analyse the links between the object of inspection and other elements of the surroundings. One must pay attention to any technical reasons that may provoke dampness of the facility, because symptoms visible on the outside are often linked with biological corrosion existing inside. In each case it is necessary to assess:

– state of the external cladding of the building, such as whether there are stains, discolourations, cracks, holes, traces of insect or symptoms of wood-destroying fungi[9] Basidiomycetes) or mould[10] (Ascomysetes and Deuteromycetes),

[3] Professor Jerzy Ważny was a member of the Polish Academy of Sciences (PAN), Dean of the Faculty of Wood Technology at the Warsaw University of Life Sciences, a prominent researcher in the field of issues related to the degradation of wood, the undisputed founder of scientific discipline of wood protection in Poland, an expert in construction mycology issues. He died on 23.08.2010.

[4] J. Ważny, *Mikroklimat pomieszczeń, jako główny czynnik porażenia budynków przez grzyby*, W: II Mycological and Construction Workshop, Ed. PSMB, Wrocław 2000, p. 25-30.

[5] *Act of 7 July 1994 Construction Law*, Official Journal of 2010 No. 243, item 1623 (as amended).

[6] Z. Stramski, *Uwagi i wytyczne dotyczące ekspertyz mykologiczno-budowlanych*, ed. PSMB, Wrocław 1997.

[7] Zygmunt Stramski - expert of the Polish Association of Building Engineers and Technicians, mycological and construction expert from the Voivodeship Governor's list, mycological and construction expert of the Polish Association of Building Mycologists, expert of State Service for the Protection of Monuments, a long-time Honorary Chairman of the Board of the Polish Association of Building Mycologists, long-time Chairman of the Nationwide Section for Protection of Buildings against biological corrosion of the Committee of Structural Durability Z.G. Polish Association of Building Engineers and Technicians Died on 2.01.2007.

[8] K. J. Krajewski, *Zwalczanie korozji biologicznej w budynkach*, W: J. Ważny, J. Karyś [Red.], Ochrona budynków przed korozja biologiczną, Ed. Arkady, Warsaw 2001, p. 185-200.

[9] J. Ważny, *Makroskopowa diagnostyka grzybów domowych*, W: III Mycological and Construction Workshop, Ed. PSMB, Wrocław 2002, p. 9-18.

[10] Z. Żakowska, M. Piotrowska, *Praktyczna identyfikacja grzybów pleśniowych występujących w budynkach*, W: III Mycological and Construction Workshop, Ed. PSMB, Wrocław 2002, p. 51-58,

– state of eaves, plinths and drainage bands (if any),
– watertightness and passability of the system of gutters and drain pipes (if any),
– the terrain around the facility which should provide drainage of rainwater from the facility,
– condition of the drainage of the adjacent land and its efficiency,
– technical condition of damp insulation under the foundations of the facility,
– condition of walls and plaster on chimneys,
– type of soil and the depth of occurrence of groundwater,
– condition of the exterior doors and windows,
– condition of security system against rainwater leaking to the basement (if any),
– presence of canopies over the entrance door to the facility, profiling of platforms, etc.

The next stage of an inspection is visual inspection of the facility. They must involve all areas and levels starting from the lowest (basements) up to the attic and roofing. Assessment of roofing elements should be carried out in conjunction with the technical condition of roofing material and with evaluation of the system of protection against the ingress of water into the building along vertical surfaces of chimneys and bay window walls. Particular attention should be paid to the watertightness of the roofing and the technical condition of roofing structures. The most vulnerable to moisture and infection by fungi are valley rafters, beam ridges, wall plates, corner rafters, structural nodes, areas where chimneys penetrate through the roof surface, areas around roof hatchways, etc.

During internal examination, one should pay attention to symptoms such as:
– increased moisture of wood and other building materials,
– specific odour inside the rooms (a musty smell, etc.),
– stains and traces of moisture on walls and roof framing elements,
– discolouration and peeling of whitewash from the walls,
– signs of warping of the wood of construction partitions,
– sagging and drooping of floors,
– symptoms of loss of cohesion of the wood structure,
– occurrence of morphological signs of fungi and decomposed wood,
– presence of mould on the surface of inner walls,
– presence of insect outlets, wood meal pouring out from holes and cracks in the wood.

Noticing symptoms of biological corrosion or moisture of the structure or disclosure of any defects which cause moisture requires an intervention designed according to the situation. These activities should result from the findings results of a specialist expertise. The key role of the expertise is the identification of current technical condition of the facility, determining the cause of infestation by pests, and drawing up a plan of repair work. In any case, works in a historic building should be carried out under the supervision of an authorized person and in consultation with the conservator.

In the context of expertise, the following activities are usually carried out:
– a comprehensive specialized technical inspection of the facility,
– gathering and possibly complementing technical documentation,
– getting acquainted with the history of conservation works hitherto carried out,
– execution of photographic documentation,
– making the necessary construction pits,
– designation of species (kinds) of microorganisms or insects damaging the structure, including taking samples for laboratory testing,
– preparing a written study with recommendations to be implemented.

It should be noted that wood-destroying factors in historic facilities can be a form of biological impact (biotic destructive factors) and a form of physical and/or chemical destructive factors (abiotic wood degradation factors)[11]. In natural conditions the interaction typically occurs between biotic and abiotic degradation factors in the process of wood destruction. Therefore, monitoring in a historic facility should also include climate control[12]. Maintaining proper climate can reduce the formation of uncontrolled damage in the structure of valuable historic buildings. The wood of immobile facilities in many cases constitutes the ground for works of art, therefore, must ensure a stable climate that would limit the wood work and destruction of valuable layers of murals and woodcarving. It should be kept in mind that the control of humidity and temperature, and the wood of a monument should also include hard-to-reach places like basements, attics, etc., because human intervention is rare in such places and conditions for the development of biological corrosion is particularly convenient.

[11] J. Ważny, *The present classification of wood degradation factors,* Folia Forestalia Polonica, Ser. B, No. 24, 1993, p. 13-22.
[12] P. Kozakiewicz, M. Matejak, *Klimat a drewno zabytkowe*, ed. SGGW, Warsaw 2000.

Evaluation of the condition of a historic facility in hard-to-reach places

The development of mould in buildings occurs often in confined areas, making it necessary to open the construction in some areas and make special inspections. On the surface of the wood, signs of mould growth are not always visible, which is why the structured should be opened in areas with the greatest potential hazard of biological corrosion. Such places in a wooden building include ceilings through which chimneys penetrate, beams in the area of wreaths of walls and eaves, beams under the floor, where the floor is sagging or near outer walls. In those places, specific symptoms of biological corrosion should be searched in the form of morphological fungi growths and traces of decomposed wood, possibly humid places or such exposed to moisture are disclosed. In any case, it is necessary to perform measurements of wood moisture in hard-to-reach places.

Fig. 1. The Church of Transfiguration in Żuków – using resistance hygrometer to measure the humidity of the foundation, (Fig. K. Krajewski).

In conservation works in historic facilities, there are restrictions on uncovering the construction of the facility, disassembling flooring and decking walls. For this reason, in narrow gaps in building partitions, in ceilings and under floors, an inspection camera turns out to be a useful device (Fig. 2). This device allows observation and recording of images in confined spaces without compromising the facility to damage that are difficult to avoid during inspections.

Fig. 2. The endoscope also referred to as an inspection camera, (Fig. K. Krajewski).

Assessing the structure of the building in uncovered areas, it should be clear whether there are traces of fungi of filling and insulating materials in ceilings and walls. Elements of wood stacked directly on substrates made of stone and brick need to be checked from the bottom side. A possibility of the development of fungi destroying the inner structure of the facility is a phenomenon often observed, also in elements previously impregnated with surface methods (Fig. 3). In wood facilities, particular attention should be paid to elements in the vicinity of damp and unventilated areas. In such areas fungal attack risk is especially high. With sites suspected of mould growth, samples should be taken for microbial tests and pass them to a specialized laboratory.

An important task of the person conducting the study of the facility is to determine the form and size of mould[13], especially to determine the fungus species. A number of useful information on ways to identify macroscopic fungi households in buildings provides Ważny[14]. As noted by the Author, different species of fungi have different growth conditions, a different destructive force and react differently to antifungal chemical agents. Recognition of fungal species is difficult and requires special preparation. The most common method of diagnosing fungal species is based on the macroscopic appearance of the morphological structures of the fungus. In practice, the most common methods are based on the appearance of fungi: the mycelium, mycelial cords and fruiting bodies.

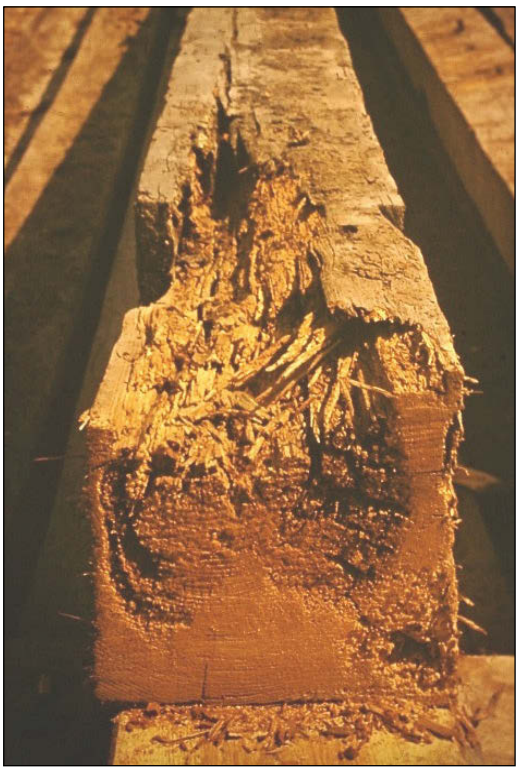


Fig. 3. An example of a fragment of wood with internal decomposition, (Fig. collections of the Wood Protection Department at Warsaw University of Life Sciences).

There are two basic states of fungal activity that may be disclosed in a building[15]:
– active process (active fungus),
– process inhibited (inhibited fungus).

The distinction between active or inhibited mould growth status allows you to specify the urgency to start antifungal works and determine scale of the threat for the facility. Active process is inductive and can spread to other areas of the building. Lack of adequate prevention does not eliminate the growth of mould and intensifies the effects of the destruction of the facility. The activity of fungi is periodically interrupted for example, in the winter because of too low temperatures (winter period), for example, in the summer due to the drought which makes fungus turn into inactive state (process halted). Fungal building manifests itself in a specific way (morphological fungus growths, decomposed wood) or in a form of non-specific signs (unpleasant smell, sagging floors, high humidity levels, etc.). Periodic mouldy dampness and drying cycles makes fungus go from an active state into inactive one. In the case of an active facility infestation by insects, outlets are visible on the wood surface, wood meal pouring out of the holes and sometimes the sound of larvae feeding can be heard inside the wood. Determining whether feeding grounds are active or expired is important because it determines the nature of the conservation works[16].

Instrumental methods in the inspection of construction wood of historic facilities

If visual evaluation does not allow for precise determination of the technical condition of the wood, and that happens usually when the damage is located in deeper layers of the structural element, one should refer to instrumental methods of diagnosis. The main purpose of the use of instrumental methods is to verify the findings made by visual methods and better define the extent of damage to the wood. Precise determination of strength loss of structural elements under the influence of fungi or insects' activity enables to design a follow-up conservation

[13] K. J. Krajewski, *Zwalczanie …. op. cit.*

[14] J. Ważny, *Makroskopowa diagnostyka grzybów domowych*. W: III Mycological and Construction Workshop. ed. PSMB, Wrocław 2002, p. 9-18.

[15] K. J. Krajewski, *Zwalczanie …. op. cit.*

[16] J. Dominik, J. Starzyk, *Ochrona drewna. Owady niszczące drewno*. PWRiL, Warsaw 1989.

and repair plan. The use of instrumental methods for testing wood already has a long history. Krzysik[17] states that the first research to implement non-destructive testing methods of wood shall cover the period between the years 1920 and 1930. In his paper the author describes non-destructive methods such as X-ray testing, gamma-flaw detection, thermal, acoustic and ultrasonic flaw detection. Literature about the flaw detection in wood, both foreign as well as Polish, is very rich. Many foreign authors provide a range of information on the practical use of methods for flaw detection of wood in building structures[18,19,20]. The division of flaw detection methods for wood and their description and suitability for testing wooden structures, is presented by Książek i Karyś[21]. The authors also shared a simplified diagram of the distribution of flaw detection methods for wood, shown on Figure 1.

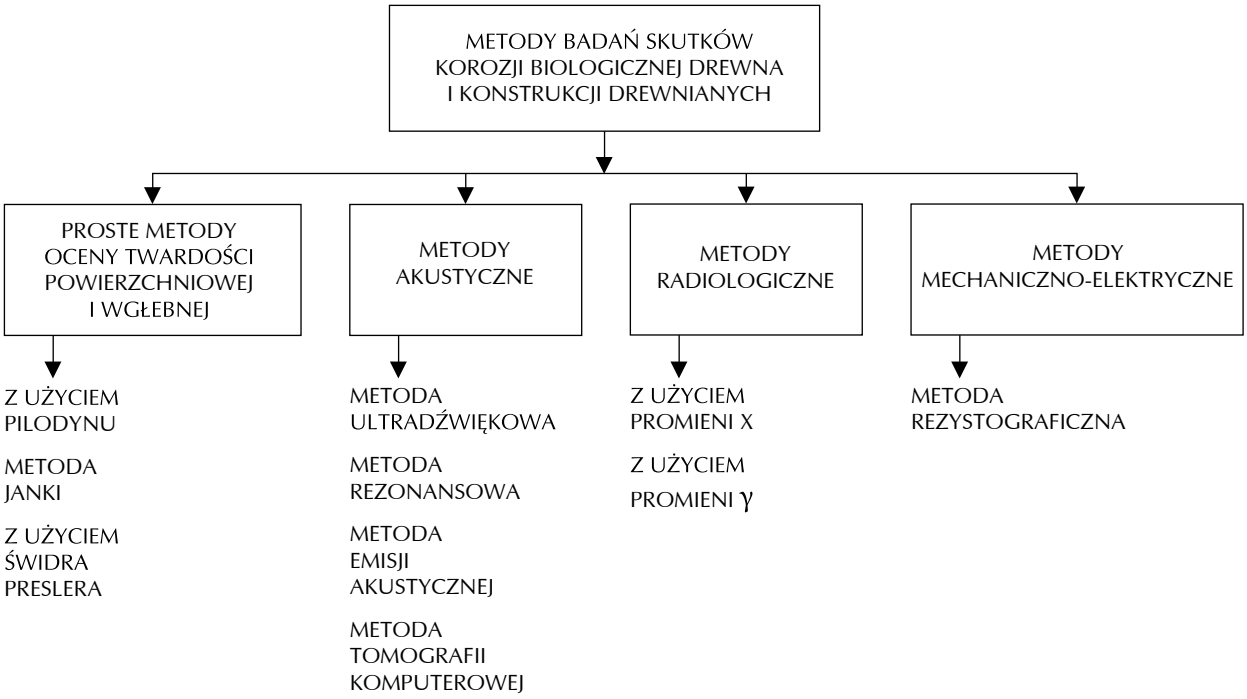


Fig. 1. The distribution of flaw detection methods for wood (according to Książek i Karyś, 2003).

In historic buildings, the use of wood-destroying methods should be avoided, although sometimes it is difficult to perform non-destructive testing only. Given the technical result for the tested material, methods of wood diagnosis in the monuments are divided into:

– less destructive methods,
– non-destructive methods.

Less-destructive methods slightly damage the surface in the form of a few point punctures in the wood or drilling it and possibly taking small samples of material. If there is no alternative, the use of less destructive methods is acceptable even in historic buildings, especially when it comes to research in order to precisely define the technical characteristics of wood and loss of strength of the structure.

One of the oldest methods of sampling material from the interior of the wood is to use the incremental Presler's drill bit. It should be noted that the method of drilling with an incremental drill bit has been developed primarily for testing increases in growth of rings of standing trees, but its application to wood in building

[17] F. Krzysik, *Nauka o drewnie*, Ch. 9. *Nieniszczące metody badania drewna*, ed. PWN, Warsaw 1974, p. 621-641.

[18] A. Rohanová, *Predikacia parametrov kvality smrekového konštručneho dreva*, Vyd. TU vo Zvolene, 2013, p. 14-39.

[19] L. Reinprecht, *Diagnostika poškodených zón jedlového trámu v bazilike svätého Egídia v Bardejove*, W: Mat. XXIV Symposium on Wood Protection. ed. PWN, Warsaw 2009, p. 127-132.

[20] R. J. Ross, R. F. Pellerin, *Nondestructive evaluation of wood*, For. Prod. Society, Madison, 2002, p. 210.

[21] M. Książek, J. Karyś, *Metody badań uszkodzeń korozyjnych w drewnie lub w konstrukcjach drewnianych*, Ochrona przed korozja, 10s/A/2003, p. 115-120.

construction is known from numerous accounts[22]. Drilling wood with a Pressler drill leaves a hole in the wood with a diameter of approx. 5 mm and its depth can be up to approx. 300 mm. Currently, this method has limited use due to the development of other methods, including methods Resistograph.

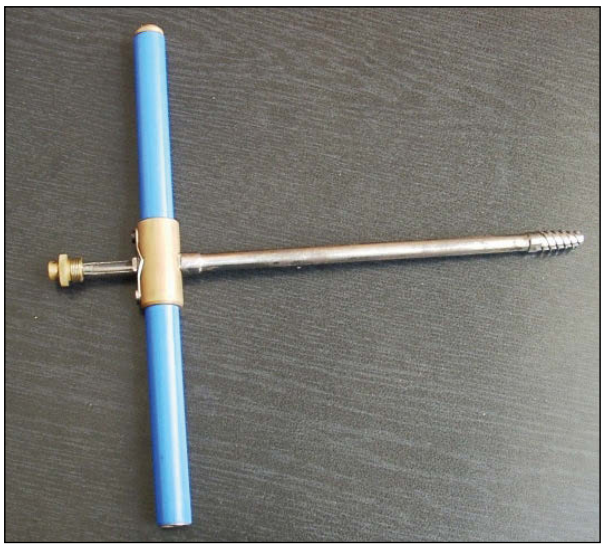


Fig. 4. Appearance of incremental Pressler drill (Fig. K. Krajewski).

Resistograph method was developed by Rinna[23] and is used for examining the trunks of standing trees as well as to study wooden structures in construction[24]. Resistograph method is a method of deep-hole drilling using a device called Resistograph. Drilling wood is made with a thin long drill having a diameter of 1,5-3 mm, to a depth dependent on the type of device. In a study conducted by Bernatowicz and Krajewski[25], the maximum drilling depth was 400 mm. A recorder allows the device to collect data from the study in the internal memory (Fig. 5) for further processing on the computer and also allows us to print the results on the built-in thermal printer (Fig. 6) in real time along the progress of drilling.

It should be noted that the Resistograph method is also very common to examine the damage to the trunks of standing trees, especially in historical parks and valuable stands[26].

Fig. 5. Testing the structure of a historic treadmill at the Museum of Agriculture in Ciechanowiec, (fig. K. Krajewski).

[22] L. Reinprecht, *Diagnostika… op.cit.*

[23] K. Krajewski, B. Andres, *Przydatność tomografii impulsowej i metody rezystograficznej od oceny stopnia uszkodzenia drewnianych elementów konstrukcyjnych w budownictwie*, Ochrona przed korozją nr 10s/A/2003, 109-114.

[24] R. Görlacher, R. Hattich: Untersuchung von altem Konstruktionsholz. Die Bohrwiderstandsmethode. Bauen mit Holz 6, 1990: 455-459.

[25] G. Bernatowicz, K. J. Krajewski, *Wykorzystanie rezystografu do oceny stanu technicznego drewnianych podwalin kościoła w Boguszycach*, Mat. XIX Symposium on Wood Protection, Ed. SGGW 1998, p. 163-172.

[26] F. Ring, B*ohrwiderstandsmessung mit Resistograph – Mikroborhrungen.* Allgemeine Forstzeitschrift 1994, 12, p. 652-654.

a) b)

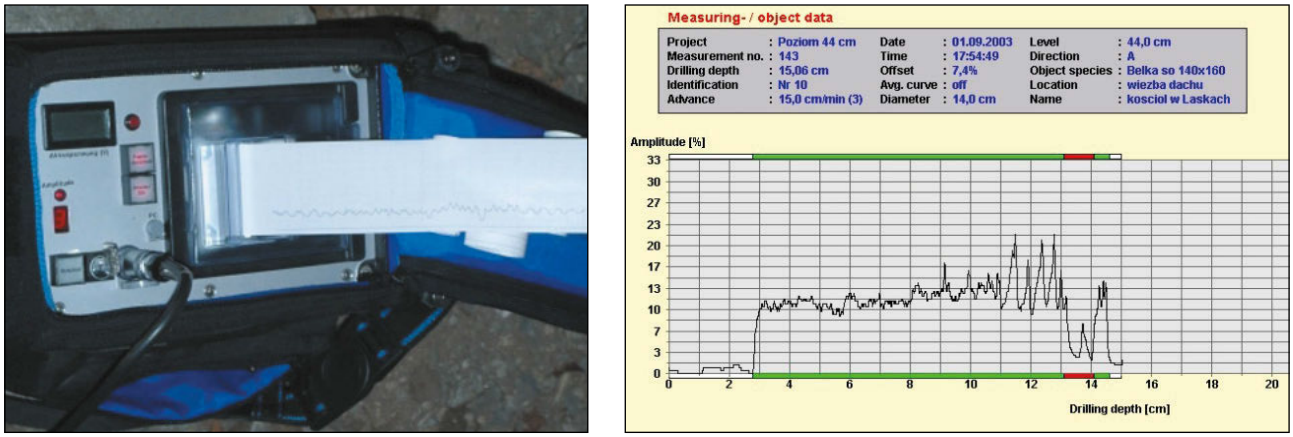


Fig. 6. Example of visualization of the results of wood drilling with a Resistograph:
a) output from the printer unit,
b) a graph from the device memory,
(Fig. K. Krajewski).

In wooden structures, a useful method is to puncture the wood with a sharp spike in search of damaged areas, showing a changed structure and cohesion of the wood tissue. There are a number of devices that are based on similar principles and include, for example Pilodyn, Vitamat, Gillwald lancing device etc. Nowadays, there are numerous scientific studies and descriptions of conservation research, which used a device called Pilodyn[27,28]. It is a method that substitutes a traditional one – manual puncture of wood and eliminates subjective assessment of the researcher. Using Pilodyn allows to obtain objective test results. A spring in the Pilodyn device sticks a steel needle in timber with a fixed energy, and the value of the cavity of the needle can be read on the body of the device, which reflects the state of tissue density and hardness of the wood. Larger depth of needle introduction may indicate the presence of changes in the wood structure. The appearance of the device[29] and how it works are illustrated on the fig. 7.

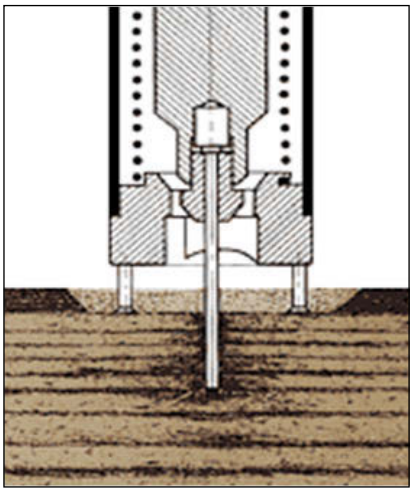


Fig. 7. Pilodyn, wood testing instrument:
a) appearance of the tool (according to: www.ferret.com.au…. op. cit.),
b) working scheme of the device (according to: Rohanova A. Predikacia … op. cit.).

[27] D. Giefing, W. Kokociński, *Badania zmierzające do określenia przydatności urządzenia o nazwie Pilodyn do oceny jakości drewna w konstrukcjach budowanych*, Scientific Papers of the Institute of Civil Engineering Wroclaw University of Technology, Vol. 49, No. 15, 1986, p. 84-89.

[28] A. Rohanová, *Predikacia … op.cit.*

[29] Source of the illustration: *http://www.ferret.com.au/c/hylec-controls/pilodyn-wood-density-meter-from-hylec-n852069.*

Another group of methods belonging to less destructive methods are acoustic ones (audible and ultrasonic). They have been the object of numerous studies in the domestic[30] and foreign literature[31,32]. Damage to the timber which arises with this method results from the need to provide good engagement of heads emitting and receiving acoustic pulses to pass through the timber at a rate dependent inter alia of defects present in the material. Knowing the acoustic pulse transit time and distance between transmitting and receiving heads can help determine the speed of passage of impulses through the wood. Sticking needles with a diameter of approx. 1.5 mm mounting heads on the wood surface takes in particular points, which usually damages the wood to a depth of approx. 10-15 mm. It is possible to use ultrasound with the contact heads, but in this case, the surface of wood at the place of head application should be smeared with a coupling paste, which also leads to surface contamination and thus the method cannot be considered entirely non-destructive. Audible and ultrasonic methods find their application in the study of structural wood and to study damage to the trunks of standing trees[33]. One of more advanced equipment for acoustic testing is Arbotom pulse tomography[34] or other devices based on a similarworking principle (e.g. PICUS Tomography[35]).

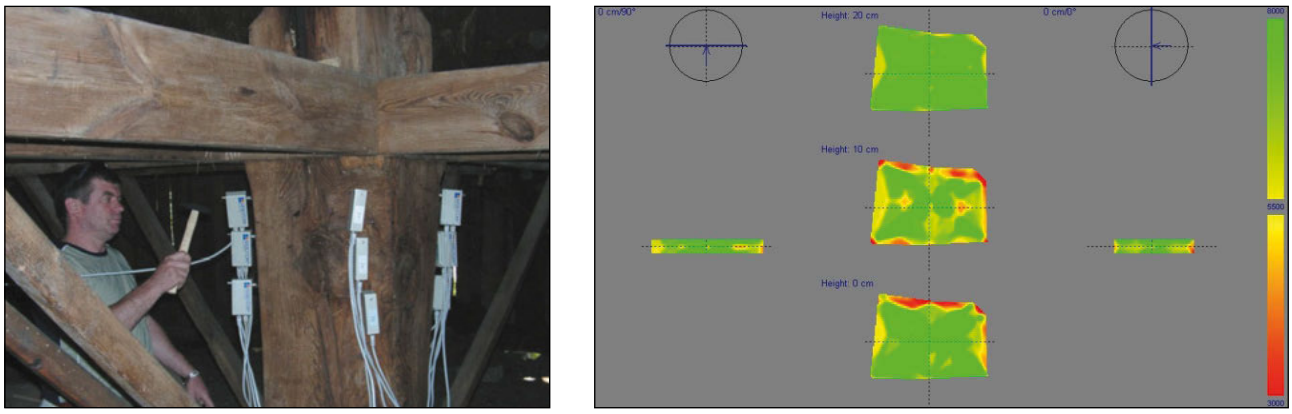


Fig. 8. Wood testing using Arbotom pulse tomography (Fig. K. Krajewski),
a) inducing pulses in transmitting heads of the pulse tomograph on the example of a facility from the Museum of Agriculture in Ciechanowiec,
b) computer visualization of pulse tomography test results of wood from a demolished farmstead building.

It is worth noting that historically the oldest and at the same time the simplest acoustic method is a method of tapping the wood with a hard object like a hammer or axe head. Wood struck with a hard object gives out a characteristic sound, the noise of which depends on the characteristics of the structure of the material. The presence of voids in the wood is usually accompanied by a thud. The method is relatively effective and an efficient investigator can quickly identify possible serious wood damage. Disclosure of these sites allows to use more advanced methods.

Methods that do not cause damage to wood are particularly recommended for the study of historic buildings, especially those of high historical and artistic value. Technical conditions and cost associated with their use mean that these methods are rarely used and their practical use is generally limited to small mobile objects (paintings, sculptures, etc.). In order to detect internal defects and damage to the wood in mobile objects can be used non-destructive flaw detection methods, which include X-ray flaw detection, gamma-flaw detection and CT scans. Works describing the possibility of using these methods are frequently published, among others, also

[30] W. Dzbeński, T. Wiktorski, *Influence of some structural wood defects on ultrasonic wave spectrum*, Annals of Warsaw Agricultural University, Forestry and Wood Technology No. 55, 2004, p. 156-163.

[31] M. Marčok, L. Reinprecht, J. Beničák, *Detection of wood decay with ultrasonic method*, Drevársky výskum – Wood Research, 42 (1), 1997, p. 11-22.

[32] A. Rohanová, *Predikacia … op.cit.*

[33] K. J. Krajewski, S. Tarasiuk, *The use of the stress wave tomography for testing of living Scots pine trees infested by Phellinus pini*, Folia Forestalia Polonica, Seria A, 46, 2004, p. 75-81.

[34] K. Krajewski, B. Andres, *Przydatność tomografii … op.cit.*

[35] E. Chomicz, *Bezinwazyjne diagnozowanie kondycji drzew zabytkowych z zastosowaniem tomografów PiCUS*, Kurier Konserwatorski No. 8, 2010, p. 29-32.

in terms of studying wood structure[36] and detection of insects feeding on wood[37,38]. Methods for screening wood with X-ray and gamma rays have limitations conditioned by the size of facilities. Application of these methods to the construction of buildings is restricted by physical accessibility of devices. It should be noted that the use of devices using penetrating radiation is a health hazard to their operators. A recommended limit testing methods using X-ray scanners and gamma rays is the thickness of wood parts exceeding 300 mm. In the case of wood damaged by insects, large hopes are in the use of acoustic recording methods, possible to be use also in the case of buildings. Listening for sounds of insects feeding on wood, especially in historic buildings uninhabited by man may prove promising[39,40].

The spectacular successes in examination of monuments are achieved thanks to the method of computer tomography[41]. In this case, as in the case of application of methods of screening with X-rays and gamma radiation, very good results can be obtained with respect to relatively small facilities. Medical equipment, such as CT scans, is used increasingly to study mobile monuments, confirming its suitability for this purpose. The use of this method for architectural immobile wood constructions, unfortunately, is not always practical because of technical difficulties and the cost of creating these devices. For wooden structures these methods are not yet available.

Interpretation of the results obtained with instrumental methods

An important hurdle in non-destructive testing of wood is its heterogeneous, anisotropic structure of wood, including structural elements such as, for example knots, curls, and twist of fibres and cracks. The presence of similar anomalies makes the results obtained through instrumental methods difficult to clearly interpret. Another factor that hinders drawing correct conclusions is that in building structures not all levels of the test piece are available for evaluation, which limits the possibility of visual inspection. Especially a lot of difficulties of interpretation arise from the use of acoustic methods, including ultrasound. The practical conclusions that flow from the application of flaw detection in wood point to a justified need for the evaluation of one element at least with the help of at least two different instrumental methods, which greatly improves diagnosis accuracy, but complicates and prolongs the whole procedure. In any case, wood research requires expertise and experience of the investigator. The specificity of historic buildings conservation requires more frequent appointment of research teams composed of specialists in various fields of science and practice, according to the complexity of the task.

Summary

Given the pragmatics of supervising technical condition of wooden historical facilities and existing formal and legal conditions, one may notice absence in Poland of clear standards of conduct for monitoring the technical condition of historic wood structures. The conclusion is that we should design solutions that could complement the system for monitoring and documenting historic buildings of wooden architecture. In the case of open-air monuments, it is possible to develop and implement such system. This is facilitated by a transparent system of facilities management and responsibility for their security status. Far more difficult situation occurs in the case of historic buildings remaining under private ownership. Despite the existing laws governing the system of protection of monuments[42], it is difficult to expect rapid and full dissemination of standards currently being developed for open-air facilities.

Monitoring and documenting historic buildings of wooden architecture should combine in itself issues:

– Development of a range of activities in the form of procedures for periodic systematic technical inspections of wood in historic buildings, particularly in the case of most sensitive facilities,

[36] V. Bahyl, A. Rohanova, *The Computer Tomography Internal Wood Structure Recognition Result,* Annals of Warsaw Agricultural University, Forestry and Wood Technology No 58, 2006, 24-27.

[37] A. Macedo, C. Vaz, J. Pereira, J. Naime, P. Cruvinel, S. Crestana, *Wood Density Determination by X- and Gamma-Ray Tomography*, Holzforschung nr 56 (5), 2002, p. 535-540.

[38] J. D. Bletchly, W. J. Baldwin, *Use of X-rays in studies of wood-boring insects,* Wood, 27, 1962, p. 485-488.

39 B. Plinke, *Akustiche Erkennung von Insektenefall in Fachwerk*, Holz als Roh- und Werkstoff, No. 10, 1991, p. 404.

[40] G. Kerner, H. Thile, W. Wunger, *Gesicherte und zerstörungsfreie Ortung der Larven holzzerstörenden Insekten im Holz*. Holztechnologie nr 3, 1980, p. 131-137.

[41] M. Paciorek, *Zastosowanie tomografii komputerowej do badania rozmieszczenia i udziału tworzywa w drewnie impregnowanym strukturalnie*, Ochrona Zbytków No. 3, 1096, p. 159-173.

[42] *The Act of 23 July 2003 on protection of monuments .... op.cit.*

– developing and operating a system of collection and analysis of data on the microclimate of premises in historic buildings,
– developing response procedures in the event of disclosure of mycological risks of a historic site,
– developing procedures for monitoring and accountability during the implementation of intervention works on the model of project supervision system specified in the act of building law,
– improving the system of issuing opinions on works on historic buildings planned and carried out by persons authorized under the Law on the protection and supervision of monuments,
– more frequent appointment of interdisciplinary teams to study the conservation and supervision of works on historic buildings,
– developing and implementing procedures for storing and processing of data obtained during inspection and works in historic buildings.

Implementation and improvement, and consistent implementation of tasks within the system of monitoring and documenting the conservation status of wood in historic buildings, are likely to contribute to ensuring greater security and sustainability of historic buildings and thus reducing the cost of repair works. Savings in this area could be a source of further development of monitoring systems of historic wood facilities.

Krzysztof J. Krajewski, prof. dr hab. inż.

Dean of the Faculty of Wood Technology, Warsaw University of Life Sciences, protection and preservation of wood, construction mycology, protection of monuments; mycological expert and mycological – construction specialist PSMB; member of the Polish Association of Construction Mycologists in Wroclaw.
krzysztof_krajewski@sggw

Jerzy Uścinowicz

Standards of conservation documentation of wooden architecture facilities as a basis for monitoring and management

1. Introduction

Krzysztof Kluk Museum of Agriculture in Ciechanowiec, as well as most open-air museums in Poland have not yet developed a coherent strategy to manage objects of wooden architecture. They have not been able to develop a modern system for recording and monitoring such facilities. Those that have existed so far, based on existing standards of open-air museums and conservation and protection of monuments, including exhibits, seem to be insufficient today.

The aim is therefore to present selected examples of currently functioning traditional and modern ways of recording, documenting and monitoring of cultural monuments, in particular their architectural and aesthetic values, according to the functioning world standards, guidelines and procedures. The present study will show and review exemplary, applied in in Poland and some other selected countries, standards of recording and documenting the conservation of objects, in particular those made of wood. At the end of the overview, conclusions will be drawn from the analysis of chosen, applied nowadays methods of recording cultural values of monuments and technologies of their recording and archiving. This will orient the work undertaken by various museum institutions dealing with exhibition and protection of historic architecture, to deepening some hitherto unrecognised aspects of research and help develop a methodology for documenting and monitoring museum objects. This will also contribute to apply "best practices" compliant with modern standards of effective conservation and protection of monuments of wooden architecture - their conservation, management and sharing for educational purposes[1].

2. Wooden architecture as part of a museum colelction - analysis of existing legal regulations

In Poland there are many legal acts constituting a basis for the formation of a policy of conservation and protection of open-air, including wood, monuments. The importance of these acts vary and probably this not an exhaustive collection. However, they may constitute the basis for analysis and to express preliminary views and proposals.

The fundamental, albeit indirect, shall be the very Constitution of the Republic of Poland and monuments-related Articles 5 and 6, Chapter I, as well as the international "Venice Charter 1964": *The provisions and resolutions of the Second International Congress of Architects and Technicians of Historic Monuments in Venice in 1964.* (art. 16).

As a direct basis serve applicable laws, including: *The Act of 23 July 2003 on the protection and care of historical monuments*[2] *and the Act of 18 March 2010 amending the Act on the protection and care of historical monuments and amending certain other acts*[3]*; The Act of 21 November 1996 on museums*[4]*, Act of 7 July 1994. – Building Law*[5] and others.

There are also numerous executive acts, including: Regulation of the Minister of Culture of 30 August 2004 on the scope, form and method of registering monuments in museums, issued pursuant to Art. 21 paragraph 2 of the Act of 21 November 1996 on museums; Regulation of the Minister of Culture and National Heritage of 27 July 2011 on carrying out conservation, restoration works, construction works, conservation research, architectural research and other activities related to monuments from the register of monuments and

1 See Jerzy Uścinowicz, Analysis of currently existing national standards of restoration doc-umentation of wooden architecture objects as the basis for monitoring; report carried out within the framework of a cooperation project between Krzysztof Kluk Museum of Agriculture in Ciechanowiec and Ryfylke Museum in Norway, Bialystok - Ciechanowiec 2014.

2 *Official Journal of 2003, No. 162, item 1568, as amended.*

3 *Official Journal of 2010 No. 75, item. 474.*

4 *Official Journal of 1997. No. 5, item 24, of 1998. No. 106, item 668, 2002. No. 113, item 984 and of 2003. No. 162, item 1568.*

5 *Official Journal No. 156.1118 of 2006 as amended, uniform text.*

archaeological research[6]; Regulation of the Minister of Infrastructure of 12 April 2002 on technical conditions to be met by buildings and their location[7]; Regulation of the Minister of Infrastructure of 3 July 2003 on the detailed scope and form of construction project[8], Regulation of the Minister of Infrastructure of 2 September 2004 on the detailed scope and form of design documentation, technical specifications for execution and acceptance of construction works and functional programme[9]; *Regulation of the Minister of Culture and National Heritage on keeping the register of monuments, national, provincial and municipal register of monuments and national list of monuments stolen or exported illegally abroad* of 26 May 2011[10]; Regulation of the Minister of Culture and National Heritage of 2 September 2014 on protecting museum collections from fire, theft and other dangers threatening their damage or loss[11].

They also include current Polish standards, manuals, diagrams (e.g. of documentation of conservation and restoration works).

Relating directly to museum exhibits is the *Act of 21 November 1996 on museums*[12], which in Chapter 4 *Exhibits* under Art. 21 stipulates that: *"1. Exhibits are movable and real estate objects owned by the museum and entered in the livestock exhibits. Exhibits are a national treasure."* (…) and *"2.* The minister responsible for culture and national heritage protection shall determine, by regulation, the scope, form and manner of recording monuments in museums, pointing out in particular the type of evidence documentation, requirements to be fulfilled by keeping this documentation, marking the exhibits and the mode of documenting them in case of translocation outside the museum's seat and their removal from the inventory of the museum".

On the basis of the above Art. 21 paragraph 2 of the Act of 21 November 1996 on museums was issued Regulation of the Minister of Culture of 30 August 2004 on the scope, form and method of registering monuments in museums.

As a result of the provisions of this Regulation – every monument obtained by the museum should be have a record card containing identification of the monument as defined under § 3. 1 of the Regulation, i.e.: "determination of its authorship or manufacturer, origin, value at the acquisition date, time and place of origin, material, manufacturing technique, dimensions, possibly its importance and identification of its characteristics". This card should contain information about the storage place of monuments and visual documentation and information about an object's value at the date of establishment of the card.

An important issue seems here information leaving the decision on the type of record cards and how to fulfil them, as well as pursue other auxiliary registers, at the discretion of the director of the museum (subject to § 3 para. 4). The museum's director may also, in accordance with his mandate, introduce other types of records and establish rules for their keeping.

It seems that architectural objects, which are part of museum collections, should also be subject to care and protection under Act of 23 July 2003 on the protection and care of historical monuments. Stipulated in the above Act criteria and general principles concerning recording, documenting and monitoring should be preserved and applied. It seems logical and appropriate that, in proceedings concerning the development of standards for recording, documenting and monitoring for buildings and monuments which are exhibits and are also regarded as monuments, to treat them as monuments within the meaning of both Acts together. Facility acquired by the museum, because of the very fact of changing its form of ownership, does not stop being a monument, only record form changes, just as the Act itself does not condition the protection of monuments and care of monuments on the right to property. All the monuments representing cultural heritage should be subject to it regardless of who was, is or will be their owner in the future. Their material and immaterial value should above all be decisive in this matter.

While determining the mode and standards of conduct with architectural monuments which are monuments-exhibits, reference should be made to an essential point 1, Art. 25 (Chapter 3) of the Act *"Management of monuments, research and works, and undertaking other activities related to monuments"*. It stipulates that: *"1. Adapting for utility purposes an immovable monument entered in the register requires the possession by its owner or holder of: 1)* ***restoration documentation*** *defining the condition of the immovable monument and the possibility of its adaptation, taking into account the historical features and values of the monument (...)".*

---

[6] *Official Journal 2011.165.987 of 11 August 2011.*

[7] *Official Journal No. 75, item 690, as amended.*

[8] *Official Journal No. 120 item. 1133.*

[9] *Official Journal No. 202 item. 2072 as amended.*

[10] *Official Journal No. 113 item. 661.*

[11] *Official Journal No. 2014 item. 1240.*

[12] *Official Journal 1997 No. 5, item 24.*

All museum objects of wooden architecture are immovable monuments (within the meaning of both the Acts) adapted for utility purposes. They perform these functions as public utilities. They should therefore have, in addition to that required by § 3 item 1 of the Regulation record card containing the identification of the monument, full conservation documentation. Although not all translocated facilities to the museum grounds had the status of a monument, they were building structures. Their rise on the museum grounds required an appropriate project. Therefore they should also have the documentation in the form of an architectural and construction project (possibly technical design). This had to be based on appropriate inventory records.

3. Records and register of monuments

One of the first steps in the process of protection of cultural heritage and recording its cultural values, as well as the monitoring of these values is recording. It is also a basic, standardized, although undoubtedly initial form of its documentation. Information contained in various forms of records should contain generally very concise, synthetic reference to the value of individual monuments and their conservation status. They constitutea formally ordered set of methodically developed information about these objects containing important, in a form of text, administrative data and address, synthetic descriptions of their history and architectural value and basic drawings and photographs in a graphic form.

The records can include both single architectural objects, as well as groups of buildings, urban and rural complexes, archaeological sites, historic parks and cemetery complexes. It provides a possibility to quickly obtain basic information about these monuments, and also supports methodical operation of their respective owners, users, and conservation services. Keeping records should be treated as part of the ongoing development process, requiring constant replenishment, adequate to the gravity of acquired new data and research results.

The Act of 23 July 2003 on the protection of monuments and the care of monuments[13], in particular articles 21-24, introduces the necessity of recording monuments. Keeping records of monuments shall therefore constitute a mandatory operation. To register monuments monument cards are used that have an established and sanctioned by law standard form. They relate to an immovable monument entered in the register, immovable monument not entered in the register, movable monument, archaeological site, an immovable monument. Although the record cards contain only necessary, basic information about historical buildings, they constitute a preliminary, important part of the system of conservation policy of the care of monuments. The activities of registration include an indication of historic buildings, gathering and compiling administrative information, their address and substantive data about them, documenting their state of preservation, preparation for possible intervention projects of conservation of buildings at risk and their monitoring. This record allows to make entries in the register of these objects, determining the scope of their protection in planning activities, conducting construction works, taking decision of intervention in the event of a risk, carrying out funding policy of their conservation and repair, preparation for full conservation documentation, introduction to the development of various research and design studies, catalogues and monographic collections, etc.

It should be noted that in post-war Polish conservation, different forms of recording monuments were used. Fundamental forms that have hitherto been applied to objects of historic architecture are primarily so-called ″green cards″ and ″white monument card″.

– Record cards of monuments of architecture and construction – so-called ″green cards″, which arose in 1958, nowadays mostly replaced with ″white cards″, though still in circulation and having a high archival value, constitute a valuable collection of information about historic objects and their contemporary preservation state. Basic data about them were included in 37 spaces;
– Record cards of monuments of architecture and construction – so-called ″white cards″, which arose in 1975 represented a significant complement to the content of a ″green card″, containing comprehensive information about the historic object, adjusted to the needs and range of conservation works, and enabling documentation of all existing types of immovable monuments and their complexes.

Undoubtedly, the most important nowadays – and of universal, allowing the documentation of individual objects, their architectural, rural and urban complexes – *is a so-called* ″white record card″. It consists of a basic card divided into 27 columns containing textual information about the object and inserts for placing photographs, drawings and additional descriptive information. An important supplement of a ″white card″ – its annex – should also be the hitherto used record cards (e.g. ″green card″ or other cards locally used). The existing uniform form of a ″white card″ allows documenting all types of historic buildings – from cottages, small

[13] *Official Journal of 2003., No. 162, item 1568, as amended.*

architecture objects, chapels to large industrial plants – but does not fully take into account their category, type, size and valuation, being a basis for establishing their place in the hierarchy of importance. This is also important while introducing an appropriate system monitoring and facilities management, particularly managed by one owner, in open-air museums.

4. Form of registering monuments of architecture and construction

Let us recall the directly applicable provisions of law, setting out conditions concerning monument register. *Under* § 3.1 and 2 *of the Regulation of the Minister of Culture and National Heritage on keeping the register of monuments, national, regional and municipal register of monuments and national list of monuments stolen or exported abroad in violation of the law* of 26 May 2011[14], a register book should contain the following information:

1) register number – the number of the item in the register, under which a monument is inscribed;
2) entry in the register – the designation of the authority which issued the decision in the proceedings for registration, date of the decision and its number;
3) the object of protection – a kind of monument, description of the surroundings of the monument or its name;
4) the scope of protection – contents of the decision;
5) location or storage place of monuments – the address of the storage place or location of the monument, specifying a city name, street name and number, and the name of the municipality and the county;
6) land register number – the number of land register, if one has been established;
7) the number of real estate register – name of the register unit and its identifier in the national official register of territorial division, precinct name or number and parcel number;
8) the monument's owner – the name and address of the person or the name and address of the legal entity owning a monument or a perpetual usufructuary of the land on which the decision of entry in the register of monuments has become final, in the case of joint ownership – details of all the co-owners; if the data of owners, co-owners or usufructuaries have been changed – there should be a note referring to a relevant set of documents;
9) the monument's holder – the name and address of the person or the name and address of the legal entity that holds the monument on which the decision of entry in the register of monuments has become final; if the data of the holder have been changed – there should be a note referring to a relevant set of documents;
10) deletion from the register – designation of authority, the date and number of the decision on removal of the monument from the register;
11) notes – other data related to the monument, including information on the transfer of registration from a previous book.

Similarly, there has been established the form and content of inventory cards of immovable monuments entered in the register (§ 9. 1 of the Regulation), namely:
1) name; 2) time of origin; 3) city or town; 4) address; 5) administrative affiliation; 6) geographical coordinates; 7) the previous name of the village; 8) the owner and his address; 9) user and his address; 10) form of protection; 11) graphic materials; 12) history; 13) description; 14) volume; 15) a total useful floor area; 16) primary purpose; 17) current purpose; 18) state of preservation; 19) the existing risks, the most urgent demands of conservation; 20) archival records; 21) notes; 22) annotations on inspections, changes; 23) bibliography; 24) standard inventory form; 25) iconographic sources and place of storage; 26) attachments.

An annex to a record card of an immovable monument entered into the register should contain the following information: *1) city or town; 2) municipality; 3) district; 4) region; 5) the name of the monument, address; 6) the content of the annex; 7) annex standard form*[15].

All information that should be included in entries to inventory cards of monuments should be examined in detail. Paying attention only to the most important, one must evoke the necessary verbal, graphic and photographic content that should be included under points: *11) graphic materials; 13) description; 18) the state of preservation; 19) the existing risks, the most urgent demands of conservation.*

Point *11) "graphic materials"*, as it is the main illustrative page of the card, its contents should enable a clear and easy identification of an object and determination of its characteristics, which are the basis of its value. In the order from the general to the particular, there should be present mainly: orientation plan, site

[14] *Official Journal No. 113 item. 661.*

[15] *Regulation of the Minister of Culture and National Heritage on keeping the register of monuments, national, regional and municipal register of monuments and national list of monuments stolen or exported abroad illegally* of 26 May 2011.(OJ No. 113, item 661).

plan, schematic view (horizontal cross-section) at the first floor of the object (ground floor), photographs of the object made of shots of characteristic angles. As the inventory card annex may include copies of old maps, plans, archives, iconography (photographs, drawings, engravings, etc.) and possibly other graphic materials, this artwork not located in this column can be supplemented in an annex in a form of an additional insert. The photographic material bearing numbers or extra symbols should be referenced in the graphic material site plan and projections, allowing for precise identification of the place where the photograph was taken. These points should enable equal positioning during the monitoring. The type of camera and its optical characteristics should be indicated.

If there is substantial conservation documentation of the object and in case in the future additional methods of photogrammetric documenting and 3D scanning are implemented, one should develop a consistent, coherent for all, method of mutual correspondence of inventory cards with the above documentation. Already at this level of inventory registration, one should ensure reference to expansions and detailed studies. It seems, however, that too much illustrative material should not be included in cards. This may result in blurring of its clarity and communicative content. One should always remember that the card is designed more for catalogue inventory and quick exploratory communication and should never – because of the very formal restrictions on the size and technology – replace a more professional way of documenting (conservation documentation, inventory, visualisation, 3D scanning, etc.), especially that today's technical capabilities and global standards execution of project documentation tend to use more of BIM modelling (Building Information Modelling) than of traditional documentation, which, although still necessary, will gradually be replaced and will have a supporting role, or sometimes even only archival.

Point 13) *"description"* is a major descriptive part of a card, enabling synthetic representation of the object and determination of its characteristics, which are the basis of its formal, spatial, functional and structural--material value. Similarly as in the graphic part, a good exposure of content should be adopted in the order – from the general to the particular and, according to the logic of the erection of the building — from the foundation to the roof covering. Another important factor is the right typographic text edition and reliable reference to primary sources and researchers' opinions through appropriate references and comments, with consideration to all copyright.

According to the illustrated graphic material, by referring to the numbers of drawings and photographs, one should synthetically depict the characteristics: site development plan of an area or plot, the form of the object (shape) and its relationship with the surroundings, elements shaping the functional and spatial image of this form through descriptions of basic floor plans, sections and elevations, materials used (building material) and construction solutions used, applied building erection techniques / technology, interior architecture, equipment (immovable monuments), aesthetic solutions of architecture (e.g. polychromy of walls, decoration), architectural details.

Point 18) *"conservation status"* should be a synthetic assessment of the conservation status of the object at the moment of inventory card establishment. It should take into account the type and degree of damage of its elements. It should apply a coherent, prior exposure of elements of the building. One should also, adopting the historical perspective, detail any construction and renovation works carried out in the facility before and after 1945, indicating their status, nature, scope and duration, as well as the authors of the projects of these works and their executors. It is important that reference to detailed documentation be made on the basis of which they were implemented (catalogue number and archiving place), as well as to reports showing their course.

Point 19) *"existing risks, the most urgent demands of conservation"* should include risks of possible degradation or partial loss of the historic value of a building. The stated diagnosis should prioritize future conservation and renovation woks by order of priority needs, the difficulty and scope of works, their cost, organizational capabilities, etc. Formulated demands should be explicitly determined in time perspective, indicating possible alternative measures to protect the building and / or changes in the way it is used, in case of inability to immediately carry out these works.

5. Documenting the architecture of buildings. The existing forms of construction design documentation and their scope

Apart from the object of wooden architecture documentation method, a construction project must be drawn up that will allow to obtain a building permit. Both the objects translocated to the museum, as well as those located outside its seat, but being its property, should obtain such permit when the utility purpose changes. Such project, after inventory, documents all functional, spatial, structural an installation transformation carried

out in the facility. Often there is a need to perform the necessary expertise (e.g. mycological one). There are specific requirements related to this process stated in the Act of 7 July 1994. – *Building Law*[16] and relevant regulations[17].

With regard to historic buildings entered in the register of monuments, which, according to diagnosis, in many cases are located in open-air museums, the cited-above Act Art. 39 stipulates that:

1. Conducting construction works at a facility entered in the register of monuments or in the area of the register of monuments requires that before a decision on the building permit is issued, a permit to carry out these works be obtained, issued by a competent regional conservator.
2. Permission to demolish a building object entered in the register of monuments may be issued following the decision of the General Conservator, acting on behalf of the minister responsible for culture and national heritage protection to delete that object from the register of monuments.
3. In relation to buildings and areas not listed in the register of monuments, which are recognized in the municipal register of monuments, building or demolition permit of a building is issued by the competent authority in consultation with the regional conservator.
4. Regional conservator is obliged to take a position on the application for a permit for construction or demolition of buildings referred to in paragraph 3 within 30 days of its receipt. Not issuing any decision within this period is considered to be a lack of objections to project solutions outlined in the application.

In the case of construction project documentation, under *the Regulation of the Minister of Infrastructure of 3 July 2003 on the detailed scope and form of construction project*[18], which is the basis for issuing a building permit, with regard to the proposed building – its form and content – there are specific requirements placed, such as required content namely in the form of technical description and a drawing[19].

In terms of technical description, the following should be briefly presented: the purpose and utility of the object and its specific technical parameters, in particular: volume, area compilation, height, length, width and number of floors (calculated in accordance with the applicable procedures and standards), architectural form and function, its adaptation to the landscape and the surrounding buildings, structural system (including construction and static diagrams used, adopted assumptions for the calculation of structures, including the charges, and the main results of these calculations). In the case of a public building and a residential multifamily building – one should describe how to ensure the conditions necessary for use by persons with disabilities, while in relation to a building for service, manufacturing or technical purpose – basic technological data and interdependence of machinery and equipment related to the purpose of the building and its structural solutions. One should also recognize solutions and operation of essential pieces of construction and installation equipment that will ensure the use of the building according to the established purpose, particularly installation and construction equipment: water supply and sewerage systems, space heating, natural ventilation, assisted and mechanical refrigeration, air conditioning, gas, electricity, telecommunications, lightning protection, and how to install connections to external networks with measuring points. One should present characteristics and relevant parameters of installation and technological devices that have an impact on the architecture, construction, installation and technical equipment related to the facility, as well as other characteristic parameters of the building and its installations and devices ensuring its functioning and relationship with the environment in which it was built.

In contrast, the drawing of the project should represent primarily: elevations in numbers sufficient to explain the architectural form of the building visible from all sides, together with a graphic or descriptive identification of its colour and finishing; projections of all its characteristic levels and sections, made in characteristic places presenting: the functional and spatial solutions, building and construction solutions and their connection with the ground and adjacent facilities, and adequate presentation of installation and equipment solutions. There should also be presented – in the form of well-described schemes or on separate drawings – ways of linking the object installation with external networks (equipment) or external installations on site and related technical devices. The drawing part should contain the necessary graphic signs and descriptive explanation enabling unambiguous reading of the project.

---

[16] *Official Journal No. 156.1118 of 2006 as amended, uniform text.*

[17] *Regulation of the Minister of Infrastructure of 12 April 2002 on the technical conditions to be met by buildings and their location (Official Journal No. 75, item 690, as amended) Regulation of the Minister of Infrastructure of 23 June 2003 on information regarding safety and protection of health and safety and health protection plan (Official Journal No. 120 item 1126), Regulation of the Minister of Infrastructure of 3 July 2003 on the detailed scope and form of a construction project (Official Journal No. 120 item. 1133), Regulation of the Minister of Infrastructure of 2 September 2004 on the detailed scope and form of project documentation, technical specifications for execution and acceptance of construction works and of functional-utility programme (Official Journal No. 202 item 2072 as amended).*

[18] *Official Journal No. 120 item. 1133.*

[19] Extract from the above-mentioned Regulation.

In the case of a redevelopment, extension or superstructure project, it should clearly graphically emphasize the current state. § 13 of *the Regulation* also stipulates that the drawing of the architectural and construction project (subject to para. 2) be prepared in a scale appropriate to the specific nature and character of the building and the degree of accuracy of graphic signs in the figures, however not less than: 1: 200 for building structures of large dimensions; 1: 100 for the remaining buildings and separate parts of the facilities listed under point 1; 1:50 for separate parts of buildings under redevelopment or extension and parts of complex objects and of small sizes.

The Annex to the Regulation also contains a list of Polish standards referenced therein.

5.1 The scope and format of documentation used for describing the subject-matter of a construction contract

Regulation of the Minister of Infrastructure of 2 September 2004 on the detailed scope and form of project documentation, technical specifications for execution and acceptance of construction works and functional programme[20], issued pursuant to Art. 31 paragraph 4 of the Act of 29 January 2004 is also a significant reference to the detailed scope and form of project documentation used for describing the subject-matter of a construction contract and applies to the activities of open-air museums. – *Public Procurement Law*[21]. Chapters 2, 3 and 4 (§ 3-19) of this *Regulation* deal with the scope and form of project documentation, both construction documentation used for the terms of reference for the execution of works, for which it is not required to obtain a building permit, as well as the executive documentation, which should supplement and detail the building project to the extent and degree of accuracy necessary to draw up a bill of quantities, cost estimation, preparation of tender by the contractor and the execution of works.

Objects of wooden architecture do not have a special status in those Regulations. They are treated like other building structures.

5.2 Site construction log – as a form of construction works documenting and monitoring

A special duty of the owner or manager of a facility, related to the process of documenting and monitoring a building, is to conduct throughout the whole period of its use, a site construction log. It is a document designed for all kinds of records of tests and inspections of the technical condition, possible reconstruction, rehabilitation, repair, etc. *during the lifetime of a building*, under Art. 64 *of Act of 7 July 1994 – Building Law*. The log should include the minutes of inspection, evaluation and expert reports on its technical condition, the energy performance certificate and documents referred to in Art. 63.

Since all open-air facilities are public buildings – their owners are not exempt from having the above-mentioned documents.

5.3 ICOMOS International Wood Committee Charter

The International Wood Committee has drawn up and implemented *Principles for the Protection of Historic Wooden Buildings*. Its part refers to documenting monuments of wooden architecture: "Review, inventory and documentation", namely:

"1. The condition of the structure and its components should be carefully recorded before any intervention, as well as materials used in treatments, in relation to Art. 16 of the Venice Charter and the ICOMOS Principles for the Recording of Monuments, Groups of Buildings and Sites. All pertinent documentation, including characteristic materials and components removed from the structure, and information about relevant traditional skills and technologies should be collected, catalogued, securely stored and made accessible as appropriate. The documentation should also contain a justification for the choice of material and methods for conservation works.

2. An in-depth diagnosis of the condition and the causes of decay and structural failure of the timber structure should precede any intervention. Diagnosis should be based on documentary evidence, physical inspection and analysis, and, if necessary, measurements of physical conditions and non-destructive testing methods. This should not prevent necessary minor interventions and measures serving for temporary facility protection."

[20] *Official Journal of 2013.0.1129.*

[21] *Official Journal of 2013 item 907, 984 and 1047.*

A significant mandatory recommendation included in the present *Charter* is that before any conservation intervention, first, it is necessary to carry out architectural and conservation inventory of the facility and its parts, and later a thorough diagnosis of the conditions and causes of degradation of the substance and structural damage of structures, etc. This diagnosis should be based on the condition documentation, inspections – supported, where necessary, with measurements of physical conditions and testing – and on sound analysis. It is essential to provide documentation of authentic materials and components removed from the structure, securing a possibility of reversibility of works.

In case permanent documenting is needed, one should evoke, significant in this regard, recommendation under Art. 16 of *the Venice Charter* and *the ICOMOS Principles* for the Recording of Monuments, Groups of Buildings and Sites. The first seems to be especially important, which provides that: *"Works in the field of conservation, restoration and excavation will always be accompanied by the creation of detailed documentation in the form of analytical and critical reports, illustrated with drawings and photographs. It shall include all phases of discovery, security, reconstruction and merge works, as well as construction and formal components identified in the course of works. This documentation shall be deposited in the archives of a public institution and made available to researchers: its publication is recommended"*[22].

Prepared documentation should present the analytical methodology of investigation to the best conservation solutions with the rationale for the choice of adequate, proven technical and technological methods and comparative testing of proposed materials. It is also recommended to archive all data, and, where necessary – sharing.

According to *the Charter of Venice*, the documentation is closely linked to the process of regular monitoring and maintenance of the monument, which requires a coherent common strategy. This is inseparable, *"crucial for the protection of historic timber structures and their cultural significance."* This indication should be a general, first recommendation while any works are undertaken at the Museum. It should become the cornerstone of the management strategy of its monuments.

In terms of documentation process, in the section entitled *Interventions* (point 8), *the Venice Charter* mentions also documenting and archiving of deleted items of historical substance, which – just as inventory documentation and documentation of monitoring of the "life" of the facility – on a par with them, should be catalogued, and its characteristic samples permanently stored as part of the documentation.

An important indicator cited in the section entitled *Repair and Replacement* (point 11), is to document *in situ* of exchanged, authentic, new elements or parts thereof, "which should be discretely marked by cuts, burned labelling or other methods, so that they can be identified later." This peculiar form of documentation of changes to the monument should also be in the form of descriptive and photographic inventory, included to accumulated archives of the facility.

Cited in the chapter entitled *Modern materials and technologies* (point 14), controlling, monitoring and proper documentation of the use of chemical preservatives also seems to be important. It seems advisable that the process be extended to all conservation materials and technologies, especially those that seek to ensure public and environmental safety, guaranteeing "the probability of long-term success."

6. Architectural and conservation inventory of monuments

The basic and undoubtedly the most important form of documentation seems to be architectural and conservation inventory. Its conservation and technical level, constituting a specific diagnosis of the existing situation, substantially affects the level of research and conservation of a monument and the process of all subsequent phases of its documentation and monitoring. Especially when it forms a basis of subsequent translocation of the object, it determines the future successful monitoring of the facility and its competent protection.

Establishing the substance of inventory documentation, as well as form and procedures for its implementation, has been the subject of various instructions issued for security personnel of monuments in order to establish appropriate standards. One of them was adopted in the form of an unpublished manuscript *"Instructions for an architectural and conservation inventory of historic buildings", adopted in the so-called "Temporary price list Part XV of the architectural and conservation inventory of monuments of architecture and construction"*[23] and functioning to this day among many project units dealing with these issues. It is, despite the development

[22] *"The Venice Charter 1964"; The provisions and resolutions of the Second International Congress of Architects and Technicians of Historic Monuments in Venice in 1964.*

[23] See *"Temporary price list Part XV of the architectural and conservation inventory of monuments of architecture and construction"* approved by the General Director of PP-SAC on 31 December 1980.

of digital registration and design techniques, still very important and timely, mainly due to the applied proper methodology.

This manual consists of 4 parts contained in 15 chapters and one annex, in which:

– Part I (chapters 1 and 2) establishes the instructions, status and types of conservation inventory;
– Part II contains a detailed description of standard architectural and conservation inventory, which in Chapter 3 (§ 4-9) *"Introductory Remarks"* outlines a form of development, thematic distribution, general content of inventory studies, transmission and storage of studies, inventory measurements content, symbols and graphics. In subsequent chapters 4-7 (§ 10-17*) "Inventory of brick and wooden buildings, inventory of landscaping elements, landscaping inventory of the compositional design of the façade and inventory of architectural items and details"* refer specifically to the scale of studies and their contents, as well as in § 18 to expansion of walls with regard to architectural design. Section 8 specifies standards for the performance of photographic documentation.
– Part III (chapters 9-14) *"Methods, measurement technique, analysis"* shows: kinds of methods, direct measurement method, geodetic measurement, mixed method, field measurements, measurement analysis.
– Part IV (Chapter 15) shows organization of the implementation of the topic and (in Annex 1) establishes a standard technical description.

The most important contents of these instructions should be analysed with great precision, as they can still constitute the current standard for recording cultural values of monuments, possible, or even desirable, for use even today.

Recalling the most important contents of this manual in the form of a synthetic extract will help to formulate meaningful opinions and conclusions.

In Part I, Chapter 2 *"Conservation inventory"* in item 1 inventory categories are listed. It might apply to:

– urban complexes,
– landscaping complexes and green areas,
– brick and wooden buildings,
– elements of landscaping (of small architecture),
– facility design, its elements and architectural details.

Under point 2, parts of inventory of brick and wooden buildings was pointed out, which provides:

– architectural and conservation inventory,
– construction and conservation inventory (or installation), by industry (heating, water supply and sewage systems, electrical and special installations).

The above inventories are supplemented with applied research and expertise specifying type of material, state of preservation, etc. It has also been shown that the scope of inventories should be determined in each individual case, adequate for the given purpose, execution abilities, etc.

Part II, Chapter 3, § 4 *"Form of the study"* point 1 indicates that the basic form of architectural and conservation inventory is called "optimal inventory, i.e. carried out to the full extent." It has the necessary data to clearly document the location of the facility, its shape and its general condition as a whole and its individual elements and architectural details. Developed in a graphic, descriptive and photographic form, it constitutes a "technical and historical document," whose accuracy should allow, in cooperation with other conservation studies the possibility of its faithful reproduction (reconstruction), even assuming its abolition. It serves such purposes especially during translocation of wooden facilities (§ 4, point 1.1), treated as a separate category of the inventoried facility (§ 5, point 1), "special" for its translocation plans (§ 5, point 1.1) . Integral components of an inventory of facilities (category of brick buildings**, wooden buildings** and of small architecture) are:

– inventories of the compositional design of the façade,
– inventory of architectural elements and details,
– photographic documentation.

§ 6 of this chapter further defines the overall content of the above inventory, which should consist of:

– a descriptive part, containing a table of contents, a general description, a technical description;
– a graphic part containing a list of drawings, orientation and situation, projections, sections, views (elevations), isometric drawings;
– a photographic section containing a list of photographs, photographs numbered and described in detail, photographic positions plan (using the graphic part);
– a working part containing the table of contents, a set of working photos, measuring sketches, matrices, left-hand matrices (when being made) other working documents;

In the case of a mixed and geodetic-method inventory, this part should also contain: geodetic control network sketches with point numbers, angles and lengths of the sides, measuring logs, logs with calculations of geodetic control network coordinates, lists of coordinates of control points, copies of topographical descriptions of control points, a list of situational coordinates and height of the geodetic control network.

§ 7 of this chapter points out the necessity of transferring documents to conservators, the owner (principal) and a project unit, as well as archiving of their elements (negatives of photographs). § 8 of this chapter indicates inventory measurements content. It consists of:

– **orientation** – as a situational map section in scale contained between 1:100 and 1:25000, depending on the context (in the city, municipality), showing the location of the facility, showing the North,
– **situation** – as a situation and altimetric map section at a scale contained between 1:100 to 1:500 with the marked outline of the facility,
– **a plan of building** – as a projection on a horizontal plane of a horizontal section of the building (or element thereof), roof truss system, the vaults, structural joists of the ceiling, floors, etc. In cases of low density of lines on the principal projection, one can map jointly the solutions enumerated above (a vault and entablature) using a dotted line.

At the same time, there are some significant reservations:

a) section for principal projection should be made at a height of 1.20m above the floor;
b) in high rooms with many levels of openings, recesses, doors and niches – which cannot be included on one projection – only their appropriate quantity should be shown, showing all the details of construction and giving a clear picture of the utility function of a given room;
c) while determining horizontal sections (projections of landscaping elements, architectural elements and details), one should be guided by the principle of their full mapping.

In addition to the above, projections should include:

a) Room dimensions, openings, woodwork, alcoves, faults, stoves, kitchen hoods, balconies, stairs, roof truss elements, pillars of the chimney, etc.,
b) wall thickness, height of window sills,
c) levels and height of rooms, in appropriate quantity - in the case of differentiation,
d) numbering and usable areas of individual rooms,
e) locations of all smoke, ventilation and exhaust chimney ducts, according to the sweeper's report,
f) vaults of holes (projections and examples),
g) entablature of ceiling structures,
h) intersecting edges of the roof,
i) location and dimensions of the gutters, downpipes of façades and gargoyles,
j) traces of planes of vertical sections with the directions of views indicated,
k) references (symbols) to drawing numbers, elements and details developed in a larger scale and detail level.

What is important in the case projections of wood facilities is that all irregularities should be exposed, as well as the following elements, possibly without making even a partial demolition (point 3.1.1):

a) walls construction (log, post-and-plank, skeleton construction),
b) seating of frames and thresholds,
c) binding system, longitudinal and transverse, serving as tie rods, stiffeners, substrings.

Point. 3.2 emphasises the exact geometric coordination of projections between all floors (basement, ground floor projection, floors, attics, etc.), which may determine the correctness of subsequent analysis of the facility construction phases, recognizable usually after reconstructions of underground parts of buildings. A basic projection is assumed to be a fundamental projection of the lowest aboveground floor.

– **vertical section** – as mapping on the vertical plane of a vertical section of the building (or fragment thereof), with views beyond the plane of the section, with a simplified recognition of design elements such as fireplaces, altars, portals, stoves, organs, panelling, etc., while maintaining mutual proportions.

It is important that sections be made in the most characteristic places, most fully reflecting the drawn object or its component or detail, and, apart from them, that recognize its changing levels (staircases, platforms, mezzanines, etc.);

– **elevations** – as orthogonal projections of external walls of the building and its interior architecture on a vertical plane;
– **a general description**, including:
  a) client's data,
  b) the position of the register of monuments,
  c) inventory methods description (direct surveying, photogrammetry, mixed) and the scope of their use,

d) a description of not inventoried fragments along with motivation,
e) a list of cartographic, technical, historical, research materials, etc. held during the inventory and the extent of their use.
f) general historical information about the object, its main historical values, inventory remarks,
g) comments relevant for further project, conservation, research, safety, operational and construction works, etc.,

– **the technical description** shall include – for buildings (according to the attached model) Appendix 1, and for other objects, their components or parts, the fullest possible information to support the graphic part.

§ 9 of this chapter *Symbols and graphic indications* highlight the need to use, during the preparation of inventory records, symbols and graphical signs from adequate and the then applicable Polish Standards.[24]

§ 10 of Chapter 4 *Inventory of brick and wooden buildings* contains the preferred scales of studies used:
a) for brick buildings – 1:50,
b) for wood buildings – 1:20.

Attention was also paid to the diversity driven by the need to show in wooden architecture more details. In the case of plastered wood facilities, a scale of 1:50 should be used. In justified cases, for greater accuracy, even a scale of 1:10 can be used.
§11 of this chapter also points to the contents of the study, which should provide:
A. **Descriptive Part**
1) documentation contents;
2) a general description /§ 8/;
3) technical description /according to the enclosed pattern – Appendix 1/.
B. **Graphic Part**
1) List of Figures;
2) orientation /§ 8 point 1.1/;
3) situation /§ 8 point 1.2/;
4) the basic sections of all floors /cf. § 8 point. 1.3a/ including the roof truss, and additional sections (for high levels such as churches, bell towers, towers, barns, etc.) or partial (mezzanines, galleries, cloisters, etc.), possibly indicating the construction of vaults in vaulted rooms, if possible;
5) vaults or ceilings projections with an indication of all elements of their structure (ribs, beams, porters). In the case of little dense drawings, these projections should be included on principal projections as above;
6) view / projection of ceiling systems;
7) vertical sections, in an amount needed to depict the spatial structure of the facility /§ 8 point 1.4./;
8) Elevations /cf. Chap. 6/;
9) inventory of items and architectural details /cf. Chap. 7/, which shall be included in a separate study (briefcase), with its own table of contents and technical description on various drawings.

C. **Photographic documentation** – as a separate part, also included in a separate development, with its own table of contents and detailed thematic descriptions beneath each photo.

The content of the development may possibly also consist of additional parts of the documentation as required to obtain a full picture, mentioned previously in § 2 point 2b.c and 2.1. In the case of translocation of a (wood) facility, according to arrangements with the appropriate conservator and contractor, as indicated in point 3.1, this range can be increased by:
1) situation and altimetric map at a scale of 1:200 or even 1:100,
2) inventory of floors, joists, foundations,
3) additional sections or projections,
4) view of the roof structure without coverage,
5) view of wall constructions from the inside and outside (after removal of the linings and plaster),
6) walls construction (log, post-and-plank, skeleton construction),

[24] *PN-70/B-01025. Graphical symbols on architectural and construction drawings;*
PN-71/B-01027. Development and landscape designs Symbols on the drawings;
PN-60/B-01029. Architectural and construction designs. Dimensioning of the drawings;
PN-70/B-01030. Construction projects. Graphic signs of building materials;
PN-62/B-01031. Land development designs / realization plans / graphical symbols
PN-71/B-01035. Sports facilities. Symbols on land development designs and construction drawings;
PN-66/B-01037. Architectural and construction designs. Principles of projection;
PN-64/B-01040. Building construction drawing;
PN-64/B-01042. Wood structures;
PN-66/B-01701. Indoor units.

7) a method of embedding frames,
8) a method of conducting the chimney through the ceiling and roof,
9) a method of laying foundations and caps,
10) a method of connecting ceiling support beams to the cap and rafters,
11) a method of sealing walls, woodwork, ceiling,
12) a method of linking porches, stairs, floors, etc. with the primary supporting system of multi-storey buildings,
13) inventory of other nodes and connections made during demolition,
14) special labelling of all elements of the facility,
15) a detailed technical description of individual elements, their condition, type of material, etc.,
16) other data relevant both for conservation reasons and to unambiguously determine the proper conducting of works related to translocation.

In point. 3.2. of the present chapter, the appropriate methods of marking elements are pointed out. It is recommended to use letter codes of individual walls of the facility and numerical indications of individual elements constituting the wall, e.g.: A-11, B-3, etc., starting from "the bottom", i.e.. in the order of their secondary assembly, e.g. the groundwork will have No. A-l, B-l, etc., respecting the labelling uniqueness of elements in drawings and in kind (durable marking, with minted numbers on the components, e.g. metal plates). The need for close cooperation (coordination) with the future contractor of the transfer[25] is recommended, who having experience in such projects, depending on the type of object and his capabilities, will propose for acceptance his own methods of marking.

This establishes very important standards of methodological conduct during the preparation of documentation for transfers of wooden objects, which applies mostly to open-air museums.

An important part of the museum's exhibition, naturally associated with the architecture exposed in the museum, due to its status as an institution of agricultural museology and local rural culture is small architecture and various additional elements of land development. This part of cultural heritage includes wood facilities accompanying buildings like: chapel, pole mounted dovecote, crane-type well, outhouse, smokehouse and apiary of 30 log and box hives. Around the exposed objects they are also organized kitchen gardens surrounded by traditional woven, ground-embedded and pale fences. They are also important carriers of local rural culture and have a strong relationship with buildings. The present instructions also refers to this category of monuments.

In chapter 5: *Inventory of land development elements (of small architecture) in* §12: *The scale of studies*, it is permitted to use scales from 1:5 to l:20, depending on the size of the inventoried object and the required calibration accuracy.

Under § 13: *The content of studies*, as in the previous shots, points out the scope of the study /cf. § 7/, which consists of:

A. **Descriptive Part**
1) Overview /§ 8 point 1.6/.
2) Individual technical description.

B. **Graphic Part**
1) orientation /§ 8 point 1.1/
2) situation /§ 8 point 1.2./
3) projections /§ 8 point 1.3/
4) sections /§ 8 point 1.4/
5) architectural details /cf. Chap. 7/

C. **Photographic documentation** /cf. Chapter 8/.

However, in Chapter 6 *Inventory of the elevation compositional design*, in §14, an appropriate scale of development is indicated, which should be adjusted to the scale at the inventory of an object, allowing clear development of drawings. § 15 of this chapter also indicates the contents of this study, which is usually part of an inventory of a building /§ 11 point 1.8. B 8/ and comprises:

A. **Descriptive part** – developed during the inventory of a building /§ 11 point I A/.

B. **Graphic part** /§ 8 point 1.5/, with reference on drawings, in addition to the basic content, to the numbers of drawings of elements and details shown at a larger scale.

C. **Photographic documentation** / cf. Chap. 8, p. 21/.

[25] In the view of regulations of the Public Procurement Act, it is rather difficult to meet unless the documentation is performed by a design team under the contract with the contractor.

However, when the inventory of an elevation is made as an individual development, it shall contain:

A. **Descriptive Part**

1) table of contents,
2) overview /§ 8 point 1.6/,
3) technical description – individual.

B. **Graphic Part**

1) list of figures,
2) orientation /§ 8 point 1.1/,
3) situation /§ 8 point 1.2/ indicating inventoried elevations,
4) elevation drawings /cf. point 1.3/,
5) architectural elements and details /cf. chapter 7/.

C. **Photographic documentation** /cf. Chap. 8/.

Similarly to the previous ones, reference is also made in Chapter 7 (§ 16 and 17) to the scale and content of a development *Inventory of architectural elements and details.*

Under §16, it is recommended that the essential mapping scales are:

a) for architectural elements –1:10,
b) for architectural details – 1: 1, with the admission, in cases dictated by the need to obtain the contents or drawing accuracy, of scales,
c) for architectural elements – 1:20 and 1:10,
d) for architectural details – 1:2.

It is also recommended in § 17 that a study, according to whether it is independent or forms part of other study, have appropriate content.

In the case where it is part of an inventory of buildings /§ 11 point l. B.8/, land development elements /§ 13 point l B.5 / or elevation /§ 15 point 2. B.4/ it should include:

A. **Graphic Part** of along with a technical description /specification developed according to the principles of § 3 point 1.3 and 1.4/.

In justified cases, the study should be enhanced with drawings such as views, axonometric drawings, etc., provided that for the mapping of flat subtitle ornaments, one should use a direct a copy (reflection) of these designs on vellum or paper, and individual drawings of elements and details must bear relevant links to fundamental drawings, which are shown at a smaller scale.

B. **Photographic documentation** /cf. Chap. 8/.

In case the inventory is made as a stand-alone development, it should include:

A. **Descriptive Part**

1) table of contents,
2) overview /§ 3 point 1.6/,
3) technical description / as in point l A.

B. **Graphic part**

1) list of figures,
2) schematic architectural drawings of projections, sections, elevations, small architecture with marked references to inventoried elements and details,
3) drawings of elements and elements developed according to the principles point 1A.

C. **Photographic documentation.**

§ 18 draws attention to the manner of preparing drawings of walls expansions (multi-faceted), including architectural design, which shall be understood as drawings made at a scale consisting of orthogonal projections of each flat wall, on their own planes[26]. On unfolding of these walls architectural details (pt. 2) are shown in an orthogonal projection on the plane of projections, i.e. a proper plane of a basic wall. Unfolding of architectural details (in a separate study) are subject to the same rules of projection as walls unfolding defining an elementary planes, on which architectural detail decoration is to be projected, not subject to further development (point 3).

In the case of multi-faceted walls (point 4), whose elementary planes are approximately parallel, one can make an orthographic projection of a multifaceted wall on one common plane. This procedure is, however, permissible only in cases where it will not cause linear errors[27] exceeding 2 cm to 10 m.

Unfolding of a ceiling is subject to the same rules as unfolding of walls (pt. 5). In contrast, unfolding of vaults with surfaces that can be unfolded (cylinder, cone) should be performed so that architectural details are

[26] In particular, unfolding of a single non-vertical wall is an orthogonal projection of this wall on its own / non-vertical /plane.

[27] A linear error is understood as a difference between measurements taken directly on the wall, and dimension read from development.

projected orthogonally to the unfolded ceiling surface (point 6), after which the surface of the ceiling together with projections of details is unfolded onto a plane. In contrast, unwindable vault planes (point 7) can be mapped on a windable surface or on a plane according to the rules of mathematical cartography.

Additionally, in the case of unfolding of multi-faceted walls and vaults developed in orthogonal projection, as in the case of preparation of projections and sections, photogrammetric methods are recommended. In order to unfolding in other cases, it is recommends to use numerical photogrammetry methods, analytical autograph methods and differential treatment methods.

An important part of these instructions are developed in chapter 8. Standards of *photographic documentation* performance, which is an illustration that is an essential complement to the graphic material, serving as auxiliary material in the preparation of the inventory. Photographies included in the documentation should objectively present the subject without distortion of perspective (§ 20), similar to orthographic projection (§ 22). In appropriate cases, in order to highlight important elements of the building, one can take diagonal or side shots. In § 19, the contents of such documentation has been specified and it should include (point 1):

1) inventory of photographies,
2) list of photographies numbered and described in detail,
3) outline of photographic positions, with their indication in the graphic part.

The followings photographic print sizes are recommended: 9x12 cm, possibly 6x9 cm and, in exceptional cases, 6x6 cm (§ 23). The individual photographic images, especially those of architectural details should be at a clearly visible and legible comparative scale. It is also required that each negative and positive was stocked with formal data concerning: the object, address, date of execution, the photographer, shot title, the type of camera, type of lens. It is also indicated how to store photographic negatives according to the instructions (§ 24). A method of exposure of photographs is determined (§ 25)[28].

An important part of the process of documenting and performing inventory is the methodology and technique of measurement. Drawings and photographic reproduction depend directly on proper, accurate measurement of the unit and ensuring proper coordination of all measurements, and their representation in the picture entirely. These issues are presented in the third part of the instructions in *Measurement methods and technique.*

The choice of type of measurement method from among those presented in Chapter 9 (§ 26) should be made depending on:

– type of facility,
– the scope of the inventory,
– execution ability.

Among the measurement methods the following methods are preferred:

1.1 **Direct measurement method** – the most commonly used in the State Enterprise Monument Conservation Labs. However, given the constantly enlarged requirements for measurement accuracy, its scope is increasingly limited to very simple objects and architectural details. It serves as a necessary complement to the geodetic measurement method.

1.2 **Geodetic measurement method** – used for special precision requirements when measuring with a direct method is not possible (no access) and while setting geodetic control networks: horizontal and vertical.

1.3 **Mixed method** – applying both geodetic and direct measurement. Its biggest advantage is flexibility in adapting to the conditions and requirements set out in point I, a lower cost of development, particularly for photogrammetric method. From the historic perspective, this method was most useful for most architectural and conservation inventories and was preferred by the State Enterprise Monument Conservation Labs.

1.4 **Photogrammetric method** – indispensable for measuring objects inaccessible and hard to reach for measuring the overall dimensions of different elevations, high-level decorations and some complex elements and architectural details.

Disclosure of the most important – methodological and technical – advantages and disadvantages of each method can allow to form meaningful opinions about their possible contemporary use, and possible use in correspondence with other inventory and data archiving methods:

– **Direct measurement method** (Chapter 10, § 27-31).

This method is used mainly for simple inventories of buildings, their elevation elements and architectural details and landscaping elements (point 3). Inventory consists of making measurements with a tape, poles and, pentagonal prism, spirit level, water scales, measuring laser, measuring rods and a rotary drill (point 1). Its application unfortunately sometimes requires the use of scaffolds and working platforms (point 2). While preparing

[28] Photos of print size of 18x24 cm should be stuck on A4 boards, according to the number of documentation copies. The size of 13x13 cm is allowed – for small elements, and 24x30 cm – for larger themes. The entire photographic documentation should be placed in a separate study (briefcase).

a building inventory, measurements should start from the outer contour (point 4.1.). In the case of complex geometric outer contour of a building, first direct measurement methods should be used. The coordinates x, y of characteristic building points, enabling a direct link of direct measurement results should be determined by the use of geodetic methods (mixed method) (point 4.1.).

Referring specifically to ways of performing an inventory of its individual components:

– **direct measurement of horizontal projections** (§ 28):

Measurements of each room is made (the length of all walls) and their components along with details after their outlines are drawn on the measuring sketch (point 1). Measurement errors are limited thanks to a so-called "chain record", i.e. record of successive measurements for each characteristic wall points, with the direction indicated by an arrow. Measurements should be made with a relative error of less than 1:500, rounding them on drawings at scales of 1:50 and 1:20 to 1 cm and 1 mm in other cases. In cases of long walls, length measurement should be performed twice with the base at both ends of the wall. In the event of bends, curvatures or deviations in a horizontal projection, a straight line should be assumed at the level of section, parallel to the general direction of the wall and ordinates and abscissae of all the characteristic points should be measured. In addition to the length of the walls, corresponding diagonals should be measured - as needed to properly determine the projection of a room. A general rule is to measure all sections at the same level and assume possibly longest measurement lines. The thickness of the walls should be measured where you can get full thickness (window and door openings), in exceptional cases, they can be made at sections (always twice). The thickness of the walls /vaults, ceilings, etc./ can be measured also in holes with a diameter of – 10 mm made in a well made with a drill. In the case of an enfilade, a measuring line through all doorways of the suite of rooms must be taken into consideration. In each room, measurement should be done in light of all the holes and cavities, window openings and doorways, both in the light of the woodwork and jambs. It is unacceptable to indicate implied dimensions. Measurements of windowsills height, arches-bows, bays and other elements of rooms should be done, indicating the level of the floor in relation to the reference level (usually - the ground floor level). Woodwork (point 2) is determined according to the scale of study (PN-70 / B-01025). Staircase measurement (point 3) is performed in the plane of a given horizontal section of the room (projection), indicating the views down.

A study of a horizontal projection of the roof truss (point 4) requires measurements of projections of all construction elements (lower horizontal beams, columns, rafters-purlins, etc.) and measurements of the pillars of the chimney, gable walls and knee walls. The measurement includes also projections of edge of the intersection of roof and eaves lines projections. Studies at a scale of 1:100 and larger should also consider cross-sectional dimensions of structural elements.

In the direct measurement method, it is important to coordinate projections of each floor with communication plumb-lines, holes, etc. (point 5).

– **direct measurement of vertical sections** (§ 29):

These measurements are made at sectionplane, visualizing the dimensions and arrangement of elements in the view. Cross-sectional dimensions (thickness) of floors, platforms, etc. are given in sketches only if they have been obtained on the basis of direct measurements (point 1). It is unacceptable to give dimensions based on calculations. Height measurement results should be given in the reference system adopted for the building or group of buildings /cf. § 28 p. 1.9./.

Study of a vertical section of an or detail at a scale of 1:10 or 1:1 most easily can be carried out by direct measurement method, except possible use of stereophotogrammetric method.

– **direct elevation measurement** (§ 30):

These measurements are made from scaffolding and working platforms, on the basis of determined heights of characteristic points and their projections. Heights of these points are linked to a common reference level. Elevation measurement (point 2) is carried out along horizontal and vertical lines, doing the readings consecutively to all characteristic points of elevations listed in (point 1). On the sketches, one should record the type of roof truss coverage (point 3). It is recommended to use photographic images and measuring sketches of edetails (point 4).

– **specific recommendations** (§ 31).

1. for elevation measurement – should be carried out after measurements of all the projections and sections of the aboveground part of the facility. It will give the knowledge about horizontal dimensions that should be further measured (cornices, window or door lintels and frames, sculptural decoration,

Acroterions, the width of cornices over pilasters or columns, grids, dormers, walls texture, etc). One should measure the main characteristic and stabilizing points of individual design elements of ornamental plastic and decorative design and indicate with references these fragments and elements that are measured separately in detail.

2. Measurement of elements and architectural details of interior elevation – should be performed in such a way so as to appropriately reflect the plastic characteristics of an element or detail. When measuring, a steel tape measure or metal or a scale ruler with a zero point on the edge and a plumb line. Dimensions should be read depending on the precision degree of a measurement of a measured detail. Particular attention should be paid to measuring and plotting curvature profiles, as it is often characteristic of a given historical period, individuality of the author and cultural level of performance. One can apply negative plaster casts which, after grinding side cross-sectional planes give the exact outline of the profile.

One should pay attention to any kind of damage and defects, cracks, punctures, breaches, collapse of the vaults, etc., as well as visible boundaries of rebuilding, adding, repairs. They should measured and located in fundamental and characteristic points on measuring sketches, drafts and matrices, and bear a reference to the relevant positions of a description. It is unacceptable to add implied elements. Premises or their fragments that are not available should be described (e.g. parts of the premises under rubble) and recorded. On drafts and matrices, one should mark the range of direct measurements of high elements, partly available and provide the basis on which non-available elements were plotted.

– **Geodetic measurement method** (Chapter 11, § 32-36):

This method is used to:

– establish a situational matrix,
– establishment of vertical control network,
– carry out measurements of horizontal and vertical sections (projections).

Its scope should be examined and determined according to the rules set out in point 1 § 26.

Specific methods of measurement in the above cases are as follows:

– **The situational matrix** (§ 33):

Situational matrix is formed by a complex of stabilized points outside and inside buildings on each floor, connected by peripheral cycles and measuring lines (points 1 and 2). Polygon points of a peripheral cycle should be stabilized with fixed signs in the form of concrete poles and steel pipes, with the centre respectively marked and the points of situational strings – in such a way as to ensure their stability during measurements.

In order to secure accurate measurement of situational details of buildings (point 3), control points measurement should be carried out in a way to ensure that an average error of the location of the points does not exceed the size of 1cm, while an average urban unit can be accepted at a surface of 1.5 ha with 6 points of a peripheral cycle.

Angle measurement of a peripheral cycle should be carried out by the ”three tripods” method with an instrument with a readability of 10°°, in two series. Measurement of sides needs to be repeated twice with a steel measure tape of 50 m, with a constant tension by a dynamometer, performing readings with an accuracy of 1mm.

Angle measurements of internal strings should be carried out with an instrument with a readability of 1° (e.g. Theo 020, or TA-6) in two series. Measurements of lengths of the sides should be performed twice with a steel measuring roulette, with readings rounded to 5 mm (point 4). Angle measurements in internal strings – due to the small length of the sides – should be performed with a method of ”three tripods”.

Situational matrix should be bound to an existing polygonal matrix (the coordinates of one point and azimuth of the referring side). As linking points, while setting up internal situational strings, one can adopt the points designated on the sides over the peripheral cycle (point 5). In justified cases, unilateral linking of internal situational strings is acceptable as so-called ”hanging strings”, provided a double independent (control) measurement is added, establishing a relationship of the coordinates of the two adjacent floors to each other by staircases using an optical plummet, electronic metastasis of point coordinates through the ceiling or wall. In case of difficulty in establishing a direct linear relation between polygon strings of the interior of the building with external strings, sides must be determined with an instrument BRT-006, measurement by parallax or with trigonometric methods (pt. 6).

In order to establish a link of internal control points of a building with outside control points, it is recommended to use a method called calculation strings. As linking points of these strings can be used: appropriate signs pasted on window panes, nails driven into the door frames or window sills. The coordinates of these signs are determined by spatial intersections. (pt. 3).

– **Altitude situational matrix** (§ 34):

The altitude matrix is a set (net) of working benchmarks established on all floors of the building, in an amount of at least 2 on each. The working benchmarks may be appropriately marked spots on window sills, thresholds, platforms or on floors near load-bearing walls. Levelling should be tied to at least two state network benchmarks. In areas of cat. C and D can be taken as levelling benchmarks the existing polygonal points of known sizes. The results of the links may be represented alternatively as:

a) indication of any height in the state levelling (absolute height),
b) determination of the absolute construction ″0″ height, for which the most commonly is accepted a set point at ground floor level and with respect to it, the height of other elements is given, including the relevant characters /+ up, - down /.

Determination of the amount of working benchmarks should be carried out by levelling with a geometric levelling method with technical levelling precision (instructions CUG and KB-VI), rounding height coordinates to 1 cm (point 4).

Reciprocal linking of each floor levels should be performed by:

– geometric levelling through the staircases,
– geometric levelling with two levellers and hanging tapes, on stairways, through window openings, balconies,
– geometric levelling, with reference to points located in window openings, on balconies or doorways, the height of which was determined from the outside by a spatial indentation method (point 5).

– **Projections measurement** (§ 35):

Depending on local conditions, situational measurement of outer contour of the building can be made by:

– pole method using an instrument, e.g. BR - C06,
– pole method with direct measurement of distance within the length gauge, rounding readings to 1 cm,
– orthogonal method when measured sections are close to a straight line, rounding readings to 1 cm,
– linear indentation method, with sides of length not exceeding 20 m, with a preferred arrangement of points, rounding readings to 1cm,
– angle indentation.

Some points of the outer contour (i.e. corners of the windows) can be determined while measuring the interior. If there is a deviation from the vertical walls (e.g. retaining walls), outer contour measurement should include both points at a predetermined level corresponding to horizontal cross section of a floor, as well as the penetration line of s wall with the terrain (ground floor) – (point 2). Depending on the conditions, situational measurement of internal contour points of individual rooms should be done by methods specified for measuring the outer contour. Additionally, due to the need for sizing each room, as well as to get the necessary checks on correct measurement, one must also perform linear measurements, including items listed in § 8.

– **measurements of vertical sections** (§ 36):

Height measurement of vertical section points must be made by geometric levelling, rounding readings to 0.5 cm. For the measurement of points height in a range exceeding 3 meters relatively to the level of the axis of sighting of the leveller, rods of a length of 4 m or 5 m should be applied. When measuring the height of details must, (by typing in the sketch of a vertical section in the view or elevation) the leveller's level /horizon/ must be shown and its height specified. When it comes to points, only points of height in relation to the given horizon should be indicated. Levelling logs include only readings of the height of the horizon line of the leveller's axis of sighting. In the case of a high density of details, it is allowed to number detailed levelling points on sketches /separately for each floor/ and record their height difference in a detailed levelling log (point 4).

The height of all points inaccessible for geometric levelling (e.g. eaves' edge) should be measured by one of the three trigonometric measurement methods:

– single-station, involving the measurement of the inclination angle and a proper distance,
– from two stations (belonging together with a set point to a common vertical plane) based on the measured distance between the two stations and two angles of inclination,
– spatial indentation from two positions of a theodolite, set arbitrarily in relation to the designated altitude point, reckoning conditions related to the accuracy of the results.

– **mixed method** (Chapter 12):

This method is a combination of a direct measurement method and a geodetic measurement method. Mutual correspondence of both these methods and their scope is regulated adequately to the nature and availability of the facility, scope of the inventory and possibilities of the inventorying entity. For example, only horizontal control network can be set up and other measurements can be done by direct methods using mainly rectangular projection at designated axes, or the measurement can be done by a geodetic method to measure only the outer contour of the building, the basic line or basement, etc.

– **Photogrammetric method** (not included in the instructions):

The instructions also includes the very procedures for conducting field works, field sketches and minor study of measurements that must be carefully thought out and organized. This is shown in chapters 13-14 (§ 37-43).

– **Field work** (§ 37):

While preparing for the field work it is necessary to (pkt.1.1):

a) perform works specified under § 45 /p. 39/,
b) agree with the principal (owner, administrator) the timetable when the facility is available,
c) prepare appropriate measuring equipment and auxiliary means of transport, etc.,
d) conclude agreements with subcontractors for works to be performed by them and specified in the contract with the client,
e) check the implementation of preparatory works (§ 45 point 5c),
f) develop a measurement works programme taking into account both the nature of the facility, the adopted method and measurement conditions (linking points, fixed points in the facility, geodetic control networks, range of projections, sections, photographic documentation, works order, cooperative relations, etc.) Prior to field work, the inventory team should be familiar with: the contract, important insights and findings made during recognition of the subject matter (see § 45 point 5), programme of works (see point 1.1.f), the terms of health and safety rules, history and historical values of the object.

As a result of inventory works conducted in the field, we should obtain (§ 38): field sketches and photographic documentation, and by geodetic surveying the relevant documents referred to, among others, under § 6 point 1.4.7.

– **Field sketches** (§ 39):

Field sketches are one of the basic documents resulting from inventory works in the field. They should be carried out on sheets of a format A-3 or A-4. On the sketches, by means of conventional signs /§ 9/, one should include geodetic control network, building elements and measures defining the location, size and shape of these elements. These sketches can be done without scale but retaining proportions. Complex details should be sketched and dimensioned enlarged, on a separate sketch attached to the basic sketch indicating the detail schematically and with appropriate reference.

The sketch should include information about the facility, the order number, address, author, the date when it was carried out, numbers of subsequent drawings, marking in relation to the scheme of the facility if it is a fragment.

The sketch must contain all the data needed to develop the original sketch of the target drawing board, namely:

– transversal lines,
– projections and sections / vaulted ceilings, exposed beams, lintels, etc.,
– views,
– geodetic data obtained by measuring entered in an understandable and legible manner,
– measuring control points lying within the sketch and directions to adjacent points (stating their numbers on each sketch, at least two numbered control points should be drawn),
– control measurements, depending on the shape of the measured object defined by a chain method (the

amount of control measures should ensure a check of all the elements during the development of the original sketch),
- comments on specific elements of buildings (e.g.: types of woodwork, kind of floors, dimensions of lights, holes and recesses height of window sills, etc.),
- comments useful for performing technical description.

The amount of information included in sketch should give the possibility to make a vertical section anywhere in the building. When measurement is done with a polar method, depending on the density of points covered by this method, one should use the following notations of polar coordinates:
- inscription directly at the point[29],
- record in a table drawn on the sketch with the numbering from-to for each sketch,
- record in a separate log of polar measurement, with a separate numbering for each floor[30],

Field sketches are an integral part of the sampling frame and must be filed.

– **Measurements analysis** (§ 40):

The aim should be to create such working conditions for the inventorying group that they could be carried out directly on the measurement spot /cf. § 45 pt. 5e/.

It is recommended that measurements analysis be carried out according to the following rules:
- measurements analyses should be carried out by the measuring team,
- the order of analysing individual drawings should be established,
- measurements analysis must be done immediately after the measurement of the object, and the original sketches of the basic horizontal projection, of characteristic cross-sections and the main elevation should – to allow to complete the measurements and remove potential errors – be made before the completion of measurement works.

Measurement results analysis is also subject to strict procedures and form, which has been specified in § 41-43. Although this does not concern directly the subject of this discussion, it is worth recalling them just for the sake of getting acquainted with used at that time, now somewhat archaic, techniques of preparing inventory studies.

It is recommended that:
1. The results of field measurements be developed on boards in a form original sketches[31] -matrices.
2. It is necessary to use standardized forms of sketches according to the nomenclature "A".
3. At a distance of 1cm from the line marking the format, a box bounding the drawing should be drawn with a line of thickness of 0.3 m.
4. Dimensioning of sketches, after conversion of the figures included in the measuring sketches, should be entered into the measurement lines clearly divided for each distance separately. Total dimensions should be expressed separately at additional measurement lines, while axial spacing between window and door openings should be measured on separate lines.
5. Dimensioning of the walls should be done in places of measurement.
6. Dimensioning of sections should be linked to the set "0" measuring point (cf. § 28 point 1.9 and § 29 point 1).
7. Graphic illustration of how to measure the thickness of ceilings and arches was clear.
8. Entering dimensions not taken from nature, without describing their determination system (e.g. counting layers of bricks at 1 running metre – by a trigonometrical indentation method, etc.) – is unacceptable. Horizontal projections on next sheet should drawn in the same way in relation to the size of the board (pt. 3).
9. In the lower right corner of each sheet of the original sketch, one should place a table with the following identification information: name, facility number, order number (archive No.), address of the facility; titles, names of the manager and performers of the inventory; title and No. of drawing; title and name of the controller; employees' signatures (listed in § 45 point l); title, name and signature of the manager of the design; date of preparation; the number of sheets A-4.
10. Formats of the original sketches depicting sections and elevations should have the same height for a given facility.

[29] According to the guidelines of the Central Board of Geodesy and Cartography of Czechoslovakia of 1965.

[30] One should use a uniform record for each object. In addition, while making field sketches, one must apply the provisions included in the instructions Cl CUG and K – Situational measurements, Warsaw 1967, (§ 104 sections 2 and 3 p.1.6 § 105, § 106 item 1.4; § 107 p.1 / 1. 1/3,5 and 6).

[31] The original sketch within the meaning of the instructions is a drawing of the inventoried architectural object, expressing: projection, section, elevation, architectural element or detail, made to scale, on a stable surface, transparent film, with a drawing technique ensuring durability of the drawing and allowing reproduction with an overexposure method. It is allowed to perform original sketches on other materials, keeping in mind that these are historical documents.

11. All boards of projections, sections, elevations were of the same size.
12. The original sketch, in addition to architectural content, expressed in a form of a drawing and dimensioning, in the exercise of measurement with a geodetic or mixed method, should also have geodetic content, as determined by coordinates included in the corners and measuring control points numbered according to the list.
13. In the event that for one floor we establish more than one original sketch depicting horizontal projection, an index of sketches should be placed on each sheet of the sketch.
14. All analysis prepared cartographically and drawing materials and drawings supporting the preparation of the original sketch and transitional materials, once the original sketch is completed, checked and signed, are not be subject to be transferred to the archive, except for those listed in § 6 point I.4.

Working study of an inventory (§ 42) is a left-sided die, performed during further study of the subject. The matrix is a copy of a draft. It is made on a surface-stable film with a reproduction technique, ensuring the sustainability of the matrix and drawing and allowing reproduction by an overexposure method. It is allowed to perform matrices on tracing paper of a very good quality.

The graphic part of the inventory (§ 42) is copied four times on sensitized paper. In accordance with the principles set out in § 7 copies with together with a descriptive and photographic part shall be submitted to: the client (2 copies), the competent local conservatory authority (1 copy). One copy, together with matrices, original sketches, measuring sketches and other documents referred to in § 7 should be kept in the archives of the design unit.

Part IV of the instructions is Chapter 15 *"The organization of realization of the topic"*. This is refers to the process of organizing inventory, procedures, qualifications, etc. It begins with quite categorical and already quite archaic provision that inventories should be carried out only in design units (§ 44).

The work of the group that develops inventory must, for the entire duration, be supervised by the same appointed manager, with appropriate vocational, as well as health and safety training. This manager is responsible for the inventory in accordance with the rules of these instructions, including the proper organization of work, ranging from taking orders to billing and transfer of the study to the client and source materials to archives of the design unit.

It is pointed out that a correctly carried out inventory and preparation of materials for the conclusion of a contract requires:

a) checking whether the object is listed in the register of monuments,
b) checking available starting materials (technical, cartographic, iconographic, historical, etc.) that should be analysed in terms of their possible use,
c) possibly exploring the subject matter and working conditions in the field,
d) determining with the immediate superior the scope, study form of the inventory, methods and organization of work, the composition of the inventory group, the anticipated cooperation, consultation, necessary, in particular cartographic, materials (see pt. b), etc.

The process also defines the responsibilities of the principal, i.e.:

– making the facility available for direct measurements (i.e. allowing access to all premises and places of measurement (provision of scaffolding, ladders etc.),
– providing cartographic materials necessary to draft the orientation and site plan,
– providing chimney sweeper's expertise establishing the location, size, permeability and the possibility of using existing smoke, ventilation and exhaust holes in the building.

e) determine the scope and form of study, agreed with competent local conservation authority, and – if appropriate – with the client.

If it is determined that the facility does not appear in the register of monuments, a written statement of the competent conservation authorities must be obtained for recognition of its historic value (point 3) – (cf. § 1 point 3).

Obtaining materials specified in point 2b requires a written application to:

a) the principal,
b) the relevant local conservation authority,
c) other specialist workshops of the Section (point 4).

The obtained materials should be, before transferring to the inventory team, registered in the archives of the design unit, and after the study has been finished, through this archive, returned to the owner (point. 4.1). In the technical description to the study, an appropriate annotation should be made about the lack, way of using or not using of these materials (point 4.2).

During the identification of the subject matter and working conditions in the area, one should establish:

a) size, type, overall condition and other characteristics of the object and the necessary scope of inventory,
b) the possibility of its inventory with a direct measurements method, mixed method and the most appropriate scope of the inventory, the need to make an inventory of parts of this building with a photogrammetric method, etc.,
c) need for scaffolding, ladders, platforms and appropriate safeguards, in order to maintain sound occupational health and safety during measurements,
d) measurement difficulties arising from the use and operation of the facility, and related mainly to its availability (developed schedule of facility's availability),
e) accommodation possibilities of the inventory team and performance of original sketches of on-site measurements, the possibility of access from the seat of the design unit,
f) other conditions affecting the method, timing and cost of the order,
g) the necessity and feasibility of the necessary technical research and conservation (in their absence),
h) optimal organization of the inventory team's works, its personal composition, the necessary measurement and security equipment, etc. People appointed for measurements at heights must pass specialized examinations and obtain proper certification.

In the course of identification of the subject matter – as the instructions indicate – it is advisable to take photographs, illustrating both the object and its individual elements or details of the inventory (point 5.1). While determining the necessary scope of inventory (see p. 5a), especially the selection of inventory items and architectural details, it is advisable to interact directly with the competent conservation authority and use specialized consulting, etc. (point 5.2). While determining the final proposal of the scope and form of study (see point 2d), one should make the necessary internal arrangements for opportunities, timing and costs of carrying out ancillary (see. point 5c) photographic documentation, necessary consultations, etc. for proper calculation of initial valuation of the project and making definitive arrangements referred to in point 2e.

All materials must be transferred to archives of the unit preparing the documentation, namely:

a) one copy (original) of studies mentioned in point 10,
b) working papers listed in § 6 point 1.4,
c) all supporting materials, primary historical research, etc., delivered to the design unit (see point 4.3.).

7. New digital technology in architecture

In analogue types of inventory of objects, the main mapping forms such as projections, sections and elevations were presented until recently in the form of drawing-made plans on paper, at different scales. They were created as a result of geometrical operations, i.e. cutting and projecting the object on selected planes. There were also drawings of elevation views of objects in the form of analogue photographic photoplans[32].

The modern development of information technology also enabled the execution of documentation in a numeric form of CAD and digital. It is saved in the form of vector and raster files. Digital technologies have enabled a qualitative leap, giving considerable precision of maps of inventoried or design objects, both vector plans and photoplans. They also created unlimited possibilities for clarification of individual elements of the building and its details and its reproduction in any scales and sizes. They enabled interactive creation on their basis of various other forms of documentation in vector and raster graphics. They made it possible to integrate the entire design process across all construction industries: architectural, construction and installation. They have developed a technology to construct virtual models of objects (programmes: 3DS, 3DMax, AutoCad, IntelliCad, ArchiCad + V-Ray, Cinema 4 and other), corresponding with the graphics. Additional technological progress associated with operational possibilities and miniaturization of computers has also led to the emergence of new forms of visual communication, also in the sphere of documenting monuments and working with digital documents on-line, in the so-called "cloud" and directly at the place of its preparation. There arose a possibility of using digital photogrammetric semi-finished products as sources of metric information about a facility and the creation of digital visual documentation (pan and stereograms)[33].

A significant advancement in the development of technologies for spatial registration of existing objects, defining new standards, is now the technology that consists in collecting data about the shape and plastic qualities (e.g. texture) of the object through a laser scanning technique. This is done by laser measuring of the

[32] See Adam Boroń, Anthony Rzonca, Andrzej Wrobel, *Methods of digital photogrammetry and laser scanning in the inventory of monuments*, Polish Association for Spatial Information, *Annals of Geomatics* 2007 Volume V, Issue 8, pp. 129-140.

[33] Ibidem, p. 129-130.

distance from the point with specific spatial coordinates of the scanning device to the test points of the object and the designation of their position in an assumed spatial polar coordinate system. By using laser beams you can obtain millions of 3D points by registering their XYZ coordinates and parameters of reflection intensity. Data thus acquired can then be imported into applications such as CAD or 3D and processed further as the aforementioned "point cloud". "Cloud" of measurement points enables an almost continuous spatial reflection of the surface of objects and creation of an accurate virtual model – a true copy of the object. In ground-based measurements, this technology is carried out by two systems: total stations and laser scanners. Terrestrial laser scanning (TLS) is represented by terrestrial 3D scanners.

In the process of perfecting ways of documenting information, both during the inventory and design of objects, recently there has developed a new standard – BIM (Building Information Modelling), consisting of modelling of information about buildings and constructions, in which the model represents stored digitally reflected their physical and functional characteristics. For modelling, software supporting architectural design is used. The method of constructing the model is using finished or shared three-dimensional elements or their groups as buildings such as a wall, floor, ceiling, stairs, roof, window, door, etc., which are assigned appropriate parameters (size, material, texture, etc.). Changes in the elements making up the model are presented in a three-dimensional form and coded in encoded in it geometrical and material data rankings. Undoubtedly, it becomes a new standard of preparation of documentation also in the field of protection and conservation of monuments, a standard requiring, however, employment of suitably competent staff, making its utilization, continuous replenishment and improvement.

8. Scientific research

One of the most important ways of recording and monitoring cultural monuments is research, finalized in different forms of manuscripts and publications and their different scopes – from reports of these studies, notes of archival queries through comparative analysis, historical research, technical research, scientific articles, monographs, etc. They represent a very important part of the process of documenting a facility, giving a possibility to know and publicize its value as a cultural and historical (historical, scientific, artistic) heritage. This important component of documentation, which is a scientific, based on reliable facts and documents, interpretation of archives of the facility, the status of research and possible revision of the existing opinion about it, either in print or manuscript, supplemented graphically through all sorts of drawings and photographs, constitutes a very valuable facility's archive – a collection of information about it and its relationships with other objects, facts, people, etc. Collecting such information belongs to the basic forms of care for a monument, carried out by a museum, as explicitly stated in point 1, Art. 25 (Chapter 3) of the said Act of 23 July 2003 on the protection and conservation of monuments "Development of monuments, research, works and undertaking other activities related to monuments".

9. The digitization

An important technical, formal and substantive part of the process of recording and monitoring is digitization of information about monuments. It is a fulfilment of the requirements under *Act on spatial information infrastructure of 4 March 2010, of 7 June 2010* being the adaptation of the Polish law to the provisions of the Directive of the European Parliament and the Council of Europe – INSPIRE (*Infrastructure for Spatial Information in Europe*). The main intention of the above Act and the INSPIRE directive is to develop GIS databases and their on-line accessibility. The main objective is to make public registers available and disseminate knowledge about these objects.

In accordance with *Regulation No. 32 of the Minister of Culture and National Heritage of 23 December 2010*[34] one of the units legally obliged to carry out tasks in the field of protection of cultural heritage is the Polish National Heritage Institute[35]. Archives stored in NID are an important source of information. The Register

[34] *Regulation No. 32 of the Minister of Culture and National Heritage of 23 December 2010 on the name change and the scope of the National Centre for Research and Documentation of Monuments.*

[35] The tasks of the NID should, among other things, include: *"Archiveing collections of documents related to the protection of monuments and their digitization and dissemination, gathering documentation for the National Register of Historical Monuments, evaluation and improvement of the system of protection and inventory of tangible and intangible heritage, creation and dissemination of documentation standards, testing and conservation of each category of monuments*".

Department and the Register of Monuments contain archived inventory documentation: inventory cards of monuments of architecture and construction, address cards, movable monuments of technology inventory cards, movable monuments inventory cards, historical green records, cemeteries inventory cards, urban folders and quantitative summaries. Substantive and procedural standards developed byNID undoubtedly can help in the implementation of statutory tasks of other units responsible to the protection of monuments.

The system of registration, recording and monitoring of cultural heritage is an integral part of the policy on the care and protection of the cultural heritage of each country. Many countries have already introduced computerization of various innovative systems for preparing inventories (records) and monitoring of cultural goods and their value. The existence of such systems allows the dissemination of information on this heritage and enables to track on-line substantive amendments thereof in the course of time. In countries which have electronic records of cultural property, there is however no uniform, standardized approach to their construction, expansion, improvement and functioning. Despite the existence of various information systems related to registering these goods, there are also many international standards and guidelines for describing them, while creating an electronic system of such records.

In the process of building the concept of a modern system of documenting and monitoring of cultural goods and their value it appears to be desirable to know the existence of electronic documentation of these goods in various countries leading in this field. It is especially important to learn selected international standards for doing so. Especially the experience of the American and the French define the prospects for a concept of building such systems in Poland. They may constitute a methodological reference for building an electronic system for recording and information management for open-air museums.

10. Résumé

The existing legal system in Poland does not create clear guidelines as to the method of recording, documenting and monitoring of historic exhibits. Containing very general requirements, it gives competence decisions mainly to the director of the museum.

Inventory card shall be the first and basic source of information about a monument[36]. It should initiate the process of creating a complete, constantly replenished and developed over time, documentation. Treated as a catalogue sheet of a facility, an initial step to create target documentation about the facility and its equipment, should never be a goal but a method. Its ancillary role lies mainly in the initiation action, constantly developed system-catalogued information, including in an electronic form. It is very important especially in the case of historic buildings, which have an additional function of a museum exhibit and beyond its function of being a set of values, they play an important educational role.

The most important way of documenting the cultural values of a monument seems to be an architectural and conservation inventory. Its level of diagnosis of the existing situation, is decisive about the level of conservation research carried out for the monument. It is a high priority in the implementation of all other phases of its documentation and monitoring.

Existing in Poland classic standards of preparation of inventory and conservation documentation of architectural and historical monuments are very good, though based on already somewhat outdated technology. It is necessary to include in this process contemporary methods of documentation (surveying instrumentation, digital photos, 3D scanners, etc.) and combine them with conventional methods. These need to undergo methodical, reasonable updating, based on today's technological possibilities.

The combination of technology (Building Information Modelling) and laser scanning sets new standards for the process of recording, documenting and monitoring exhibits. This is where the methods should be sought to the develop modern technology of design and inventory of objects of architecture, in particular historic buildings. The possibility of a precise mapping of all material and spiritual values of an object of culture and coding in it a lot of information gives a chance for more effective management, conservation and protection.

Although in many countries there is no uniform approach to the description of cultural goods, there are however international standards for describing cultural objects in already existing systems. The process of digitization of historic objects is already highly developed in the world and gives positive practical results. It is particularly desirable in scientific research and educational work. In order to remain in the international circulation of information about cultural heritage and its values - one should adapt to these standards.

[36] See Magdalena Róziewicz, *Ewidencja zabytków architektury i budownictwa, Kurier Konserwatorski,* No. 1/2008, p.13-20.

In the era of universal digitization, one should strive to introduce innovative technologies into the process of registering (recording) and monitoring of cultural goods and their value, with the use of on-line access. The existence of such systems in other countries and the existence of international standards in this field is an example of "good practice" and a model for proceeding while building such system in Poland. This will give an opportunity to provide and disseminate information about its heritage, which has a definite educational and scientific, and research value.

It is desirable to build an electronic system for recording and information management, adequate to the specificities of the museum, size and nature of its resources, as well as the ethnos of the local culture, which they represent in an integrated transmission of material and spiritual values.

Jerzy Uścinowicz, prof. nzw. dr hab. inż. arch.

Architect, professor of the International Academy of Architecture, Head of the Department of Architecture Faculty of Architecture of Local Cultures BTU, head of the International Union of Architects UIA Work Programme "Spiritual Places". The main field of scientific and creative research: sacred and monumental architecture, religious architecture, architecture of local neighbouring cultures, protection and conservation of monuments.

Piotr Kozarski, Marcin Górski
Katarzyna Skiba, Grzegorz Basiński

Technical evaluation, as a basis for monitoring of the state of preservation and management of objects of wood architecture in Krzysztof Kluk Museum of Agriculture in Ciechanowiec

The aim of the present report was to develop modern standards of management of objects of wood architecture with respect to documenting and monitoring their biotechnical and architectural and aesthetic condition. The adopted standards were compatible with the Principles for the Preservation of Historic Timber Buildings of the Wood International Committee of ICOMOS. In connection with the preparation and implementation of the project "Documentation and monitoring in the management of wood objects in Krzysztof Kluk Museum of Agriculture in Ciechanowiec and Ryfylke Museum, an analysis was carried out aimed at checking the currently existing models of monitoring historic buildings and the applicable regulations, standards and guidelines in this regard. Open-air museums are a unique type of establishment. Analyses of the current functioning control protocols, legal regulations and norms, and surveys conducted in museums allowed us to define guidelines concerning protection and conservation rules of historic wood structures. The conclusions arising from this study were used to perform a consistent and comprehensive monitoring system of objects belonging to the museum. The final stage of the programme was to create a computer application used to monitor and manage wood objects in details.

The need for the project stems from the fact that the Museum of Agriculture in Ciechanowiec does not have a uniform and modern system to document and monitor its buildings. Until 2011 as many as 23 of them did not have a "white card" of the monument (it contains information about the condition and the history of the monument, as well as address, description, plans and photographic documentation). In many cases, there were gaps in the knowledge related to conservation works carried out. On the other hand, when it comes to monitoring, no detailed guidelines in relation to individual buildings were developed. This type of situation in the long term could pose a serious threat to maintain an adequate condition of objects.

The analysis resulted in a basic documentation, currently operating for historic buildings which includes "Inventory card of monuments of architecture and construction", called "white card".

Records and documentation of monuments is one of the starting activities in the protection of monuments. The main goal of conservation inventory is to collect records and compile information about historic buildings, needed to provide care, protection and conservation of monuments and carry out scientific and research works. Properly made "white card" contains complete, comprehensive information about the object and it is adapted to the needs and scope of conservation works.

Maintenance of buildings and the responsibilities of building owners and managers have also become the subject of discussion. Pursuant to the provisions of the Construction Law, Art. 61-65 of the Act of 7 July 1994 (as amended), contains specific provisions related to the maintenance of buildings. The law provides also audit scope of these objects. Existing provisions of the Construction Law are published on the web page of the Chancellery of the Sejm, in the Internet System of Legal Acts, isap.sejm.gov.pl.

From the summary made, it is clear that the duty of every owner, manager of a building is to maintain and use it for its intended purpose and environmental protection requirements and to keep it in proper technical and aesthetic condition, preventing excessive deterioration of its performance and technical efficiency. In particular, one should bear in mind the requirements such as:

- structural safety,
- fire safety,
- safety of the use.

Owners and managers of a building on which there are imposed obligations to carry out checks are subject to sanctions specified in the criminal regulations of the Costruction Law. In accordance with Art. 93 point 8 of the Construction Law, who does not fulfil the obligation referred to in Art. 62 paragraph 1, i.e. does not carry out periodic inspections to the facility shall be subject to a fine.

The Supreme Chamber of Control has published detailed reports on the results of checks carried out with respect to the regularity of maintenance of buildings and performance of regular technical inspections of buildings. The inspection included the Mazowieckie voivodeship. Supreme Chamber of Control controllers in the published results of the inspection, assessed negatively the fulfilment by the owners or managers of responsibilities defined by the Construction Law.

The main failures were the following:

– not performing periodic inspections of the technical condition of buildings or not carrying out those inspections in the full-range,
– lack of implementation of recommendations stemming from the carried out inspections,
– lack of proper supervision of municipalities over managers of buildings,
– lack of record books of buildings and their improper conduct.

Owners or managers of objects, according to the SCC (pol. NIK) controllers do not have reliable information about the technical condition of objects and purposes of the implementation of urgent renovations or repairs. The above findings were confirmed during the inspections carried out in 2011 by the General Office of Building. It was stated that over 50% of the cases of irregularities related to keeping the building log book, while nearly 15% of the cases concerned bad technical condition.

In connection with these conclusions, an analysis was made with regard to periodic inspection protocols on state of buildings in the field of general construction, which are carried out depending on the type of building, as well as subject to various ranges of control. At present, the current form based on Art. 62 paragraph 1, item 1 b and Section 2 of the Act of 7 July 1994 – Construction Law (Official Journal of 2010 No. 243, item 1623 as amended) in connection with § 4 – Regulation of the Minister of Internal Affairs and Administration of 16 August 1999 on the technical conditions of use of residential buildings (Official Journal No. 74, item 836 as amended), is a document comprising:

– description of technical elements of parts of wood buildings which constitute a common part, in the field of general construction.
– conclusions of examinations necessary to include in collective protocol of the inspection,
– description of the aesthetics of the object,
– use classification of the building depending on the condition of common parts,
– general criteria of assessment and classification of the technical state of the elements of the building,
– determining the degree of urgency of renovation of building elements.

These protocols are made depending on the scope they apply to, usually on an annual basis or every five years, according to the current Regulation.

General criteria of assessment and classification of the technical state of elements of the building		
Classification of technical condition of an item	**Percentage consumption of an item**	**The criterion for assessment**
good	0% – 15%	The building element (or type of construction, finishes, equipment) – is well kept, maintained, does not show signs wear and damage. The characteristics and properties of embedded materials meet the requirements.
satisfactory	16% – 30%	The building element is properly maintained; running repairs are recommended (small repairs, maintenance, insulation works).
average	31% – 50%	In parts of the building there is minor damage and losses do not threaten the safety of the operation. Partial renovation is purposeful.
bad	≥ 51%	In parts of the building there are considerable damage and losses. The characteristics and properties of embedded materials have a reduced class. A comprehensive overhaul or replacement is required.

The data contained in the protocols of control, form the basis for drawing up of a tabular list of degrees urgency of repairs, renovation of buildings.
The summary includes the division of works according to:
I – the degree of urgency of the repair (main repair) – elements that require immediate repair. Failure to perform repairs may affect health and lives of users,
II – the degree of urgency of the repair (running repair) – elements that require repair before the next annual inspection of the facility,
III – the degree of urgency of the repair (maintenance works) – elements that require repair to be carried out over some period of time, before the next five-year inspection of the object,
The urgency of repairs has not been indicated – elements whose renovation should be included in material and financial plans of the board of the building during a normal renovation cycle (longer than the period until the next five-year inspection).

Summary of repairs according to the degree of urgency is the basis for drawing up a plan of renovation works.

In case of moisture and biological corrosion (biodegradation) of building elements, mycological expert opinion shall be performed. With this respect, the applicable provisions contained in the Regulation of the Minister of Infrastructure of 12 April 2002 (Official Journal No. 75, item 690) clearly state that before attempting to carry out repairs (*I degree of the urgency of the repair = main repair = overhaul, running repair, maintenance works*) every investor should have such documentation. Section VIII – "Health", § 322, par. 3, ch. 4 – "Protection against moisture and biological corrosion" Regulation states that: …. *"Before the reconstruction, expansion or change of use of the building, in case of occurrence of moisture and biological signs of corrosion, one should carry out mycological expertise and on the basis of its findings – an appropriate protection works."*

In the section 1 "General Provisions", § 2. 4 the legislator requires what follows: *"In the case of buildings and sites entered in the register of monuments or conservation-protected areas, based on the findings of the local spatial development plan, the expertise referred to in paragraph 2 is also subject to consultation with the regional conservation officer*".

The expertise should be made by an expert or mycological and construction specialist under an expert's approval. It should be comprehensive, concise, in a way that would give against the general state of the object clear view of the destruction of the building under the influence of biotic corrosion factors and therefore the urgency of the repair. It should specify which elements, structures, parts of the building or parts thereof have been destroyed stating the conclusions and recommendations for repair works. It is therefore important to closely define the kind of envisaged renovation works in the building, the type of means and methods, consumption standards, etc.
The plan of the renovation should be drawn up with priority for works aimed at:
1. eliminating security risks for premises users and third parties,
2. fire safety of the building,
3. compliance with environmental requirements,
4. observance of a precautionary nature of the repairs.

During the renovation of a building, one must ensure:
1. execution of works in an order according to the elaborated renovations plan,
2. the safety of users and third parties in the course of works,
3. using technical, material and technological solutions limiting nuisance of use of premises and improving the functional value of the facility.

The primary duty of every owner or manager of a building is to maintain and use the object in proper technical and aesthetic condition. Additionally, the object must be used in accordance with its intended purpose and requirements of the protection of environment, that is why art. 5 paragraph 2 of the Construction Law forms the basic rule in the design, construction and maintenance of buildings. In the case of museums, manager's duties are usually entrusted to the Head of Administration, which is the administrator of the building.

Maintenance of the facility in good condition requires regular monitoring of its technical condition as well as possible risks. Mandatory inspections are set out in the relevant legislation together with time limits when they need to be carried out.

According to the Law of 7 July 1994 Construction Law, objects should undergo when they are used by the owner or manager periodical inspections, i.e.:

– checking the technical condition of the building elements, structures and systems exposed to harmful and destructive influence of atmospheric factors occurring during use of the building – once a year,
– checking the technical condition of installations and equipment for environmental protection – once a year,
– checking the technical condition of gas installations – once a year,
– checking the technical condition of the chimney (smoke, combustion and ventilation) – once a year.

Further periodic inspections, resulting from the Construction Law do not vary according to the size of the building or roof area and include:

– checking the technical condition and suitability for use of a building,
– the aesthetics of a building and its surroundings - every five years,
– checking the wiring and lightning in terms of performance status of connections, equipment, security and protective measures against electric shock, resistance of insulation of cables and installations and equipment earthing system – every five years,
– checking the technical condition of boilers lit with non-renewable liquid or solid fuel of an effective rated output of more than 100 kW – once every two years,
– checking the technical condition of boilers lit by non-renewable liquid or solid fuel of an effective rated output of 20 kW to 100 kW and gas boilers – every four years,
– control that consists in assessing the energy efficiency of refrigerating appliances in air conditioning systems, their size in relation to the operational requirements of the nominal cooling capacity greater than 12 kW – once every five years.

Buildings should also be inspected with regard to safe use. Especially in the case of risks and external factors that could have a significant impact on precisely this object. Prepared inspections should be carried out by people having building qualifications in the relevant speciality. The Act requires that the owner or manager be obliged to keep for each building (other than those specified in Art. 64 paragraph 2) a building log book, i.e. a document for recording tests and technical inspections, repairs and reconstruction in the period of use of the building with annexes: protocols, expert opinions, reports or notes relevant to the facility.

"From the obligation to keep building log books of a building are exempt only those owners and managers of single-family dwellings, farmstead buildings and holiday homes and facilities mentioned in Art. 29 paragraph 1 Construction Law, i.e. buildings whose construction does not require a building permit. The requirement does not apply to owners or managers of roads or bridges.

When the object has a building log book, but it is carried in a different manner as specified in the Regulation, it is advisable to change the form of running the book after completing the currently run volume. The existing book, as an important document should be attached to the required documentation of the object. The new book should refer with its numbers to the previously conducted. It is not allowed to destroy books kept so far, because they are an important document testifying to the history of the object. Building log books do not need to be registered by a construction-supervision authority because they constitute a document belonging to the property owner". Such a provision is included in the Guidance to the building log book developed by Rafał Marciniak, Wroclaw in January 2012. The book should be submitted on the day of transfer of the building for use and systematically carried out for the period of its use until demolition. The procedure for admission of a facility for use is set out in the Construction Law.

A building log book shall contain information about the person authorized to make entries in the book. Legal regulations do not clearly define what qualifications must have the person who carries a building log book. The owner or manager may run book himself or authorize another person to exercise thereof; a copy of the authorization should be included in the documentation of the object. One can also give out an authorization to make entries to a larger number of people, the final number of people is determined mainly by the owner or manager of the facility.

During operation of the facility, its owner or manager should back up vital and important consultancies, technical documents together with relevant annexes.

A very important element especially when monitoring objects of wooden architecture is a complete summary of works at each of its stages. This approach gives an image of changes in the facility and it is basic documentation to carry out subsequent operations. Information on materials used, measures used help monitor ongoing changes, plan future works and procedures to protect the building. Today, as-built documentation or record of works carried out is often overlooked in the construction process, resulting in serious consequences.

An equally important part of the construction process in relation to the preparation of documentation of the scope of works to be performed in a given facility is adequate and reliable supervision of these works as well as comprehensive documentation of the works already performed.

Preparatory works to create a unified and coherent program of monitoring and managing objects of wood architecture for the Museum of Agriculture in Ciechanowiec were preceded by a detailed analysis of the provisions contained in the EU's standard in the field of cultural heritage or Act on museums and the Charter of ICOMOS. Published in English by the Polish Committee for Standardization Polish Standard PN- EN 16096: 2012: *Conservation of cultural goods. Overview and description of the state of preservation of architectural heritage* provides guidance on organoleptic (visual) examination of the state of objects. It determines how the state of cultural heritage should be assessed, documented, recorded and passed on.

The description should include the status of the two basic components:

– record in the form of a short text about the state, symptoms, type and extent of damage,
– state of an element on the border with another element, including details of connections.

The condition of building elements is determined by the four classes (CC) shown in Table 1:

Condition Class (CC)	**Symptoms**
CC 0	no symptoms
CC 1	minor symptoms
CC 2	moderate severe symptoms
CC 3	large symptoms

Risk classification because of the urgency is specified in Table 2:

Urgence class (UC)	**Urgence**
UC 0	Long-term
UC 1	Medium-term
UC 2	Short-term
UC 3	Urgent and immediate

General recommendations classification is shown in Table 3:

Recommendations Class (RC)	**Possible actions**
RC 0	No action
RC 1	Maintenance / preventative conservation
RC 2	Moderate repair and / or further research
RC 3	Larger interventions based on a diagnosis

Status Report should be a clear and concise report on the state of the opbject.

It should include among others:

– information about the property and cultural heritage,
– registration state,
– risk assessment and urgency of repairs,
– summary,
– photographs, graphics and other documents.

Act on Museums of 21 November 1996 (Journal Law of 20 January 1997) refers to exhibits belonging to the museum. According to the requirements, they must be inventoried and their way of recording should be in accordance with the Regulation of the Minister of Culture and the Arts on the principles and method of registering cultural property in museums. Keeping records is primarily a record that allows to identify each of cultural goods which are in the museum, with the help of:

– inventory card,
– inventory of exhibits, conducted in the form of an inventory book.

An entry in the inventory book should include possible to ascertain identification data. The Commission's verification of compliance of documentation with the facts of collections should be in accordance with the provisions of the Construction Law. Entry of a cultural property to the inventory book must be made within 60 days from the date of taking possession of it.

ICOMOS /International Wood Committee/ Principles for the Protection of Historic Wood Buildings, the document was created to help define the basic and universal rules for the protection and preservation of historic timber structures due to their cultural significance, and a coherent strategy of regular monitoring, maintenance and protection of the historic buildings. The scope of intervention, repair or replacement of elements should include the least interference with the historic structure of the building. It is however not always possible, therefore, the document sets out the guidelines which one should abide by to maintain the historic authenticity and integrity of the cultural heritage.

In order to maintain the structures, one should apply the principles that:

- recognize the importance of timber structures from all periods as part of the cultural heritage of the world,
- take into account the great diversity of historic timber structures,
- take into account the various species and qualities of wood used to build them,
- recognize the vulnerability of structures wholly or partially in timber due to material decay and degradation in varying environmental and climatic conditions, caused by elevated levels of moisture, light, fungal and insect attacks, wear and tear, fire and other natural disasters,
- recognize the increasing scarcity of historic timber structures due to vulnerability, misuse and the loss of skills and knowledge of traditional design and construction technology,
- take into account the great variety of actions and treatments required for the preservation and conservation of heritage resources,
- have in mind the Venice Charter (http://www.ochrona.zabytki.lodz.pl/data/other/karta_wenecka.pdf),
- Burra Charter (http://www.icomos.org/iiwc/principles/principlespolish.pdf) and related UNESCO and ICOMOS doctrines, and seek to apply these general principles to the protection and preservation of historic timber structures.

In June of 2013, at the initiative of the National Institute of Museology and Conservation of Collections at the Museum of Mazovian Countryside in Sierpc, a nationwide seminar on the Protection of open-air museums was held. The event was the exchange of experiences and insights between museum specialists and representatives of the State Fire Service, General Office of Building and the National Institute of Museology and Conservation of Collections. The effect of these actions was to make, in the period preceding the seminar, a series of works to try to assess the real state of security in open-air museums, which led to the development of a study entitled: "ABC of protection of open-air museums". Conclusions of the training were also part of our analysis.

Not only the results of studies of acts constituted the scope of analyses. The main aim was to identify current working models of monitoring historical monuments of wood architecture in Poland, so it was decided to carry out research in the form of a questionnaire. The main group to which the query was directed were teams of historic wood buildings in a a form of open-air museums. On the Polish territory, among numerous examples of preserved wood architecture, it is precisely this type of objects that have a legal form of management (Act on museums) and protection, which should guarantee the maintenance of such facilities in a good technical condition. Out of the functioning across the country 35 open-air museums and ethnographic parks 24 were selected with more than 10 wood buildings. The report's authors also created a contact list for directors and managers of the following sections: conservation, documentation of collections, repair and construction.

Questions to teams aimed to determine the resource and forms of available documentation and how to store data about objects. The research shows that respondents due to the applicable law on museums and regulation possess inventory cards of objects. Some of them have a building log book in accordance with the Regulation under Article 64 of the Construction Law. Other entities treat buildings as uncultivated exempted from the provisions of the Construction Law. Most museums use paper documentation. Electronic recording is used in four units, of which two use for this purpose a dedicated programme for cataloguing museum collections. Radom Village Museum in Radom also runs a full record and collection of information in an electronic form, where in folders for each object are placed scanned or photographed materials. This entry in the surveyed museums has been carried out for several years.

However, most museums do not have uniform documentation and adapted to the characteristics of wood objects. Typical set of information is contained in inventories (held by most units), rarely evaluations, opinions or mycological, dendrochronological expertise.

Frequency of control of technical state of objects in more than half of museums is high – carried out twice a year. Other respondents carry out inspections once a year. There are also emergency inspections related to weather anomalies.

Separately are carried out annual inspections of the external installation. Inspections of the technical condition of the facility, performed and recorded in a systematic way, by various parts of the building are carried out by two institutions. Each has a separate control scheme. In other cases, only a non-systematic record of necessary repairs and overhaul works is performed. The course of conservation and restoration works is recorded in building log books objects and inventory cards in all surveyed museums.

Complete documentation of individual objects is stored in one place in the form of folders/ binders. In two establishments documentation is stored separately in different departments (e.g. "white card" in inventory section, while repair and conservation documentation in the section of architecture or conservation).

On the basis of the described results of the survey conducted among 11 open-air museums, the Museum of Agriculture in Ciechanowiec does not deviate from the norm, has a similar arrangement, both in terms of documentation and control of technical condition, as the objects of similar size (approx. 50 objects).

The conducted survey as well as a detailed analysis of the above range also helped to compare practices applied in Poland with standards adopted in the world.

In the Museum of Agriculture in Ciechanowiec research was conducted with museum employees designed to verify preliminary reports and studies, so it supplemented the final version of the necessary elements, corresponding to the best practices used.

Getting familiar with the system in place at Ryfylke Museum in Norway, on-site trainings and meetings with those responsible for monitoring and management of objects of this type in the area, made it possible to specify labour standards which would be to introduce in the country, due to the applicable standards and legal acts, and at the same time will be the basis to create a uniform, consistent and very clear system. The programme is to be fully exploited so it had to let efficiently carry out actions to facilitate detailed monitoring and management of objects of wood architecture.

The result of these actions was the creation of a report from internal technical inspections/ monitoring of the building. The range included in the table refers to the technical state, the state of technical efficiency and functional value of the building's elements, the building's suitability for use, its aesthetics and surroundings.

The report is a collection of conclusions resulting from ongoing studies, surveys and studies to monitor and manage objects of wood architecture, adapted to the current law and constituted a basic guideline to create the software. Developing the application, because of the assumptions was systemic, comprehensive and consistent, its detailed scope and its filling manner was presented in the form of instructions to the application. These instructions explain the standards and guidelines with reference to the application in an understandable way so that the system be fully utilized.

During meetings and conferences held in the Museum of Agriculture in Ciechanowiec important personal decisions were taken to designate specific people and allot them with a detailed scope of responsibilities according to their privileges and work experience.

The analysis shows that control procedures in the form of periodic inspections are needed to fully be able to monitor buildings. It is also significant that such inspection if performed regularly gives you a reliable preparation for implementation of the necessary and urgent renovations and repairs in the building.

In connection with the preparation and implementation of the project entitled: *Documentation and monitoring in the management of timber objects in Krzysztof Kluk Museum of Agriculture* in Ciechanowiec and Ryfylke Museum, it should be remembered, however, that the scope of intervention, repair or replacement of elements comprised the smallest interference with the historic structure of the building. The proposed technical solutions should seek to preserve as much as possible of the authentic structure of the monument, while maintaining the characteristics of rationality for technical and financial possibilities of the owner. This means, inter alia, to carry out operations which will be primarily aimed at stabilization of the construction, preservation, protection and preservation of the original substance, respecting the principle of primum non nocere (Lat. - Do no harm).

Protection of open – air museums and other museums in Poland should be organized in accordance with the applicable regulations, which result in two levels of organization: qualified protection and basic protection.

Qualified protection – in accordance with the Act of 22 August 1997 on protection of persons and property.

Basic protection – in line with the Regulation of the Minister of Culture and National Heritage of 1 December 2008 on the protection of collections in museums against fire, theft and other risks of destruction or loss of collections and ways to prepare collections for evacuation in case of danger.

The variety of open-air museums enforces a very thorough analysis of risks and recommendations to take measures to protect these facilities as well as movable. It is important to plan and organise protection of these

collections. Open-air museums belong to the group of museums difficult to protect. Because of the area they occupy covering tens of hectares of rugged terrain and varying land use.

Organizing technical protection in open-air museums, one should always take into account all kinds of technical protective measures, construction and mechanical and electronic products and their interrelation. Only such approach to conservation organization can effectively protect the museum area at an acceptable cost.

The factors having a significant impact on the protection in museums in the first place should include the nature of collections and places of their storage and presentation. Other types of protection will be required for museums located in buildings with typical exposition halls, others for interior museums, and still others for open-air museums. In the last case, their managers often face a task requiring implementation of customized solutions.

A coherent strategy of regular monitoring and maintenance is crucial for the protection of historic timber structures and their cultural significance.

A very important element documenting an inspection carried out in the facility is preparation of photographic documentation. Usually, image quality and quantity depend on the person who executes them. During the analysis, it was found that there are no guidelines for this type of documentation. Due to the fact that this is an important element of control activities, as well as subsequent repair works, it would be important that this documentation be at each of the stages in handy. Therefore, it is so important to define guidelines for compiling and updating photographic documentation regarding monitoring buildings.

In order to carry out inspections are important kinds and types of tools depending on the purpose they serve so that the actual condition of the building could be most reliably defined.

The created report, in addition to data like the object's name, time of origin or function,
has been divided into various categories:

– Basic elements of the building.
– Checking the technical condition of the building premises in the field of general construction.
– Construction elements and aesthetics of the building surroundings.
– Equipment of fire protection.
– Elements/equipment attached to external walls, roof, etc.
– Elements/equipment of fittings.
– Graphic/photographic annex.

It also includes a division into:

– Equipment elements depending on the parts of the world (usually set at situational sketches of the object).
– State of preservation taking into account the type of damage, as well as their classification.
– Recommendations defining the urgency class and nature of actions.
– Ability to enter comments or annotations concerning the facts.
– The range of graphic and photographic attachments.

Systematic and reliable tracking of objects of wood architecture allows for efficient management and greater control over objects of wood architecture.

Assessment of individual needs of open-air museums is crucial when one thinks of maintaining a uniform standard for more teams. Hence the importance of cooperation in many areas, exchange of experience. In such action, it is necessary to create a database, basis for further action, that a developed programme can provide.

Piotr Kozarski, mgr inż.

Graduate of the Faculty of Forestry in the speciality of forestry engineering (Forestry Building) of Warsaw University of Life Sciences (1972), Postgraduate Study (Conservation of Monuments, 1986) on the Faculty of Architecture of Warsaw University of Technology. Since 1988 he's been expert of the Minister of the Environment in field: environmental protection, specialization: protection of area of earth and green. In 1998-2000 and 2001-2004 he was the expert of the Minister of Culture and Art and then the expert of the Minister of National Culture and Heritage in field: immovable monuments protection. He is a mycological-building expert (1974), mycological (2004) and the Honourable Member of the Polish Association of Building Mycologists, an expert of Historical Monuments & Art Conservators Association, specialization: protection of the building against the corrosion and the moisture. Wood preservation (2010), conservator of brick and wooden historic buildings, wooden detail, full-scale metal detail, historic green, conservation supervisions and the judicature in this scope, documentary and executive works of conservation of movable objects made of wood and the wooden architecture (1987) and the member of the Polish National Committee of the International Council of the ICOMOS. He published numbers of books concerning the building and the green. Decorated with a Medal for Merit to Culture "Gloria Artis".

Marcin Górski, dr inż. arch.

He graduated from the Faculty of Architecture Warsaw University of Technology. He specializes in issues related to historical preservation. Author of several scientific publications. Co-author of a number of concepts and projects for the restoration of historical complexes and architectural objects. In 2007 he defended his doctoral dissertation: Theme Parks as a form of historical development of nineteenth-century fortification complexes in Poland (supervisor prof. zw. dr hab. inż. arch. Andrzej Tomaszewski) at Faculty of Architecture Warsaw University of Technology. Since 2008 Assistant Professor in the Department of Conservation of Monuments, currently in the Department of Architectural Heritage and the Arts Faculty of Architecture Warsaw University of Technology. Member of the Commission of Military Architecture ICOMOS. Co-founder of the studio Festgrupa in 2007. Qualified mycological and construction specialist by the Polish Association of Construction Mycologists.

Katarzyna Skiba, mgr inż. arch.

Graduate of the Faculty of Architecture of Warsaw University of Technology (WAPW). The architect, the author and the co-author of numerous architectural designs, cooperating with many architectural and trade studios at home and abroad among i.a. with Grupa5 Architects, at the project on the development and modernization of the main station in Wrocław, at the project of elevation of a shopping centre Klif in Warsaw, in cooperation with festgrupa sp. z o. o. i.a at the project of the repair of St. John the Baptist historic church in Turośl. In 2009 she acquired mycological and building qualifications given by the Polish Association of Building Mycologists in Wrocław. Since 2013, she's the owner of the authorial office Noba Katarzyna Skiba, operating in the field of architecture, urban planning, interior design, applied art and graphics, she specializes in preparing the mycological documentation.

Grzegorz Basiński, mgr

Conservator, mycologist. Graduate of the Faculty of Fine Arts of the Institute of Historic Monuments and Conservation of Nicholaus Copernicus University in Toruń. Coordinator for the conservation of monuments in Twierdza Srebrna Góra. Laureate of the J. Zachwatowicz 1st award in the international PKN ICOMOS competition for the best diploma works concerning the protection of the cultural heritage. Employee of the History and Conservation Education Centre (OEHiK) in Twierdza Kłodzka. Areas of interests: examinations and conservator's issues of wooden architecture monuments, old-time building techniques, education concerning the cultural heritage protection.

Maciej Trochonowicz
Bartosz Szostak

The state of preservation of vernacular wood objects Village Museum in Lublin

1. Introduction

According to PWN dictionary, an open-air museum is a ”national ethnographic museum in the open air, where are exhibited monuments of folk architecture and the equipment and tools of a specified region”. The name comes from the world’s first open-air museum, which was opened in 1891 on the island of Djurgarden (Pol. Zwierzyniec) in Stockholm. The originator of the project was Arthur Hazelius. On the area of around 30 ha, 150 historic buildings were deployed, which as a whole was arranged to resemble a nineteenth-century Swedish town.

Museum of the Lublin Village was founded in the early 60s of the twentieth century, as the Department of Folk Architecture at the Regional Museum in Lublin. About 10 years later, in January 1970, it became an independent unit. Museum originally was to be located in the district of Kalinowszczyzna on an area of 12 hectares. However, due to various difficulties with the acquisition of land for development in 1975, the museum received a new land with an area of approx. 27 hectares of land in the district Sławin near the route Lublin – Warsaw. The first object transferred to the museum was a fan from Zygmuntowo, while works began in 1976. Three years later the first sector ”Wyżyna Lubelska” was opened. To date, the museum has additional available sectors ”Roztocze”, ”Powiśle”, ”Podlasie”, ”Nadbuże”, ”Dworski”, ”Miasteczko”. The resources of the museum include more than 150 historic buildings. About 50 of them with equipment made available to the public. Part of objects is not available for visitors (12), a significant number (73) is stored under the roof and waiting to join the exhibition. Figure 1 shows the location of specific areas within the Village Museum.

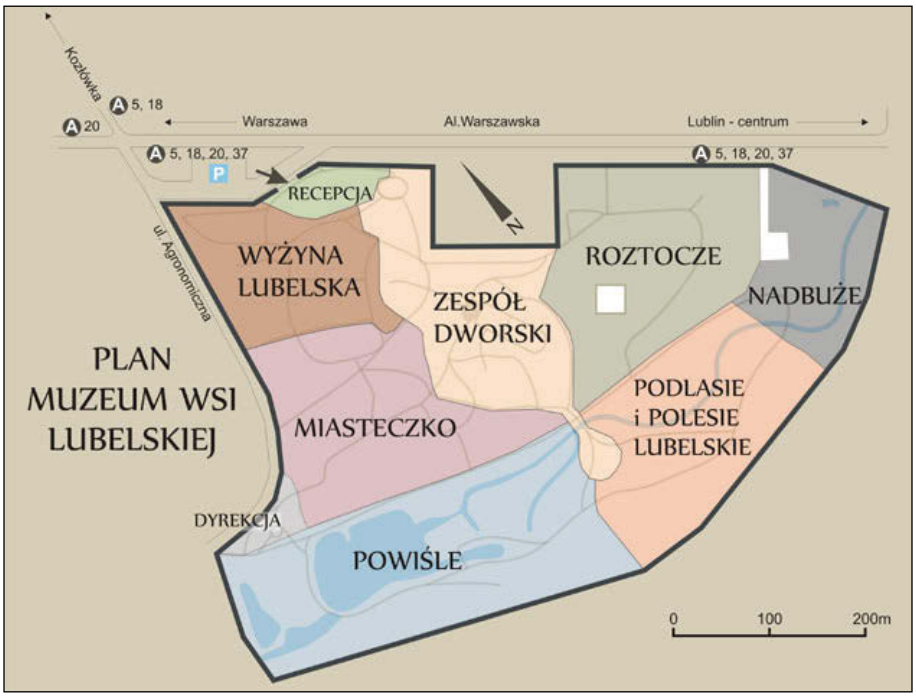


Fig.1. Division of sites in the Lublin Village Museum, Source: http://skansen.lublin.pl/.

In 2013 the authorities of the Village Museum, in consultation with the Department of Conservation of Monuments Department of Civil Engineering and Architecture of Lublin University began a programme of comprehensive inventory and assessment of technical condition of the objects in the museum of the Lublin open-air resources. In the years 2013-2015 studies were made for 30 buildings (summarized in Table 1) and started for next ones.

Table 1. Objects of the Museum of the Lublin Village analyses

No.	Facility	Date of creation	Date of transfer / Date of making available	Sector
1	Orthodox church Tarnoszyn	1759	- / -	Roztocze
2	Cottage of Błonie	1914	around 1980/ -	Roztocze
3	Cottage of Brzeziny	1789	1976/1979	Powiśle
4	Cottage of Bukowa	1857	- / -	Roztocze
5	Cottage of Głodno	1880-1890	- / -	Powiśle
6	Cottage of Gozd Lipiński	IInd half XIXth century	1980 / -	Roztocze
7	Cottage of Huta Dzierążyńska	IInd half XIXth century	- / -	Roztocze
8	Cottage of Janiszowo	XIX and XX century	around 1979/ -	Powiśle
9	Cottage of Karczmisk	1748	- / -	Powiśle
10	Cottage of Korytkowo	1798	1976-1977/ -	Roztocze
11	Cottage of Niemcy	1890	1979 / around 1979	Wyżyna Lubelska
12	Cottage of Tarnogóra	1773	- / -	Wyżyna Lubelska
13	Cottage of Teodorówka	XIX and XX century	- / -	Roztocze
14	Cottage of Urzędowo	1784	- / 1979	Wyżyna Lubelska
15	Cottage of Żabno	1895	- / -	Wyżyna Lubelska
16	Manor house of Żyrzyno	mid XVIII century	80's of the XX century	Dworski
17	Belfry of Lubycza Królewska	IInd half XVIII century	ar. 2001 / -	Roztocze
18	Barn of the village of Huta Dzierążyńska	1920-1921	- / -	Roztocze
19	Circular of Teodorówka	XIX and XX century	- / -	Roztocze
20	Circular of Urzędowa-Bęczyna	IInd half XIXth century	- / 1979	Wyżyna Lubelska
21	Circular of Żabno	end XIXth century	- / -	Wyżyna Lubelska
22	Court granary of Piotrowice Wielkie	IInd half XIXth century	- / -	Dworski
23	Court granary of Turki	IInd half XIXth century	- / -	Dworski
24	Wood barn of Brzeziny	IInd half XIXth century	around 1980/ -	Powiśle
25	Barn of Rogowo	-	around 1982 / -	Powiśle
26	Barn of Tyszowce	1905 -1912	ar. 1980 / -	Town
27	Barn of the village of Bukowo	1839-1857	- / -	Roztocze
28	School in Bełżec	ar. 1866	- / -	Roztocze
29	Windmill of Zygmuntowo	1918	1976/1979	Wyżyna Lubelska
30	Farm from the village Niemce	end XIXth century	1979 / around 1979	Wyżyna Lubelska

Due to the vast character of issues, the present article deals only with a part of them, focusing primarily on the state of preservation of objects. This paper shall discuss the technical condition of rafters, roofing, floors, walls, fittings, doors and windows. Elements of buildings were evaluated taking into account: mechanical damage, moisture, biological corrosion and natural wear and tear.

2. Walls

In all analysed sites, condition of the structural elements of walls and joints was examined. Particular attention was paid to longitudinal and transverse cracking, and deflection of an element of the plane.
Wooden walls in the analysed objects were made in the following structures:

- Coronary – solid walls made of beams horizontally arranged and connected in the corners, the beam can have round or rectangular cross-section.
- Skeleton – traditional half-timbered walls. The supporting elements are beams. On the lower beam (grounding) poles are set. The top of the columns are linked with a girt. Fields between poles are strengthened with bolts and braces and filled with insulating material. The entire construction is finished with boards or cladding panels.
- beam-post structure – supports elements are beams. For grounding are set poles (posts), which have longitudinal grooves into which are inserted horizontally logs (beams). Such a wall from the top is closed with a cap. In the corners of the building there are braces, stiffeners.

The main types of connections of walls are:

- connection of beams of walls in the corners: fish tail, swallowtail,
- connection of wall beams with vertical beams at the door, windows: beam-post structure,
- connections of foundations: full mutual or one-sided notch,
- connection of caps at the corners: full mutual notch composite with studs,
- connection between beams of the cap: simple overlay.

Overall condition of the walls was defined as good. There was partial replacement of elements in some constructions. In 11 of 30 (37%) of the analysed objects structural damage in the form of longitudinal cracks was found. All cracks present in the elements with a width of opening of 2 to 8mm do not have a material impact on the carrying capacity of wooden structure. In three objects were observed single strengthening wall elements. No excessive deflection of the wall structures was observed. None of the elements does not pose a direct threat to the use of the facility.

In far weaker condition are the elements of foundations but not as a result of exceeding the limit states or undue burden, but as a result of biological corrosion caused by moisture. The connection status is defined as good. There was no damage directly resulting from work in the structure.

3. Door and window woodwork

Durability of wood doors and windows is clearly lower than wall elements, in which it is built. Elements of design of windows and doors have significantly smaller sections, a large number of connectors and are subject to wear and tear. Their rapid degradation is also influenced by the fact that elements often extended beyond the face of the wall are exposed to meteorological factors. In open-air museums damage or destruction of woodwork occurred during their translocation (demolition stage, transport and new construction). In view of these, a significant portion of doors and windows of the examined objects is secondary and comes from different periods of use of these buildings.

Assessing the woodwork attention was paid to: technical condition of doors and windows, jambs, hardware, glazing, protection against biological corrosion, installation quality, scope of repair works and distinctiveness.

It was found that most works on woodwork was comprehensive and consistent with the principles of conservation. An analysis of project documentation shows that for individual objects have been developed separate treatment conservation programmes. Installation of doors and windows shows a clear division according to the purpose of objects. In facilities open to the public along with the interiors and furnishing most of the windows and doors movable before, after conservation works also remain movable. For buildings whose interiors are not made available to visitors most of the windows, but also part of the doors, are permanently bonded to the wall elements. A significantly lower accuracy of installation on elevations invisible from the main directions of movement of visitors was noticed. Most of the newly introduced woodwork clearly distinguished from the historic elements. The manner of its execution and, above all, a kind of woodworking exclude the possibility

that over time this feature will be erased. In order to merge with the general appearance of facility in many buildings reconstructed elements like the walls were whitewashed with lime.

Overall evaluation of door and window woodwork is good. In much better condition are window elements mostly secondary, or even made today. There was no significant mechanical damage, signs of intense biological corrosion or defects in glazing. Overall evaluation of door woodwork performs worse. There are material losses in woodwork primarily in the lower parts of the wings, there are no original skirting boards, in panel doors there are longitudinal cracks. A series of operational failures have been noticed. The worse door state in comparison to windows is influenced primarily by the fact that a significant portion of doors is original and they are intensively used.

In the examined objects condition of the doors and windows was evaluated as good or very good.

4. Ceilings

Ceilings were evaluated in vernacular wooden buildings of the Village Museum in Lublin. In 5 of the 30 analysed objects ceilings were absent. These objects were omitted from the analysis of ceiling structures. In two objects with cellars basement ceilings made of brick construction – the technical condition of the ceilings defined as good. In other places, wooden floors, a dominant bare floor structure. Ceilings combined with capped beams of walls with a mutual incomplete notch. In most objects ceilings are original – but it is clearly impossible to determine the originality of the floor. In most buildings plank ceilings have been exchanged. Overall condition of ceilings was defined as good. In one of 25 (4%) of the analysed objects with ceilings, the general condition of ceiling was defined as sufficient in view of the numerous cracks. Significant longitudinal cracks of beams of up to 15 mm aperture. In other places, there was no structural damage to roofs and excessive deflection.

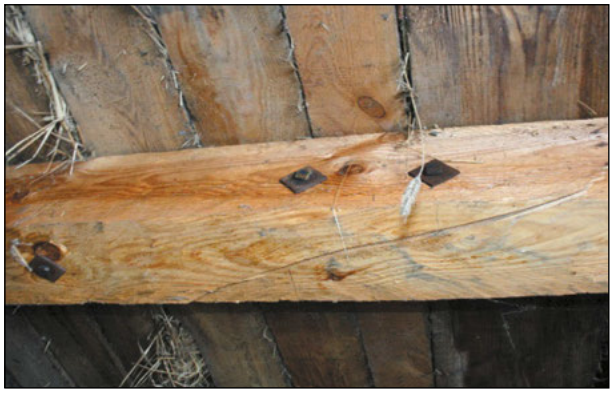


Fig. 1. Strengthening the joist – wood farmhouse from the village of Niemce.

Fig. 1. Strengthening the joist – wood farmhouse from the village of Niemce.

5. Roof trusses

During the analysis of roof trusses, special attention was paid to the technical condition of elements of rafters, collar beams, purlins, cap beams and connections. Almost all of the examined objects have a collar roof structure (excluding two with a mixed construction). All components connected to wooden dowels or a combination of woodwork. In the construction of roofs dominant types of connections are:

- connection of the rafter with the cap – one-sided notch,
- connection of the pole with the cap – full notch,
- connection of the beam with the cap – one-sided notch.

Roofing of some objects in whole or in part is secondary. It was impossible to clearly determine which of the components used are secondary. On the basis of visual assessment and gathered archival documentation,

it is estimated that approx. 20% of the analysed truss objects are entirely secondary, made after the object was moved to the Village Museum in Lublin. In other buildings roof structures are at least partially preserved in the original.

General technical condition of the roof structure was determined to be good. None of the analysed objects presented excessive deflection. One of the objects (cottage of Janiszów) had longitudinal cracking of one of the rafters. In the cottage from Teodorówka one of the rafters qualified for replacement. In other places no significant cracks of rafters were found. Elements of collar beams in all objects in good condition.

The technical condition of connections defined as good. Two of all analysed connections (in a cottage from Żabno and the cottage from Teodorówka) in satisfactory condition due to the state of preservation and external mechanical factors. The remaining ones in good and very good condition.

Fig. 3. Damaged joint between rafter and collar beam – cottage from Żabno.

Fig. 4. Longitudinal rafter crack – cottage from Teodorówka.

6. Roof covering

Given the primary purpose of objects and time from which they come from, virtually all of the tested buildings are covered with straw or shingles. In the group of 30 objects 4 were roofed with shingles, the others have covering of straw or straw and hoods of wooden shingles. It should be presumed that coverage of open-air objects is secondary and often are not more than 40 years. This is due to the fact that all objects have been transferred from other sites, and subsequent use of straw and coverage is unlikely.

The general condition of roofing evaluated as good or very good. The research carried out with regard to humidity and visual inspection showed no significant moisture of rafters or items beneath the cover. The basic function of coverage, protection against rainwater is thus satisfied. Among examined objects only in the case of two losses have been defined as significant making roofs eligible for immediate repair works. In the majority of objects only minor irregularities especially along the ridge were noticed. Without much importance for leaking, but clearly reduces the aesthetics the presence on many thatches of large numbers of individual stalks of straw (standing out). In buildings with thatched wooden eaves, traces of biological corrosion were found. In most cases, these elements have been inhabited by algae, lichens and mosses. They cause a slow degradation of wood, but in the opinion of the authors add authenticity to re-introduced elements. Wooden eaves should be exchanged only if they cease to fulfil its technical function.

7. Biological corrosion

As part of evaluation of the technical condition, the museum objects were visually inspected for the presence of biological corrosion. Due to the nature of objects (in whole or nearly whole wooden) reviewed were all elements that do not require outcrops. The evaluation covered: cover, truss, ceilings, walls, door and window woodwork, stairs and flooring.

Already the first examination showed that the biggest problem in the past were technical insects, pests of wood. Taking this into account a number of in situ examinations scheduled for the months in which the prevailing outside temperatures enabled the intensification of corrosion processes, and hence their diagnosis. The presence of wood-degrading organisms was found in all 30 buildings. The inspection revealed the presence of: insects, fungi, mould, fungi, mildew, moss, algae and lichens. Bbacterial degradation was also found.

By far the biggest problem for the museum objects are insects, in all of the buildings traces of their presence were found. The study also showed that all the buildings were treated with impregnants. Because of the age of the majority it has become a key element to determine whether feeding grounds are active or come from an earlier period before impregnation.

It was found that most of the places affected are not active feeding grounds, and paralysis took place in the period before transferring the objects to the museum. Of the whole group of examined buildings active, but only local and spot, feeding grounds were found in 10 buildings. The exit holes indicate that the dominant species were old-house borers and knockers.

Fungal decay was found in only a few places within their foundation. It concerned ground beams based directly on the ground. In two objects degradation has led to a clear loss in sections, qualifying beams for replacement. Higher parts of the buildings were devoid of signs of corrosion caused by mould. The team examined the occurrence of a large number of items infested with algae, mosses and lichens. These organisms had grown above all components exposed to weathering: roofing, roof truss protruding elements, canopies and lower parts of the walls (foundations). There were no significant changes in the structure of materials covered with algae, bryophytes or lichens.

Fig. 5. Biological corrosion – cottage of Janiszowia.

Fig. 6. Biological corrosion and the state of wood treatment – cottage of Brzeziny.

8. Wood treatment

The study also evaluated the condition and quality of impregnation. One can isolate protective works made when the objects were moved (usually with preparations of oil and solvent) and salt formulations made today. Most often the infected places were secondary elements impregnated today. In the wood-protected historic old types of preparations (oil, solvent) active feeding grounds occurred sporadically. In many elements protected in recent years eluting of formulations from the wood has been noticed, which has an impact on the effectiveness of protection. Currently used protective measures are substances water-soluble and upon contact with water, their loss is a natural property. Such areas require continuous additions.

Applied over several years, different types of impregnants of different composition and colour schemes adversely affect the aesthetics of elevations of buildings.

9. Humidity

The study was performed using resistive humidity. Measurements were made in the months of autumn and spring (state of moisture close to the average). Each time measurements were made with the continuing for several days dry weather. The study was performed for roof trusses and elevations of buildings.

In the case of roof trusses the vast majority of objects did not show any signs of dampness. In 3 of 30 objects were found point (in places with damaged cover) situations of exceeding the acceptable level of humidity for elements of wood. Research on humidity of wall elements was carried out on a measuring grid 50x50 cm. In the X-axis measurements were performed from ground level to the eaves or to a height of approx. 2.5 m in the Y axis over the entire length of the elevation. Based on the results of measurements a moisture map of the entire wall elements was developed (sample map in Figure 2). In most studied objects can be found smaller or bigger problems with increased humidity of wall elements. By far the most common concern is the elevation of the north and west. Accordingly least sunny areas – the north, the dominant direction of winds and driving rain – west. In places where there were many points in excess of the allowable level of humidity we can distinguish two types of moisture. In 5 buildings of 30 there were damp foundations and lanes directly contacting the wall beams. In such places there was a clear degradation of the wood. In all cases, these elements either directly entered in contact with the ground or were not isolated from stone foundations. In 12 buildings of 30 moisture belt was found just below the eaves. Storage humidity values were lower than those at the waist foundations, but exceeded limit values. In the remaining 4 buildings, where elevated humidity level were found, damp elements appeared in various spots on elevations and their numbers were not great.

Fig. 7. Effect of excessive moisture – barn from the village Bukowa.

Fig. 8. Result of excessive moisture on walls – circular Urzędowo.

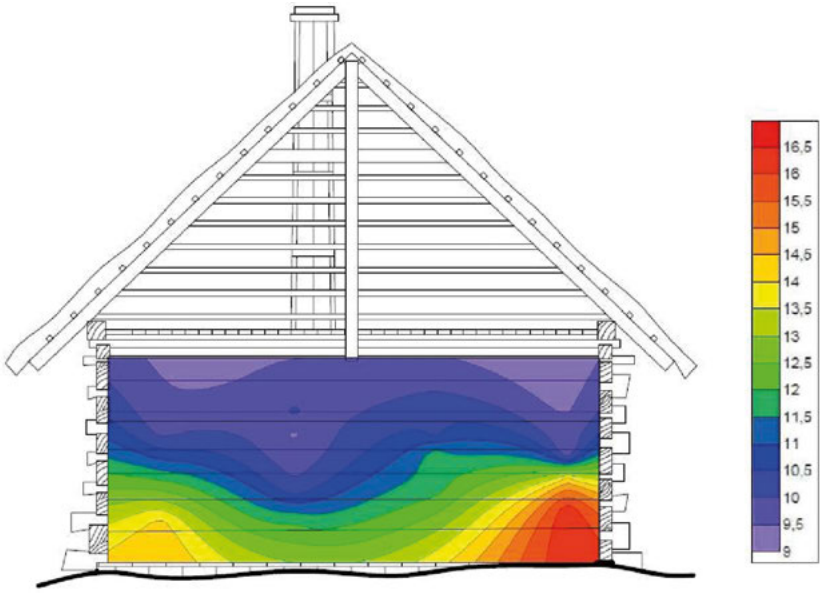


Fig. 2. Map of moisture of the south-east elevation – cottage of Brzeziny.

10. Summary

In the analysed group of objects there was no structural failure. Concerning the assessment of structural components in terms of the state of preservation due to construction loads and external loads, no significant defects were found. In the most part of objects, there were found signs of biological corrosion, but in most cases these were earlier, secured and did not constitute a risk to the substance. Moisture tests largely demonstrated an acceptable level of dampness. Significant changes in humidity were found mainly in the waist to the ground on sill logs.

On the basis of these analyses, overall condition of wood objects located within the Village Museum in Lublin can be described as good or very good.

Maciej Trochonowicz, dr inż.

Graduate of the Faculty of Civil Engineering and Architecture of Lublin University, assistant at the Department of Conservation of Monuments of Lublin University, conducts research on the isolation performed by chemical methods – subject of the doctoral dissertation, specializes in issues related to the assessment of technical condition of objects in terms of moisture, salinity and development of biological corrosion, author and co-author of over 60 scientific papers and nearly 200 different types of technical studiesm, trochonowicz@op.pl.

Bartosz Szostak, mgr inż.

Graduate of the Faculty of Civil Engineering and Architecture of Lublin University, assistant at the Department of Conservation of Monuments Lublin University of Technology. He specializes in issues related to the analysis of structures and evaluation of the technical state of objects from the point of view of: structural issues, planned transformation of objects; author and co-author of several scientific publications and about 70 technical studies (drafts, opinions, expertise), b.szostak@pollub.pl.

Krzysztof Koszewski

Information technologies in the protection and management of objects of wood architecture – the potential and use

Introduction

By taking on a topic of an application of information technology in the protection and management of objects of wood architecture, one should refer to a broader context of the problem both from a formal and functional aspect, with the latter in two perspectives: the need to protect facilities and opportunities offered by new technologies. This means concentrating the analysis of their potential and use on aspects related to the characteristics (and potential) of tools in the following areas: documentation, monitoring and management. The principal assumption of the whole discussion is based on the adoption of a broad perspective related to the protection of cultural property, especially architectural heritage.

The importance of heritage in the context of the preservation of the identity and cultural continuity therefore sets priorities of the present analysis. It should be remembered that values associated with identity should constitute a superior aspect against tactical objectives in economic, organizational or functional terms. In other words, all tools (not only those related to information technologies, but also organizational, legal, system, etc.) should be subordinated to the chief purpose of preserving and transmitting the knowledge about heritage to future generations, as well as using the potential of cultural goods in the current development. An important role of heritage in social life is stressed in all documents relating to the protection of cultural goods, ranging from doctrinal and ending with formulated at the operational level: strategic or legal regulations.

The first part of the text sets out reference of a potential need for new methods and tools for documenting, monitoring and management in specific arrangements and documents concerning the protection of monuments and care for them. The second part analyses operation and functionality of applications used to monitor and manage objects in Polish open-air museums and Ryfylke museum. The third part refers to the progress of digital techniques in the management of architectural heritage, including new methods of collecting information about objects, with particular emphasis on digitization. The text is closed with conclusions.

1. Analysis of theoretical and formal conditions in the context of the need to use information technology

Computerization of various fields of human activity is often taken for granted. However, in the name of fairness of the study, one should seek reasons for adopting this type of action and effort, directing their attention to key documents and regulations in the context of the broader protection of heritage, including architectural heritage.

One should also refer to specific texts defining the framework for action and indicate how they determine the use of appropriate tools. The need for effective and efficient methods[1] of documentation, monitoring and management of historic resources (within the policy of protection and care of monuments), justifying the use of efficient information technology, results in a general way from:

1. accepted international documents and doctrinal principles:
   a. "Venice Charter" – an international charter for the conservation and restoration of monuments and sites[2], Venice 1964,

[1] According to management theory, efficiency is defined as a relation of the effects of action to the invested expenditures, the effectiveness as a measure of the degree of realization of the set objectives. Both aspects require the use of proper tools. One group of tools currently used are IT tools, including adequate systems of management and monitoring. Although the cited documents, recommendations and regulations do not always relate to them direct, IT tools can be an effective solution to issues raised in them.

[2] The provisions and resolutions of the Second International Congress of Architects and Technicians of Historic Monuments in Venice in 1964, by "Protection of Monuments" No. 3 (74), 1966, insert.

b. "Kraków Charter" – Kraków 2000[3],
c. Principles for the Protection of Historic Wood Buildings[4], Mexico 1999.
d. Principles for the Recording of Monuments, Groups of Buildings and Sites[5], Sofia 1996.
e. Charter on the Built Vernacular Heritage[6], Mexico 1999.
f. Quebec Declaration on the Preservation of the Spirit of Place[7], Quebec 2008.
g. The Paris Declaration on Heritage as a Driver of Development[8], Paris 2011.

2. some existing legal regulations:
a. The UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage[9], Paris 1972.
b. The European Convention for the Protection of the Architectural Heritage[10], Grenada 1985,
c. The national programme for the protection of monuments and care of monuments[11] of June 2014.
d. Statutory laws and the resulting regulations.

3. of adopted sets of recommendations, prepared reports and sets of "good practices":
a. Recommendations for planning and implementing digitization projects in museums[12].
b. The programme of digitization of cultural goods and collecting, storage and sharing of digital objects in Poland 2009-2020.
c. The European Commission recommendation on the digitization and on-line accessibility of cultural material and on preservation of digital sources.
d. Reporting poll addressed to museums by the National Institute of Museology and Collection Protection in 2014.

In the following part, we shall discuss the findings and the documents cited above in paragraphs 1 and 2. Recommendations and documents listed in section 3 refer in detail to the use of information technology in the protection of heritage at the operational level, their implementation being assumed as certain. Therefore, the author was limited to mentioning them, without analysing the texts in detail at this point.

1.1 Adopted international doctrinal documents and principles

The adopted doctrinal documents relate to the findings of specialized bodies and provide substantive background for considerations. They have been designed for universal application, hence their level of generality. However even at this level, one can find references that justify the need for action on the introduction of information technology to the area of documentation, monitoring and management of the heritage of wood architecture. Reading these documents in this regard, one can find a lot of guidance on important aspects of

[3] So-called "Kraków Charter" was established as a result of the findings of the International Conservation Conference in Kraków "Kraków 2000" and its plenary session of *Cultural Heritage as the foundation for the development of civilization*. It has not been adopted as an official document of ICOMOS, but in the face of 50 years that have elapsed since the adoption of the Venice Charter, it constitutes its significant expansion and upgrade in the context of civilization and cultural changes, according to Information Circular of art conservators, vol. 11, No. 4 (43) 2000.

[4] ...The principles adopted by the General Assembly of ICOMOS in Mexico in 1999, according to[http://www.international.icomos.org/charters/wood_e.pdf]access 16.01.2015.

[5] The rules adopted at the 11th ICOMOS General Assembly in Sofia in October 1996.

[6] ...The principles adopted by the General Assembly of ICOMOS in Mexico in 1999, according to[http://www.international.icomos.org/charters/wood_e.pdf]access 16.01.2015.

[7] The declaration adopted at 16th ICOMOS General Assembly in October 2008 in Quebec, according to[http://www.international.icomos.org/quebec2008/quebec_declaration/pdf/GA16_Quebec_Declaration_Final_EN.pdf] access 16.01.2015.

[8] The declaration adopted at the 17th ICOMOS General Assembly in November / December 2011 in Paris, according to[http://www.international.icomos.org/Paris2011/GA2011_Declaration_de_Paris_EN_20120109.pdf], access 16.01.2015.

[9] The Convention adopted in Paris on 16.11.1972 by the General Conference of the United Nations Educational, Scientific and Cultural Organization (UNESCO) at its 17th session, according to the Official Journal of 30.09.1976. It applies to the whole heritage, although it is mainly associated with the establishment of the World Heritage List including the most significant and valuable objects, groups and areas (both cultural and natural).

[10] Council of Europe Convention adopted in Granada in 1985, ratified in Poland in 2011, which entered into force on 01.03.2012. [http://www.coe.int/pl/web/conventions/full-list/-/conventions/treaty/121] access 2015.

[11] National Programme adopted by resolution of the Council of Ministers No. 125/2014 of 24 June 2014.

[12] Galas, Daniela (ed.), *Zalecenia dotyczące planowania i realizacji projektów digitalizacyjnych w muzealnictwie*, National Institute of Museology and Collection Protection, Warsaw 2011. Study prepared by an expert panel appointed by the National Institute of Museology and Collection Protection composed of: Eryk Bunsch, Piotr Jamski, Tomasz Kalota, Lidia Karecka, Marcin Kłos, Anna Kuśmidrowicz – Król, Jacek Marciniak, Cezary Mazurek, Robert Sitnik, Marcin Szala, Marcin Werla, Tomasz Zaucha.

heritage protection, implying expectations with regard to the tools used even if they arose long before the advent of these tools. Such analysis makes it possible to indicate the key problems whose solution can be facilitated by appropriate use of modern information technologies.

The Venice Charter

According to the wording of the Charter, the use of new technologies (including probably also those related to knowledge management) is fully legitimate and desirable as making significant contribution to the conservation and restoration of monuments (article 2).

In the present state of saturation of social and cultural environment with information technologies, maintaining the continuity of historical monuments (article 4) requires the use of tools that enable effective communication with other participants in complex processes which are the essence of conservation and protection of monuments.

The demands of documenting any action related to monuments (article 16) imply the need to have tools for effective management of an increasing resource of documentation. Analytical and critical nature of the collected reports requires a different approach in terms of data collection and management. Archived illustrative materiał is today far more widely understood than drawings and photographs, since they are all representations of historic buildings, including those created with the participation of information technology. Another important issue is the question of access to the accumulated knowledge, because in this area the most noticeable improvement has occurred thanks to the development of information technologies.

Kraków Charter

Already in the preamble to the Charter, there appears a reference to the aspect of heritage management in the context of community tasks, in this case carried out by its members and the state. It is clear that implementation of these tasks requires the use of appropriate tools, including – at the operational level – applications and systems using the potential of information technology, thus meeting called postulate of flexibility towards ongoing changes, which also applies to the heritage.

Drawing attention in Article 1 of the Charter to the important role of preventive environmental conservation and ad hoc conservation of monuments implies the need for appropriate measures for the implementation of these demands, and link with the socio-cultural context, due to its dynamic nature, requires equally dynamic analysis tools. An equally important issue is the provision of knowledge about the heritage created in the belief that it is not only the transfer of a steady state of affairs, but also a contribution to the development of awareness of its importance, including a potential discovery of new facts and meanings. Protection of material recordings of the state of knowledge and sharing them is of fundamental importance here. These aspects can now be effectively implemented using information technology.

Underlining monitoring and control as key elements of conservation and repair of monuments (Art. 2), and therefore their protection, also requires the use of appropriate tools so that the process be carried out continuously, in an effective and efficient manner. The capability of multi-dimensional matching and collating gathered data provides opportunities to anticipate risks and effectively prevent them.

The process of creating and implementing conservation project, cited in Article 3 of the Charter, based on interdisciplinary knowledge and requiring coordination of specialists from different fields also requires tools to support this complex process.

Article 11, relating to complex structures, which are historical cities, essentially appealing to the dynamics of change also applies to smaller teams, particularly in situations of social interaction. Risk identification and prevention of undesirable situations can also be well-facilitated by the use of appropriate systems.

Principles for the Protection of Historic Wood Buildings

The recommendations referred to in point 1 of the Rules, on careful documentation refer explicitly to the methodology of conservation activities; important is the methodology of actions, including a wide and interdisciplinary range of collected information. This type of resource, comprising the components of ”quiet knowledge” requires the use of tools for linking collected information with each other as well as to facilitate recording their knowledge in a manner useful for further analysis and planning of activities.

Multifaceted and in-depth analysis mentioned in point 2 will be the more effective, the wider the range of relevant data will be collected and the more efficient the tool for integrating and presenting the information will be. Records at this point clearly indicate the need to develop and use such tools / equipment.

Regular monitoring of wood structures (section 3) can also be carried out on the basis of more and more advanced technologies, and the results of examination, expertise, especially measurements can be easily collected as part of a dedicated system.

The activities described in section 8 of the Rules, indicating a need for very accurate records of deleted historical items, may be to some extent achieved by the use of tools for creating representation of these elements (or their original state without deleting them), which can be used in the proposed application. It does not replace the practice of diligent cataloguing and, if possible, preservation and storage, but it can greatly help.

Similarly, as above, in the case of intervention described in paragraph 11, that is new supplements, in addition to physical activity discreetly informing about the provenance of the introduced elements, one can mark them in the documentation. This documentation, if it takes a form of a three-dimensional digital representation of an object, can greatly facilitate the identification of new additions.

Means and preservative techniques used at a monument should be monitored, as indicated by point 14 of the Rules. In view of the multiplicity of ways to prevent the destruction of wood, possession of tools to help monitor would facilitate analysis consisting of compiling together information on the event, the behaviour of the wood, its properties, conditions in which it is located, and the means used, together with their essential features.

Principles for the Recording of Monuments, Groups of Buildings and Sites

In the section: *Conditions of inventory* in section 3 of the Rules, a number of situations were identified when it is necessary to build inventory documentation that would meet conservation requirements (therefore quite precise). Meeting these demands requires efficient management tools, also in an aspect of allocation of inventory actions taken in time, as they are taken repeatedly with respect to the same object, although often to a different extent.

Cited in the chapter *Responsibility for inventory*, point 2-4 complicated nature of works and their interdisciplinary nature (often incorporating specialists from highly computerized fields) require tools that will ensure coherence of the results of works carried out, both at the stage of conducting and recording.

The necessity of a reliable query before starting the inventory (Chapter *Inventory planning*, point 1 and 2) is associated with the implementation of a number of labour-intensive and time-consuming tasks. Suitable system for collecting information about a historic resource, both in terms of its documentation (current and previous inventories) as well as the associated information related to a broad context (cited archives, bibliography, people and organizations associated with the object), would greatly facilitate works prior to preparing an inventory of an object. This is particularly important in a situation where you cannot afford long-term preparation, for example in the case of an emergency to a facility. Although the cited document dates from 1986, we find here a direct reference to "new technologies". From today's point of view, they may include a much wider range of applications than it was in the time of creation and adoption of the *Rules*, for example, the collected data management systems.

Mentioned in the chapter *Contents of documentation* (point 1), references to other sources of information can be most effectively implemented within an appropriate data collection system based on information technology. In fact, the simplest form is hypertext, or text with references to other texts. It is a basic operation principle of www websites on the Internet[13]. The same is true of a need to identify these references in an inventory already made.

The whole section of the Rules relating to the management, sharing and dissemination of information points to the need for using information technology, applications and systems appropriate for all tasks associated with inventory already made. The need to secure storage of documents and copies thereof may be realized by keeping them in a digital form, in which the original is no different from the copy[14]. Recommended sharing and dissemination is feasible using appropriate tools, it is also easier to control access to information, as only an elected scope of documentation can be accessible to the public. The potential of information technology in this field is literally indicated in point 6 of that section.

[13] In fact, Tim Berners Lee and Robert Cailliau started to develop at the European Organization for Nuclear Research, CERN a project called the World Wide Web only in 1989, which is three years after the adoption of the cited *Rules*.

[14] It does not change the fact, however of good practices of storing analogue copies of the documentation due to the sensitivity of digital documents, resulting, inter alia, from interdependence with the infrastructure - both software and hardware, as well as the ease of erasing the file.

Charter on the Built Vernacular Heritage

Chapter *Principles of Conservation* (point 5) of the Charter points to multifaceted connections of vernacular (folk) heritage with the context, including the intangible heritage. A record of such networks can be greatly facilitated by using the appropriate tools, the most advanced use of the concept of the semantic web, associating units of information containing content semantically close.

The highlighted in the chapter *Guidelines in practice* (point 1, 3 and 7) the need to analyse the form and structure of the building is associated with the requirement of archiving carried out in such a way that it can be easily accessible. The use of information technology offers such potential. Dealt with in point 3 a need to preserve and continue the traditional performance techniques, even though made for centuries on the basis of verbal communication, it can also be, thanks to modern possibilities, written in an understandable and communicative way, easy to store and transfer. The message can be supported by means of media so as to further secure the continuity of traditions in this area. The data stored in an electronic form, can potentially serve as a base for training materials and information, while suggested creation of regional networks to exchange experience and knowledge may also relate to the creation of such conditions that this knowledge accumulated within the information systems could be freely exchanged between them on the basis of social networking sites. In other words, it is important here to indicate standards both for description, recording and exchange of information.

Quebec Declaration on the Preservation of the Spirit of Place

Indicated in item 1 of the document, multithreading and diversity of characteristics of the spirit of a place enriched by equivalent substantive intangible heritage requires a systemic approach to the gathering of knowledge internally coherent and cross referenced. Delicate, sometimes difficult to grasp nature of relationships and contexts, is here defined as one of the primary features describing the spirit of a place. Recording such complex relations, not necessarily expressed explicitly, requires the use of tools using the latest achievements based on semantic networks previously mentioned, containing multifaceted relations among the information gathered.

Point 7 of the Declaration refers directly to digital technologies, however it should be noted here that the mentioned low cost of creating and sharing multimedia content becomes a reality when systems of publication and dissemination of knowledge use the resources accumulated during the operation of institutions, for example using appropriate systems and applications to manage and monitor the historic resource. In the opposite case, a significant part of the expenditure must be incurred twice, which is not economically justified. It should be noted that information systems supporting management and monitoring should be a priority action, as the digital content produced in the course of their operation may be used for the purpose of dissemination and education, which is much less likely in the reverse action.

Indication in Section 8 of the importance of aspects of communication and exchange of information in the process both of preservation and maintaining and developing the spirit of the place as a desired value remains inextricably linked with the use of electronic communication.

The underlined in section 9 of the Declaration role of education and dissemination of knowledge about the heritage in its richness also requires the use of information technology, cited here again directly. Even if a system serving internal goals of a unit (museum, open-air museum) is used, the successfully gathered information can be used to create the mentioned educational programmes, knowledge bases, websites, etc.

Another point – 10 – points to the need for such a collection of information within the institution's work, whose job is to protect the heritage (including all intangible) that it could be possible to replace them. Ensuring interoperability of data sets is a condition of their movement, both in the context of broad access, as well as specialist consultations. It should be noted that a total standardization seems impossible and impractical, however designation of certain basic areas of harmonization is essential and has already been partially accomplished (the introduction of standards of description and of format). It is important to find reference in the text of young generations as recipients of the communication on tangible and intangible heritage. It is connected with the formulation of a right message, which must be (at least partially) created using information technologies.

The Paris Declaration on Heritage as a Driver of Development

The approach consisting of perceiving historic architecture, especially wood as a source of inspiration requires collecting all data documenting its nature, both in terms of materials, such as techniques, spatial disposition, function, form, and the accompanying elements of intangible heritage (point 2 *Declaration – Return to the art of building*). Thus collected material, properly selected and developed, should be shared as widely as

possible using modern communication tools. Traditional methods of publication are in this area far less effective (though for obvious reasons should not be abandoned).

In point 3 of the Declaration (*Tourism and Development*) the need to create tools for collecting data on tourism is indicated. Managing large amounts of data relating to the use of historic resources (in open-air museums, the number of visitors of individual monuments, daily and annual distribution of visits, influence of the number of visitors on the condition of the building, analysis of the economic impact of tourism) requires properly prepared applications to be integrated with the process management and monitoring, and sometimes (e.g. the analysis of the risk posed by a large number of visitors) to be part of it.

This passage of the Declaration in a later part refers critically to any unauthorized and unjustified heritage factual interpretation that might overshadow with its attractiveness the authenticity value. It seems that only ensuring the widest possible access (properly developed and reliable) to knowledge, preferably at its source, can be a tool for the right – in this context – interpretation of such messages. That broad access is also a function of the used tools and techniques, including the possibility of multipurpose use of the collected data.

Just as in the statements of the Declaration of Quebec City, here also one can find a direct reference to the use of information technology and new media. It refers to the domain of education and dissemination of knowledge about the heritage. In the context of the problem undertaken in this text, it is important therefore that this educational content, which constitutes the content of cultural transmission, be based on reliable data. These in turn, in order to be effectively made available, must be collected using modern management techniques, knowledge and appropriate tools, including applications.

Cited in paragraph 5 (*Stakeholders and capacity building*) statements of the Declaration refer directly to the tasks that research centres must face in order to create tools to monitor the status of the architectural heritage, its values – including the economic ones – with respect to generate tourist traffic. Taking such actions is aimed at heritage capacity building as an engine of development, not as a difficult burden. These very general goals must be achieved by taking a wide range of activities, including at the operational level, enabling to build on added value.

1.2 Selected legal regulations

The UNESCO Convention on the Protection of the World Cultural and Natural Heritage

The statement, which is found in Art. 5 of the Convention, that heritage and its protection should be incorporated into comprehensive planning programmes to ensure them a place in the collective life implies the use of new technologies in management, as they are gradually introduced in all the vital areas of functioning of state organisms. A similar interpretation can be adopted for appropriate measures enabling monuments protection services to implement their tasks.

Later the art. 5 lists a whole series of actions concerning the heritage that should be pursued by all available and possible measures, including technical, which can also include the use of information technologies. Any action to undertake research and provide education in the field of heritage protection, mentioned in the Convention, is significantly aided by facilitating access to information about heritage. This information, generated at the source, which in the case of architectural monuments are the very objects, can be effectively communicated using these information technologies.

The European Convention for the Protection of the Architectural Heritage

Mentioned in article 14 of the Convention need to establish systems for exchanging information about heritage is undoubtedly a prerequisite for the use of modern techniques and the introduction of knowledge management systems to facilitate this exchange.

The demands stated in Art. 15 (development of public awareness, pursue of a policy of disseminating information, stimulating the interest of society) imply the need to explore the possibility of promoting awareness of heritage by using modern electronic media. Even when used as a tool for monitoring and managing, applications and systems will not directly serve such a role, it is the accompanying need for digitization of materials that will facilitate their dissemination both as widely-available and a specialized source of information.

Mentioned in Art. 17 methods of protection of monuments (including their inventory) are uniquely associated with new technologies, both relating to information retrieval, management and promotion of awareness of heritage.

The national programme for the protection of monuments and care of monuments for the years 2014-2017

This programme is discussed quite extensively due to the fact that it is the most modern legal regulation relating to the wider protection of monuments in Poland. Its first part is an analysis of the existing situation, carried out in three areas: organization and tasks of protection of monuments, condition of the monuments – the role and importance of forms of protection of monuments and systems of information about monuments and communication, understanding and cooperation in the field of protection of monuments in Poland.

In the National Program (Area 2: The condition of monuments in Poland - the role and importance of forms of protection of monuments and monuments information systems, point e) there is a reference to spatial information systems implemented by the use of advanced information technologies (as the implementation of the INSPIRE Directive). They fulfil a dual role: they facilitate management and promote knowledge of monuments. These solutions are in the process of introduction on a national scale, their counterparts on a smaller scale – for example of a museum / open-air museum can – and should – play a similar role.

Cultural Heritage, as indicated later in the Programme (Area 3: Communication, understanding and cooperation in the field of protection of monuments in Poland point a) carries a potential for social development. The condition for recognition of heritage in this context is continuously raising awareness of monuments. Not to be underestimated is the activity of museums here, including open-air museums. It should also be noted, however, that this activity should also include modern methods of communication and dissemination of knowledge.

Important in this context is also a reference to the local culture, which fits directly in the theme of architectural folk, vernacular heritage.

In another passage of the Programme (Area 3, point B) there is shown a link between the perception of heritage with the necessary means of efficient information infrastructure. It is also in this context that modern information technologies, including in particular the Internet, are depicted as more and more common content transmission channel. Preparation of the content in other tasks such as management and monitoring, makes it much easier to meet these demands. The use of efficient solutions that are compatible with systems of publication, is also important from the point of view of necessary control over published content.

The programme also refers to the need to facilitate access to heritage. This applies above all to the potential interaction with monuments *in situ*. In addition to indirect, potentially positive effects of the introduction of modern solutions for resource management and monitoring (efficient protection, and therefore a greater chance of preservation for future generations), it is possible to introduce solutions that help this interaction on the spot on the basis of multimedia technologies and modern ways of communication.

The above-mentioned portions of the document relate to the analysis of the existing state and conditions. Specific guidelines are reflected in the tasks identified for implementation in the years 2014-2017. The programme defines the main goal: *Strengthening of the role of cultural heritage and protection of monuments in developing cultural and creative potential of the Polish people and three specific objectives:*

1. *Supporting system solutions for the protection of monuments in Poland.*
2. *Strengthening the synergies of operation of monuments protection authorities.*
3. *Creating conditions for active participation in culture, education for cultural heritage and its promotion and reinterpretation.*

In the three specific objectives appropriate courses of action have been indicated. Below are listed those that specifically determine or justify, directly or indirectly, activities related to the use of information technology:

- *Increasing the efficiency of the management and protection of monuments through the implementation of infrastructures for spatial information about monuments.*
- *Developing standards allowing for a better flow of information between the protection of monuments and communities living in the vicinity of protected monuments.*
- *Promoting awareness of the social function of cultural heritage as the basis for national identity and local communities.*
- *The promotion of heritage resources via the Internet.*

  In the case of the latter course of action it seems appropriate to also cite tasks that form its part:

  1. *Digitization and on-line publication of information about the monuments listed in the register of monuments.*
  2. *Providing information about sights on mobile devices to enable planning tourist trips.*
  3. *Development and maintenance of a digital repository that stores and publishes on-line digital images of monuments.*
  4. *Allowing the public to interact with the information about the monuments, assess their conservation status and management as well as providing information on potential risks or destruction.*
- *Increasing access to the heritage resources and facilitating its public perception.*

Statutory laws and the resulting regulations

The necessity to gather and share information on cultural property, including heritage, is highlighted by the applicable laws on museums[15], monuments[16], archive materials[17] and published on their basis regulations[18]. In principle, all the mentioned documents also point to the need to exercise proper care of resources, including conducting monitoring of the status and proper management. Indirectly, the importance of an efficient flow of information in this area is also shown in other regulations, such as the Spatial Planning Act[19]. Both the first of these objectives, relating to information heritage and the need for immediate protection, cannot now be fully and effectively implemented without information technologies. Recalling at least one argument in support of that thesis one can specify a report on the level of computerization and networking of the Polish society[20]. If in fact the share of the Internet as a digitally conditioned communication channel has significantly increased – it should be taken into account when preparing the content of information relating to heritage so that it can be easily passed through this channel. This concerns not only the issue of popularization, but also professional activities in all areas related directly and indirectly to the protection of heritage.

2. The current state of using applications for monitoring and managing historic resources

In this part of the text were generally examined applications used in Polish museums and Ryfylke museum in Norway. At the beginning it should be noted that the majority of Polish museums do not use any such programme[21], while those that do, use software dedicated to handling collections consisting of movable monuments, destined for museums. As the market for this type of service is relatively small, the number of applications for this type of action is also not high: there are practically two: Musnet and Mona. Next to them we will also discuss a dedicated application for immovable monuments, even though it is not currently used in any of open-air museums.

2.1 Musnet System

The system is designed to support activities related to cataloguing and management of exhibits – generally movable monuments. It is used in four of the open-air museums in Poland, to develop both immovable and movable monuments resources[22]. It was developed by Ontia company (formerly Infogenia). The system is based on an activity of a relational database, it can interact with the server MySQL or MS Access. It operates on the basis of client-server architecture. The data are stored in tables using the XML format.

The basic unit of information in the system is a card. Mmonument cards are organized within a data structure, presented at the user level as collections reflecting the organization of exhibits (e.g. relating to museum sections). In addition to monument cards containing descriptive information we have in the data structure cards describing participation of exhibits in events, the very events and with lexical cards. Cards can be assigned to files, e.g. containing graphics, such as scanned images or photos. They are then in the logical structure of the system within the so-called repositories. These are relevant tables in a database containing references to files stored in any accessible location (in a particular case as objects in a database of the Musnet programme).

[15] Act on Museums of 21 November 1996, Official Journal of 1997. No. 5 item 24, as amended.

[16] The law on protection and conservation of monuments of 23 July 2003, Official Journal of 2003 No. 162 item 1568, as amended.

[17] The law on national archive resources and archives of 14 July 1983, Official Journal of 2006 No. 97 item 673, as amended.

[18] among others *Regulation of the Minister of Culture and National Heritage of 26 May 2011 on keeping the register of monuments, national, regional and municipal register of monuments and national list of monuments stolen or exported abroad illegally (Official Journal of 2011 No. 113 item 661); Regulation of the Minister of Culture of 30 August 2004 on the scope, form and method of registering monuments in museums (Official Journal of 2004 No. 202, item 2072); Regulation of the Minister of Culture and National Heritage of 2 September 2014 on protection of museum collections against fire, theft and other dangers threatening the destruction or loss (Official Journal of 2014. Pos. 1240); Regulation of the Minister of Culture and National Heritage of 14 October 2015 on carrying out conservation, restoration works, construction works, conservation research, architectural activities and other activities with relation to monuments from the register of monuments and archaeological research and search for monuments (Official* Journal of 2011, No. 165, item 987).

[19] The Law on Spatial Planning and Development of 27 March 2003 (Official Journal of 2003 No. 80 item 717, as amended.

[20] Szymanek, Violetta (ed.), *Społeczeństwo informacyjne w liczbach* (transl. Information Society in numbers) *2014*, the Ministry of Administration and Digitization, Warsaw 2014.

[21] According to a report by J. Uścinowicz within the framework of the project "Documentation and monitoring in managing wooden objects in Krzysztof Kluk Museum of Agriculture in Ciechanowiec and Ryfylke Museum, to 16 analysed open-air museums only 6 use a dedicated historic resource management system.

[22] According to the report mentioned in footnote 22,f the Musnet system is used in: Upper Silesian Ethnographic Park in Chorzów, Opole Village Museum in Opole, the National Museum of Agriculture and Agri-Food in Szreniawa and Museum-Kashubian Ethnographic Park in Wdzydze Kiszewskie.

A monument card refers to information about the catalogued object; this information consists of descriptive data in accordance with relevant laws and regulations[23] and is stored with the programme's support tools such as dictionaries or event log. Apart form those data, there are also links to information collected in databases such as bibliography database or attachments.

The basic view is the main index of cards presented in tabular form with all the information about the catalogued objects. Its variants are user-defined sets (subsets of cards grouped by the user, created according to criteria based on searching for information in the fields of the database or manually), and search (using criteria based on the contents of one or more fields). Each of these views can be stored by the user as a template, so it is possible to operate on pre-defined sets of cards, for example, in the case of a group entry. The user has the possibility to organize these sets in groups and manage them. A functional variant based on specific search criteria is a list of all cards removed from the system (this option allows you to trace the history of non-existent objects, also in the records of actions taken and their characteristics, which may be important in the context of a current resource management).

Each of these tabular views can be sorted using criteria based on the contents of the fields.

Data about objects – cards – in the system are organized into sections. Such action is highlighted with an appropriate lexical entry, which must be in the structure of the card. The structure of sections is in a form of a hierarchical dictionary. Each section can be assigned to a correct form of a card – its content and data organization.

The system offers functions relating to the management of historic resources. These include a record of events that relate to the exhibits or where exhibits may be involved, such as exhibitions or conservation. It is possible to trace current events as well as detect collision (multiple events potentially related to the same object, for example conservation and rental) or irregularities concerning objects (e.g. not returned on time).

Each of the defined event has its own card, which defines its parameters (mainly the time span, information on the nature of the events, people involved in it). The system allows management of events by displaying them in the appropriate combinations (for example a list of items borrowed and not returned on time), as well as colliding events. This last feature allows you to manage large collections and avoid situations when, for example rental is planned, while the facility is currently undergoing conservation.

Dictionaries are stored in the system in a form of sets of entries or as dictionaries-bases (for example a dictionary of exhibitions, in which exhibits participated, which includes not only entries, but also the entire set of data relating to those events). Dictionaries with entries have an option to save a note-definition relating to the entered entry. Recording structure of dictionary entries is hierarchical, which allows you to organize entries, such as addresses or materials.

The system offers possibilities of searching cards: simple (using different user-defined criteria) and complex, giving the possibility of formulating multi-condition queries about any field of the card, connected by powerful logical operators. Thus built queries can be modified by temporarily shutting off parts of conditions. There is a full-text search engine based on an index basis updated on a regular basis when creating new cards.

The system offers the ability to create paper documentation in terms of both the cards and their respective sets. Each of the methods of printing gives you the opportunity to shape the appearance by editing appearance templates available in the system.

These programmes always preserve data security by protecting access to content (user name / password and the history of logging into the system and expanded event log), also offering varying levels of user rights. Such entitlements can be attributed to both individual users and their groups. Groups are assigned to sets of permissions for data editing and at the level of programme features, as well as an additional level of access to various databases. Creating user groups is done by saving combinations of these settings: access to databases (sections), fields in the cards and functions (for example, you can give permission to edit only parts of card field in a specific section of the museum, leaving cards in other sections only for inspection).

All sets of entitlements and user groups can be saved as an XML file in order to be transferred to another system. The system also allows you to restrict access to the database at the level of client stations (optionally, one can define only those computers, where after starting the client programme, one can use the system).

[23] In particular, under the Act of 21.11.1996 on museums (Official Journal of 1997. No. 5, item 24; 1998. No. 106, item 668, 2002. No. 113, item 984, 2003. No. 162, item 1568 2005. No. 64, item 565, 2007. No. 136, item 956) and Regulation of the Minister of Culture of 30 August 2004 on the scope, form and method of registering monuments in museums.

2.2 Patrinet System

This system is based on similar principles of action, as described earlier Musnet[24]. The difference is its purpose: it is dedicated to cataloguing immovable monuments. The system, according to data collected is not used in open-air museums in Poland, but it is worth mentioning because of the subject area that it embraces – immovable monuments, particularly architectural, which include objects of wood architecture in open-air museums.

The difference between the systems Musnet and Patrinet relies on other sets of data collected, and hence other fields in monuments' cards. They contain additional information concerning matters relating to: location of the monument (addresses, numbers of mortgage books, descriptions of the location), works carried out at a monument (in terms of their general description) and data specific for buildings (area, volume etc.). The card also contains information about inspections (audits) of the building.

The range of information is consistent with the relevant regulation[25] on this subject (with a few exceptions, such as the lack of the field for saving geographical coordinates).

Each building also has an address card, compatible in principle with the relevant regulations of cards in the municipal register of monuments (GEZ)[26]. In order to ensure consistency with older studies, fields referring to the previous administrative division of the country were added.

Patrinet system also enables recording of movable monuments related to an immovable monument. The diagram and description rules are consistent with the rules applicable in the Musnet system.

2.3 MONA System

This system is used to operate museum collections, just as described earlier Musnet. It was originally developed by the Office of Information Services S-Soft, in subsequent versions in collaboration with Pentacomp Systems S.A. According to questionnaires it is used in two open-air museums in Poland[27]. Therefore, it is worth attention as the second, next to Musnet, operating system used in Polish collections of museum institutions dealing with historic wood architecture[28].

The system exists in two guises-versions, with different principles of operation. MONA-FB version is based on the concept of client-server database where the service takes place in a dedicated application run on work stations. A newer version, MONA-3W, uses a database running on the server, and the service it is done using applications run in internet technology, operating in the web browser. The manufacturer of the system also offers the program on a software-as-service basis, consisting in monthly subscription fee for the use of access to the server. The base is located on a server in the cloud, on the client side using the services is not required to install any software or buying and configuration of data server. This approach is part of a trend of offering "cloud services" in which data is stored on the server and the applications run in user's web browser or also on the server[29].

The system allows recording of exhibits in accordance with regulations, offering also possibility to combine them into groups-collections. Within the records, it is possible to take into account changes in the names, registration numbers and identification in the event of having to register previous data included in archive documents. The basic set of data is grouped in the card of the object.

The system is equipped with built-in dictionaries that can be edited, forming a flat (simple) or hierarchical structure of entries. These entries have their own cards, which can accommodate definitions or details of a description (for example, in the case of a person).

One can generate combinations of cards and their groups according to criteria specified by the user. The system offers advanced management features, ranging from systems to generate reports required by the Ministry of Culture and National Heritage and the Central Statistical Office, until the flow of information within the framework of performed tasks (electronic flow of matters and monitoring the process of digitization, acquisition,

[24] It is offered by the same company – Ontia, previously Infogenia.

[25] *Regulation of the Minister of Culture and National Heritage on registering monuments, keeping national, regional and municipal register of monuments and national list of monuments stolen or exported abroad illegally* of 26 May 2011, card pattern - Appendix 2.

[26] According to Annex 6 to the referenced Regulation of the Minister of Culture and National Heritage on keeping the register of monuments, national, regional and municipal register of monuments and national list of monuments stolen or exported abroad illegally of 26 May 2011.

[27] According to the report of J. Uścinowicz, op. cit., see footnote 20 and 21, MONA system is used in the Vistula Ethnographic Park Museum in Wygiełzów and Castle-Lipowiec and in the Orava Ethnographic Park in Upper Zubrzyca.

[28] According to information on the website of the manufacturer, the system is used in more than 100 museums in Poland, the full list: [http://www.jws.com.pl/mona/uzytkownicy.html], access 30.01.2015.

[29] Another issue is the safety and durability of data stored in such a way, this matter is beyond the scope of this text.

maintenance, etc.). Statements and reports can be generated for both selected part of the collection and for the selected time interval. Service of events related to the movement of objects has been expanded (exhibitions, rental, relocation). An additional function, outside monitoring of such events, is the service of documents related to the movement of monuments (rental agreements, licenses, records, receipts, copyright issues).
In order to manage a collection, MONA system offers the possibility to carry out an inventory. Activities associated with the list can be divided into smaller units, as well as spread out over time. An interesting option is to work with graphic codes (e.g. strip) or markings of RFID[30].

The software also allows you to record conservation works with a description of the state of preservation and the anticipated plan of works. There is an option of saving multimedia documents showing the course of works and their results. Prepared by the system documentation complies with the relevant regulations.
A powerful element of the system is a repository of files, including multimedia documents. In addition to indexing, identifying and describing via automatically generated metadata, there is also a possibility to manage copyright to these files and their contents, including generation of relevant license agreements.

Descriptions of data stored in the system are consistent with international and national standards: in particular, the Categories for the Description of Works of Art (CDWA)[31] for a description of exhibits; IPTC (International Press Telecommunications Council) Photo Metadata Standards: IPTC Core and IPTC Extension for descriptions of digital photos. Description of conservation works is consistent with the "Scheme of documentation of research, conservation and restoration works" developed by the National Centre for Research and Documentation of Monuments.

MONA media repository system when combined with selected descriptive data can be used to publish content on the Internet. This option is available from the system.

2.4 Primus system developed at Ryfylke Museum in Norway

Ryfylke museum uses a programme by the Norwegian company Primus KulturIT, which is used for the management of the museum. The system is currently undergoing final tests (spring 2015). One can use it to catalogue collections of both movable and immovable monuments. It is offered in a client-server version installed locally or as a service running in the "cloud", where both data and applications can be run on the supplier's server.
The system was developed in collaboration with Norwegian museums. Some of them are open-air museums, although outweigh those having collection of movable monuments.

The Primus has a module dedicated to immovable monuments, which performs the following functions related to monitoring and management of objects:

- recording basic catalogue data of a building,
- recording the current condition of the building, along with risks and damages, with the possibility of planning and assigning priorities to actions,
- recording full conservation documentation with history of actions taken,
- support for craftsmen works in the workfield,
- advanced search allows you to quickly find the desired information,
- full support for multimedia files, including video files,
- resource management support through: risk identification, ongoing monitoring of damage and saving the fact of their removal,
- introduction of checklists with inspections of objects.

The priorities of the system are: flexibility, gathering knowledge about the heritage and historic resource management. This is done inter alia by adjusting the application to be run on mobile devices. Ryfylke Museum is an open-air museum, in which buildings were not transferred to its territory, but they remain in their original locations. The result is a huge expanse of land and the need for access to information from any of the places where the monuments are located. The application is oriented to practically support professionals' works, including craftsmen making repairs in the workfield. One of its important features is a detailed recording of all damage that took place at the facility.

The main catalogue card of the building contains, among other things alerts about risks and damages (and their summary below basic information), list of works (actions) carried out to the building, assessment of the state,

[30] RFID - Radio Frequency Identification - a system based on miniature systems - transmitters, from which data can be read out by a machine--reader to identify the object on which the transmitters have been placed. In the system basic information about an item can be saved.
[31] A standard developed by J. Paul Getty Trust to describe works of art.

checklist and planning of works. There is a basic historical information (possible to develop in a detailed version) and a list of linked files (visible in a form of icons).
One of key elements of the building card, in addition to its core data is recording the state, current risks, as well as a history of actions taken at the monument. This information is located on the main page of the card of a building so that they are easily accessible. In addition, any registered risks are displayed in a visible alert.

It should be noted that adapting applications to be run on mobile devices increases operational efficiency for rapid registration of damage or – in advance – risks, which is the basis for monitoring. Each mobile device is equipped with a camera, so it offers a possibility of registration of a film. The system, having such functionality provides ongoing monitoring of the condition of buildings. This solution is valuable, even if it is done at the expense of the quality of recorded material (though the latter is getting better with the development of mobile devices). Another aspect of multimedia recording options is the ability to save specific notes allowing to register tacit knowledge relating to traditional practices, techniques, using tools. This is possible because buildings that are under the care of the museum are in their original locations - where inhabitants cultivating these habits live.

Comparing the system implemented in Ryfylke museum with those used in Polish open-air museums, it should be noted that the first is oriented towards managing historic resources consisting of stationary objects, with special emphasis on processes affecting these objects, while the Polish solutions focus on cataloguing, offering process management tools primarily corresponding to the specifics of movable monuments (which is natural in the context of their purpose).

3. Digitization of monuments and the monitoring and management

When talking about the potential of information technology in the protection and management of architectural heritage, one cannot ignore the issue of digitization – in other words, saving the information contained in the sources relating to monuments[32] in a digital form. This operation is a prerequisite for the full use of possibilities of these techniques; in the absence of digitized material, recording is possible to be done in the system, practically limited to metadata (and possibly to materials originally produced digitally, such as pictures).

3.1 Digitization of heritage

Digitization – with respect to objects of architectural heritage, it should be understood as follows:
– introduction of digital methods of inventory so that these objects be have their representation in a digital form,
– digital archiving of existing documentation in order to facilitate its transmission and search,
– digital archiving of sources (or finding and associating relevant indirect sources available in a digital form).

Additinally – no longer being a digitization of the very resources – preparing in a digital form of new documentation not directly related to the representation of the object (project documentation) and the introduction of information technology in monitoring and managing the resource.

3.2 Digital methods of inventory of architectural heritage

Digital methods of inventory of historic buildings are those in which the representation of an object has been created using digital techniques, with only a small participation of traditional techniques. Those, however, always remain as a tool to support, necessary for each inventory (sketches or measurement notes have a raison d'ętre even when using the most automated methods of measurement).

It is a common practice (encountered to date) to use in inventory measurements analogue techniques (sometimes aided with simple measuring tools, such as laser rangefinders) and to use digital technology only to record the inventory results in a form of vector CAD files. Documentation prepared in this way is easy to disseminate and useful in the design process, however, cannot guarantee the highest precision, and the process of its preparation is laborious.

Among purely digital inventory techniques should be mentioned digital photogrammetry, where orthophotos are extracted from digital photographs (high-resolution raster digital documentation), using geometry transformations implemented by the relevant software. The result of this technique are orthophotos – photographs of

[32] As a source for architectural monuments, one can treat the very objects themselves (then as direct sources), and any data on them (treated as indirect sources), cf. A. Miłobędzki *Badania nad historią architektury* [w:] *Wstęp do historii sztuki* t. 1 *Przedmiot – metodologia – zawód*, PWN, Warszawa 1973, oraz P. Skubiszewski, *Dzieło sztuki a źródło historyczne*, tamże.

flat pieces (e.g. elevation) in an orthogonal projection. Shown elements are projected onto the plane of an image always at a right angle (differently than in classical photography, where the angle is different depending on the angular distance of the motif from the axis of the lens). Images thus obtained are a valuable, very precise description of the image of the monument, but it is a two-dimensional flat recording[33]. Their undoubted advantage is the possibility of precise[34] mapping of the colour of the monument.

Another technique are methods of terrestrial laser scanning, offering digital recording of a three-dimensional object. In the case of an architectural inventory, most often used scanners are the LIDAR type (using the method of time-of-flight – polar measurement of points' position in space) suitable for measuring large objects[35]. The result of scanner work is called a point cloud. Often, when the scanner is equipped with a digital camera, these points also have colour characteristics. It is a quasi-continuous representation of the geometry of a scanned object being, but without any topological distinctions – the only information beyond the spatial shape is the mentioned colour assigned to the point. Thus obtained sets (clouds) of points are very accurate representation, but in terms of use in the project documentation, repair and management, they are only the beginning of further action. These activities consist in processing such sets to a vector form. Of key importance here are optimizing algorithms built into dedicated for this purpose applications and methods for segmentation of point clouds. It should be noted that these operations do not take place fully automatically; in order to ensure the accuracy of measuring, human intervention is necessary. The data collected in the form of point clouds are also used in the dissemination of knowledge about monuments. One can use tools to present the geometry of an object with its colours on the Internet. An interesting example is the CUMULUS[36] project implemented by the National Heritage Institute. With this kind of actions, each user having access to the Internet and a web browser of a newer generation has the opportunity to see three-dimensional interactive presentations of historic architecture, which are based on clouds consisting even of several million points.

One of the latest trends in obtaining three-dimensional models of architecture is the use of SFM algorithms (Structure from Motion) and DMVR (Dense Multi-View 3D Reconstruction), used in applications available both as commercial solutions, as well as on the basis of open code (open-source) . These methods allow the reconstruction of a three-dimensional solid from a series of unordered images of the subject taken with a commercially available camera equipment without any additional costly accessories. These algorithms, largely automatically, make it possible to analyse the data contained in images and reproduction of the geometry of objects by comparing the position of the corresponding elements – of markers in relation to the read image directly from the camera parameters (position, type and settings of the optical system etc.). These methods are constantly being improved, their accuracy is also examined[37], even today, however, one may state that they constitute an interesting kind of low cost alternative to techniques for scanning surface, suitable in cases where speed is important, and low cost of the operation.

3.3 Methods of digital semi-automatic inventory

As already mentioned, the result of terrestrial laser scanning are point clouds without a topological (geometry) and morphological (elements and construction type of the building) identification. One can also obtain these models from measurements obtained in the process of inventory, but it requires ongoing interference in the course of action, namely control of measurement with a dedicated hardware and applications. Digital semi-automatic inventory is done by allowing the scanner to perform CMM measurements. On the basis of a distance and measured angles (horizontal and vertical) determined by a reflectorless EDM, calculations are made of positions of indicated points in space. The principle of operation is similar as in the case of terrestrial laser scanners, but the main action while using this type of equipment is for the operator to identify specific points

[33] It is possible to obtain a 3D model of measurements using the so-called stereograms, but the core product of digital photogrammetry are orthophotos.

[34] For inventory of objects of architecture, it is assumed that the size of an object pixel (i.e. the pixel size of a recording device projected on a plane of the photographed object) should be approx. 1-3 mm..

[35] Other types of 3D scanners are optical scanners: triangulation and structured light scanners. They are applied to scan smaller objects (at a scale of an architectural detail). Wider discussion of the principles of their operation and use goes beyond the scope of this text, they are cited here only for information.

[36] CUMULUS project is about creating a tool to visualize and manipulate point clouds themselves for the change of view – using a web browser. Information about the project: [http://www.zabytek.gov.pl/Nowosci/news.php?ID=2598} access 2.02.2015. From the point of view of the subject matter of this paper, it is an interesting fact that within the framework of this project are presented mostly historical buildings of wood architecture.

[37] See Koutsouras, Anestis et. al. *Multi-image 3D reconstruction data evaluation* [in:] Journal of Cultural Heritage, No. 15 (2014), ss. 73-79, where a comparison of that method was made with terrestrial laser scanning.

to measure and produce on their basis a topological 3D model in a dedicated application. This work is carried out simultaneously with works at the measured object using a laptop computer or a mobile device. Created representation has the hallmarks of the BIM model[38], where one can identify during works individual elements of the building and save them in the model as logical units. Such action leads to obtaining a comprehensive vector model of a database character, where you can identify and describe the different parts of the building.

Such action, however, requires a significant amount of work during the inventory, it is not automatic. This effort is all the greater, as the greater should be the precision of the obtained data. It is clear that we have to deal with the postulate of precision during the inventory of historic buildings, which require a solid representation of complex, often irregular shapes (especially wood buildings).

3.4 BIM and the monitoring and management of monuments

Each spatial digital model, at the elementary level, is a database organized in file read by the appropriate software. This can be a database of coordinates of points in space that with a dense mesh define the object's geometry, it may be a set of vectors generalizing to some extent this information. In models used in applications such as CAD, these data, however, refer mainly to the geometry of a building, rarely to its properties. BIM philosophy is based on the separation in the model, on the basis of object-oriented approach, of logical and spatial units corresponding to the elements or construction of a building. Each of these units has included multiple specific information, stored in the database. They can be exchanged between applications using standard recording of IFC attributes (Industry Foundation Classes).

If, therefore, there is a possibility to create a digital model of the monument in BIM standard[39], all information concerning elements of the building can be saved in a database of the model and used in its monitoring and management. Objects of wood architecture are particularly predestined for such approach, as it in their construction and spatial structure one can separate elements that can be adequately described by assigning to them adequate attributes. That description can relate to the diagnosis of the existing situation, risks, actions taken, recommended action or necessary intervention. What's more, at a certain generalization one can observe that in the BIM of a historic building one can record its vaporisation carried out at the level of construction or even elements of the building. Examples of characteristic data are: originality / integrity of an element (in the model, one can show the items listed), the state of biological corrosion (and thus the risk for neighbouring elements), taken specific preventive measures (e.g. using protective preparations in relation to these elements). The data can be appropriately visualized on a 3D model. This information, due to using IFC format, may be used in other applications, for example in applications for monitoring resources and resource management.

The problem is firstly the lack of a standard of such actions - from the methodology consisting in using an approach associated with building information modelling (BIM) to standards for recording information in the model database in the case of historic buildings. Secondly, we have to deal with the lack of such models for historic wood architecture. Third, as already mentioned, it requires a specific approach to create an inventory using digital techniques and the relevant operator accuracy, which cannot be fully automated.

On the other hand, an approach associating data with properly structured three-dimensional model is increasingly present in architectural design, it should also be anticipated that this trend will continue until the standardization that will define the requirements for project documentation. Then all project activities, including those related to monuments, will have to be executed in BIM technology.

3.5 Geographic Information Systems in the management of historic resources.

Geographic information systems (GIS) are used for the collection, processing and presentation of spatial data. Visualization of the data is made on a map presented within the system.

With the entry into force of the INSPIRE Directive[40] , government authorities have been obliged to spread in spatial information systems spatial data constituting a public register. This obligation also applies to protected areas and objects, including immovable monuments. Among the relevant statutory powers conferred upon the

[38] BIM Building Information Modelling, philosophy of an integrated system of information about the building combined with its spatial model.

[39] Assuming its accuracy so as to meet the requirements of inventory of monuments.

[40] Directive of the European Parliament and of the Council of Europe 2007/2 / EC of 14 March 2007. *Infrastructure for Spatial Information in Europe* entered into force on 15 May 2007. It concerns public access to spatial data, including protected areas and objects, both cultural and natural. In Poland, it is carried out in accordance with the Act on spatial information infrastructure of 4 March 2010.

Minister of Culture and National Heritage, is publishing data on immovable monuments (buildings listed in the register of monuments). The body responsible for the implementation of this task is the National Heritage Institute.

Although the activities carried out in the fulfilment of the directive may be regarded as dissemination, their importance should be emphasized from the point of view of monitoring and management of the national historic resource. Not to be underestimated is the role of social factor in this process, and universal provision of full and reliable information about the resource is of paramount importance here.

These data are presented on NID geoportal[41]. They cover both the resource of immovable monuments and archaeological sites. In beta version (as of October 2015), historic resource was visualized with its basic data, introducing further categorization of monuments (formal and functional division reflected by the shape of icons representing monuments and chronology visualized by their colour)[42]. Additionally, at different scale levels, a suitable generalization was introduced in order to make maps legible and avoid displaying of an accumulation of icons (fig.1- 4).

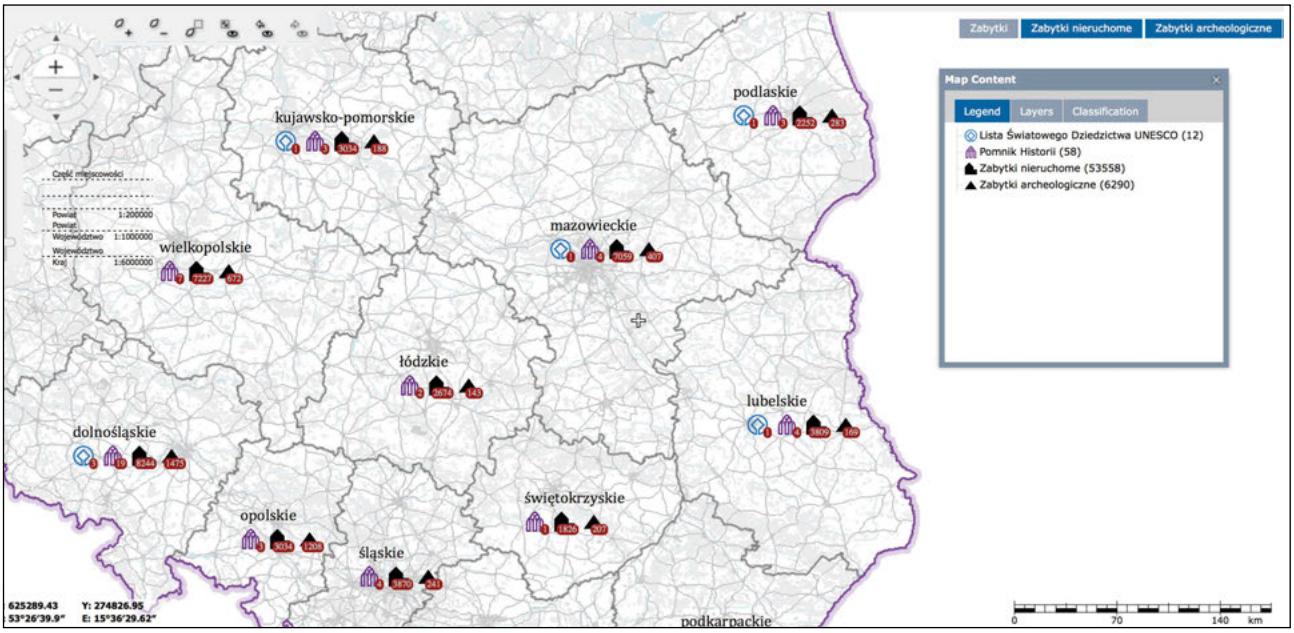


Fig.1. Visualization of information about monuments on a geoportal of the National Institute of Heritage – monuments in a part of Poland presented within the country. Icons represent the number of monuments aggregated at the level of regions divided into: objects on the list of UNESCO World Heritage, Monuments of History, immovable monuments and archaeological sites. Map is accompanied with a dynamic legend (changing depending on the contents of the map). Source: NID maps service, http://www.mapy.zabytek.gov.pl/nid/.

[41] NID map service available at [http://www.mapy.zabytek.gov.pl/nid/], 15.10.2015 r access. The author of this text was part of the team that on behalf of the National Heritage Institute was carrying out the mission: *Developing the concept and realization of cartographic visualization of immovable monuments on information portals of the National Heritage Institute.* The project was carried out by a team of Warsaw University of Technology academic employees: Anna Fiedukowicz, Andrzej Głażewski, Krzysztof Koszewski (coordinator from the Department of Architecture PW), Paweł J. Kowalski, Kamila Latuszka, Robert Olszewski (coordinator from the Department of Geodesy and Cartography PW), Leszek Włochyński in 2013 and 2014.

[42] More information on visualization of the historical resource on NID geoportal: Koszewski Krzysztof, *Visualization of Heritage-related Knowledge – Case Study of Graphic Representation of Polish National Inventory of Monuments in Spatial Information* [in:] Anetta Kępczyńska-Walczak (ed.), *Envisioning Architecture: Image, Perception and Communication of Heritage*, Łódź University of Technology, Łódź 2015.

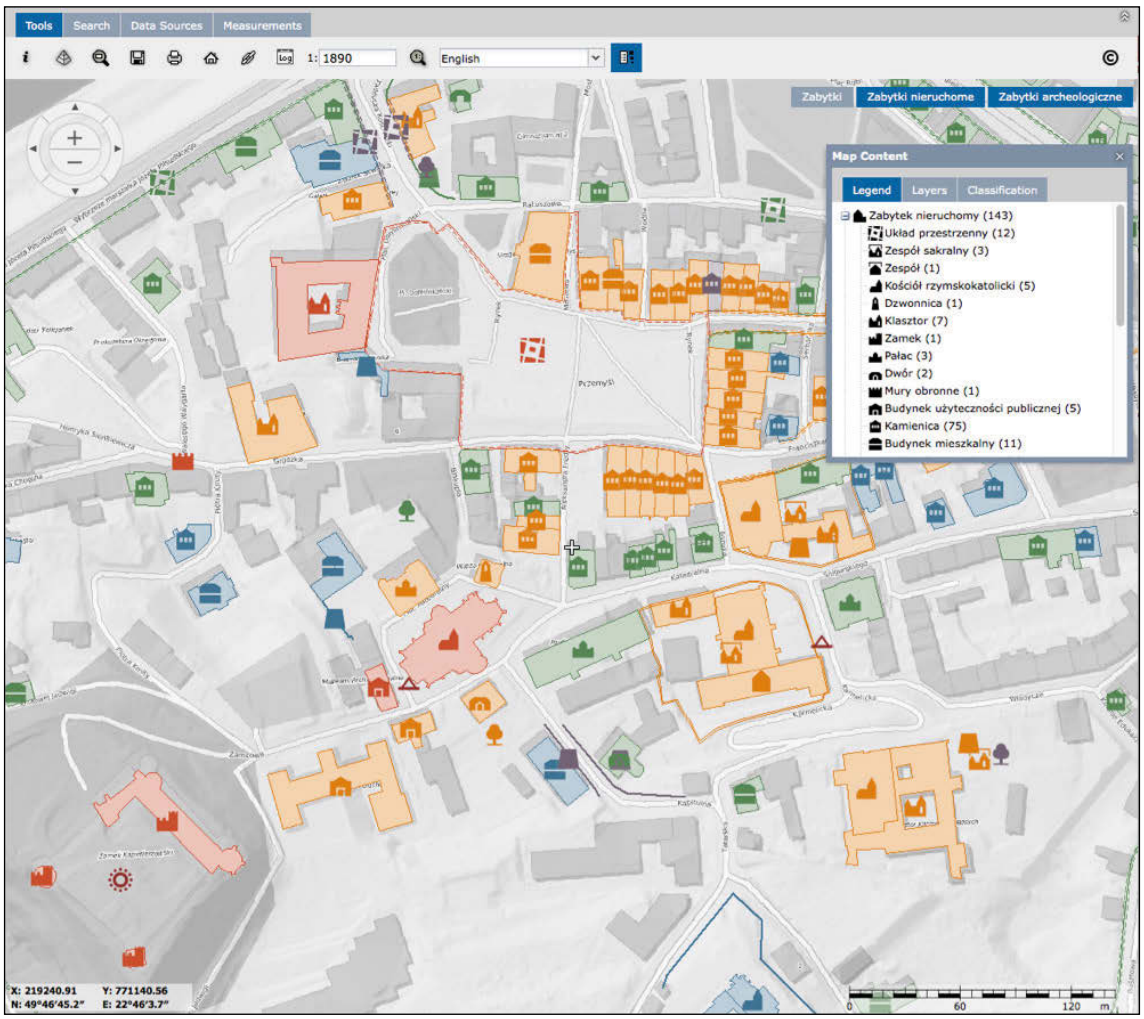


Fig. 2. Example of a visualization of information about monuments on the Geoportal of the National Institute of Heritage – monuments in the historical centre of Przemyśl, shown functional and spatial, and chronological categorization. Source: NID maps service, http://www.mapy.zabytek.gov.pl/nid/.

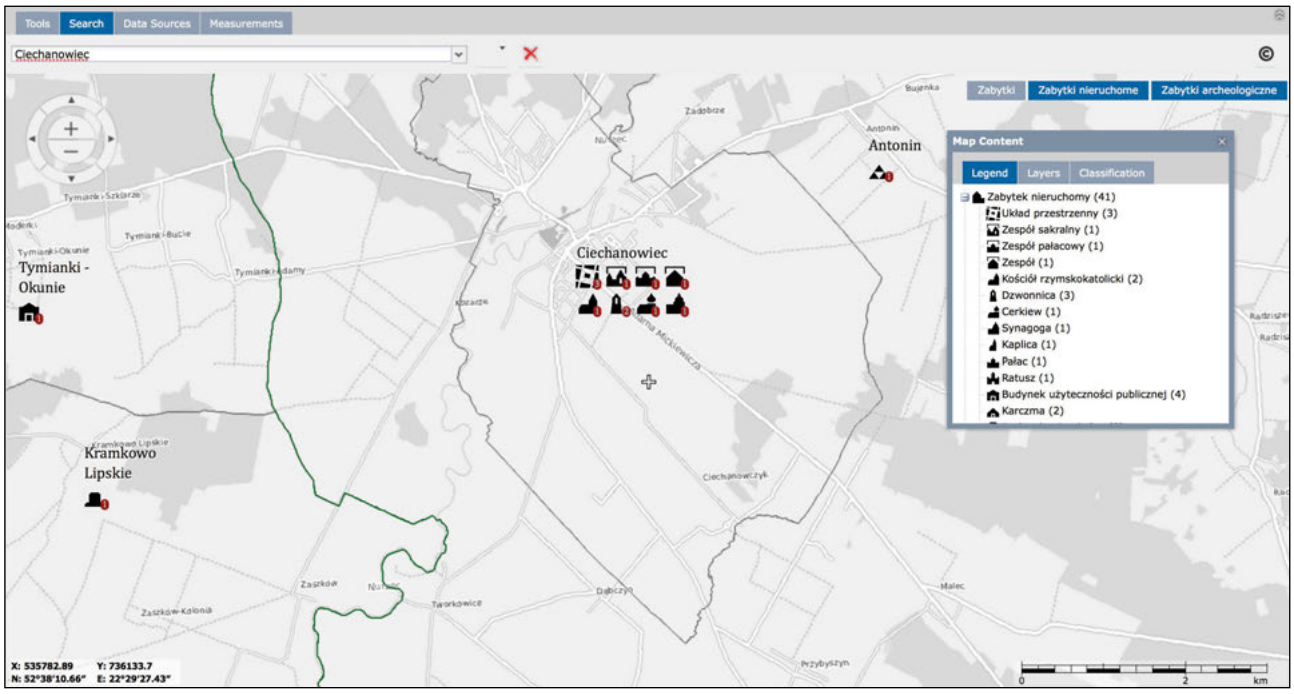


Fig. 3. Monuments registered in the area of Ciechanowiec on NID Geoportal, aggregated to a cartographic matrix, representing the number of monuments of that type in the area. Source: NID maps service, http://www.mapy.zabytek.gov.pl/nid.

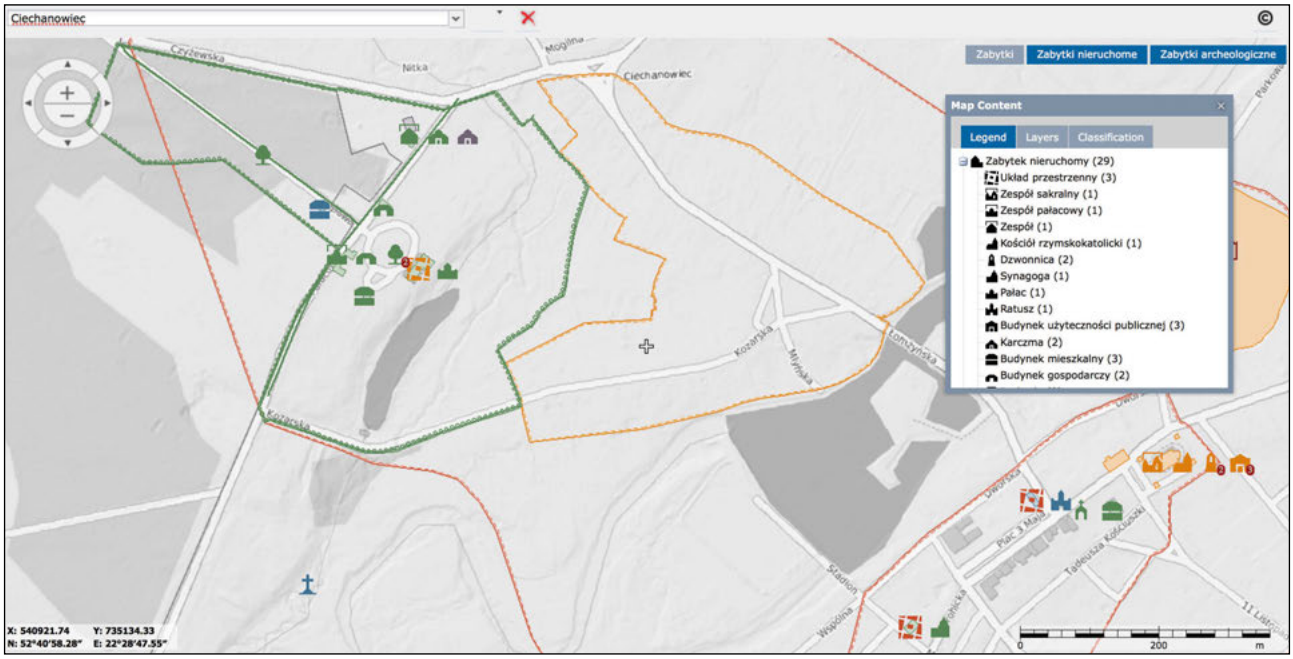


Fig. 4. Monuments registered in the area of the museum in Ciechanowiec on NID Geoportal along with a dynamic legend relating to the content of the map. For large scales of a map, icons representing monuments are located in areas relevant to their location. Source: NID maps service, http://www.mapy.zabytek.gov.pl/nid/.

The development of data concerning the historical resource and their publication on the Geoportal has certainly an educational significance. It should be noted, however, that GIS systems were also created with a view to supporting management, not only in the context of public participation, which was mentioned earlier, but also on a professional level[43]. Suitable spatial data compilation can enrich our knowledge, identify risks. Visualization of the historic resource in conjunction with relevant analyses of a digital elevation model (DEM, digital elevation model) can be used to describe, for example, the number of monuments at risk of floods and indicate the degree of the risk. Such a system, after determining the appropriate access rights can also serve as a platform for cooperation of experts, even in order to monitor the status of the historic resource, including basic issues such as timeliness of entries in the register of monuments. Working in the field can be facilitated by mobile applications (GIS systems typically offer such a possibility). In the case of the National Heritage Institute Geoportal such application has been developed for education, in order to present information about the monuments. Mobile devices equipped with more accurate location systems facilitate filtering data so that the browsing person can easily find information about monuments in the vicinity.

An example of the application of GIS systems to monitor and manage a museum is the The Museum of King John III's Palace at Wilanów[44]. Although it is not an open-air museum, one may notice some similarities consisting in the diversity of objects (including immovable monuments) distributed over a wide area (in the case of Wilanów it is almost 89 hectares). The system is implemented on the basis of ESRI's ArcGIS software. All spatial data represented on the map also contain references to textual data stored in a database in a tabular form, as well as data in the form of files containing drawings, models, orthophotos, photos, scans etc. These include in particular information from archaeological and architectural research, conservation, inventory, studies concerning the location of movable and immovable monuments, greens (including antique), infrastructure (installations, roads). The system is also gradually enriched with historic data, including the transformation of the palace throughout its history. From the point of view of this analysis, "conservation module" seems interesting, as it shows, with respect to GIS maps, such data as list and placement of windows exchanged in the palace, information about shading in rooms, type of lighting, the current temperature and humidity indoors. Monitoring of events that occurred in various places of the park and palace is available, and there are plans to monitor the

[43] More information on GIS applications in the protection of cultural heritage: Jaździewska Iwona, *Zastosowanie Systemów Informacji Geograficznej (GIS) w zachowaniu dziedzictwa kulturowego*, [in:] Więcek, Bogusław, Perkowski, Jan, (red.), *Rola nauki w zachowaniu dziedzictwa kulturowego*, Technical University of Lodz, Lodz 2010, pp. 167-183.

[44] More information on the use of GIS in the Museum in Wilanów: Markiewicz, Waldemar, Przeździęk, Małgorzata, *System informacji przestrzennej jako narzędzie zarządzania zasobami muzeum* [in:] Spotkania z Zabytkami, special issue 2012.

number of visitors. The collected data also allow to analyse safety of the park and palace, including setting and monitoring escape routes for visitors and for collections, including the most valuable, determination of optimal emergency access roads, analysing the spread of fire in the park. It is also possible to determine flood risk of individual areas of the park and facilities.

The GIS system also acts as an integrator of all historical information about the objects, acting as an interface to the assembled and digitized information. Therefore it is used in all sections of the museum. Thanks to the mobile application provided by the software manufacturer, verification and data entry in the field are possible.

Such an integrated system facilitates comprehensive management of a large museum resource of diverse character and of high value. Experiments concerning, for example fire safety, including optimal organization of rescue, evacuation of collections, etc. are certainly valuable also for open-air museums.

A drawback of this system is representation of data on a two-dimensional map, which with respect to architecture brings some difficulties, with respect to precise determination of installations at the facility. Also precise management and monitoring of elements of the building at a scale smaller than rooms is difficult. It seems that the development of such systems for management of objects forming complexes within a certain area will go towards the integration of GIS with BIM systems, although these types of issues still remain to be solved.

3.6 The potential – digital support in historic resource management

Modern information technology in the context of historic resource management not only refer to collecting, processing and sharing of knowledge. Significant progress in areas related to the Internet[45], forces people to carefully analyse new applications of technology in this field. Its use is not limited to data (information, knowledge), which are a representation of reality, in fact it engages the very objects and processes they undergo. This requires equipment of physical items in suitable infrastructure by which they can be identified e.g. mobile applications. The simplest example are long used barcodes[46], also the subsequent matrix codes (QR code) that recognized by an optical reader cause to refer to a piece of information on the Web, relevant for a given object. Nowadays a far-reaching automation of this process is possible, based on the technology of Radio Frequency Identification (RFID) or beacon devices[47]. All these solutions in conjunction with mobile applications technology can improve the management of the automatic identification of objects or their components. One can thus mark elements at risk, damaged, exchanged etc. There is also a possibility of using this type of technology for the transmission of knowledge – to visitors. Keep in mind, however, that this requires effort and maintaining the system. This solution is however taken into consideration, as there is already a possibility of identifying museum objects using RFID by MONA system described above. It seems, therefore, that such opportunities should be taken into account in the consideration of the potential of information technology in protecting heritage.

Conclusions

On the basis of analyses presented in this text, it can be stated that, given the complexity and enormity of tasks associated with both the amount of information and complex nature of the processes for monitoring and managing the heritage of wood architecture – it is advisable or even necessary to use efficient tools. This necessity also results, directly or indirectly, from doctrinal documents adopted by expert organizations involved in heritage protection (ICOMOS, UNESCO), legislation (international conventions and the Polish law), as well as recommendations and good practices. This happens even if we analyse documents established long before the prevalence of the use of information technologies.

Analysis of the current situation with respect to the use of applications supporting monitoring and management the heritage of wood architecture shows some deficiencies in this regard. One needs to consider introduction at first stage of a tools that will facilitate the ongoing, mandatory action, arising mainly from provisions of the applicable law. Such a tool should be scaled, i.e. should allow, after its expansion, implementation of

[45] The English term Internet of Things, first used in 1999 as the title of a business presentation by Kevin Ashton is the idea of redirecting networking of the Internet right into the world of real objects.

[46] Research on the possibility of coding of digits using machine-readable graphical representation began in the United States even in the 30s of the twentieth century; barcodes were commonly introduced in commerce in the 70s of the twentieth century.

[47] Beacon – (ang. Lighthouse, signal) – a microscopic Bluetooth transmitter (recognized by standard smartphones) cooperating actively with applications installed on the user's device, calling under his consent for appropriate actions.

tasks concerning efficient collection and use of knowledge, its management, as well as multi-faceted analyses creating new research and cognitive perspectives. It is essential to take into account the specificities of open-air museums, where we deal with objects which are simultaneously museum exhibits and architectural monuments. It is of great importance to support monitoring of the state of facilities, carried out by efficient identification of risks, prioritizing actions and recording interventions that had been carried out. One should also pay attention to the need to include in the information recording process those directly involved in works at monuments, therefore the indicated importance of using mobile versions of applications. Thus accumulated current knowledge about the monument and its condition should be systematically enriched with tacit knowledge about traditional techniques and materials as well as possible wider cultural context – intangible heritage, so important in the case of wood architecture and similarly seriously at risk.

In the process of implementation of information technology in this area one should also consider expansion of the tools used in the widest possible integration with other systems, including in particular with methods for recording information about buildings and grounds (BIM and GIS systems). Only the perception of such a solution in a broader context of a multi-faceted information environment gives us an opportunity to use a systemic approach, integrating data in an efficient manner from different areas and offering real benefit from informatization taking place in all areas.

Krzysztof Koszewski, dr inż. arch.

Academic employee at the Department of Architectural Design at the Faculty of Architecture at Warsaw University of Technology, Head of MA studies of Architecture for Society of Knowledge ibid conducted in English, member of the Programme Board of the National Heritage Institute. The main areas of interest and research: management of knowledge about the heritage, methodology of process design, visual communication in architecture and heritage protection.

Cezary Głuszek

Guidelines for making an inventory of wooden architecture facilities.

Reflections from student internship of the Faculty of Architecture at Warsaw University of Technology in Krzysztof Kluk Museum of Agriculture in Ciechanowiec

Prof. Jerzy Uścinowicz stated in a report entitled *Recognizing the already existing national standards for building restoration documentation of wooden architecture as the basis for monitoring* (quotation):

... *"The Museum's mission is to protect the national heritage areas corresponding to broader agricultural matters and rural folk culture and history of the region of Podlasie*

...The aim of is the protection of monuments, information about values and content of accumulated collections, promotion of basic values of the Polish and world history, science and culture, shaping cognitive and aesthetic sensitivity and enabling contacts with the collection."[1]

... "In local terms associated with regional specificity of the Podlasie region, where the heritage of wooden architecture and its various ethnographic resources and others of many local communities belonging to different cultures, nations, religions and ethnic groups is one of the most important cultural values, actions taken by the museum as a cultural institution of Podlasie Voivodeship, are part of an overall strategy on the protection of cultural heritage and cultural development of the region of Podlasie."...[2]

... Krzysztof Kluk Museum of Agriculture in Ciechanowiec does not yet have a coherent strategy for managing wooden architecture facilities. It also failed to develop a modern system of documenting and monitoring facilities, and those that exist, based on existing standard activities of open-air museums and standards for the protection and conservation of monuments, including exhibits, though gradually improved, are today insufficient.

The aim of the project is therefore to develop, adequately to the possibilities of institutional activities of the Museum, modern standards with respect to documenting, monitoring and, indirectly, the management of wooden architecture facilities, as well as maintenance of their architectural, aesthetic, technical, material and biological value according to current legal regulations of the country and guidelines of regulatory bodies and other guidelines, procedures and standards functioning in the world. "...[3]

In this context, the issue of inventory of wooden buildings in the open-air museum in Ciechanowiec and its surroundings, made in the formula of student inventory, fits in perfectly with the objectives of the project – adaptation of inventory techniques (measuring, recording, collecting and monitoring) into modern requirements.

Inventory internship are conducted by the Department of Architectural Heritage and Arts of the Faculty of Architecture at Warsaw University of Technology under substantive care of Maria Ludwika Lewicka and Cezary Głuszka. At the beginning of cooperation with the Museum, during the internship, students learnt only the traditional techniques of measuring and drawing used in the documentation. Inventory documentation was "the result of" work – intended to archive as a record forms, e.g. in case of damage and the need to reproduce. Often drawings were drawn up manually. Traditional techniques were used that were developed during previous inventory carried out since the interwar by students of the Faculty of Architecture at Warsaw University of Technology. The experience of the past period have been included in the reprinted publication by Professor Maria Brykowska.[4] The author notes among others that the measurement of wooden construction should be done with the same methods as that of brick construction, but more accurately. Measurement notes should be larger than the scale of the drawing, because they must contain a greater number of measurement digits.

---

[1] J. Uścinowicz, Raport *"Recognizing the already existing national standards for building restoration documentation of wooden architecture as the basis for monitoring"*, as part of a cooperation project between the Krzysztof Kluk Museum of Agriculture in Ciechanowiec and the Museum Ryfylke in Norway, analytical part, Bialystok-Ciechanowiec 2014, p. 4-5.

[2] Ibidem, p. 5.

[3] Ibidem, p. 5-6.

[4] Maria Brykowska, Methods of measuring and testing architectural monuments, Warsaw University of Technology Publishing House, Warsaw 2003.

Moreover, in the case of wood elements, it is especially important to reproduce a form with deformations caused most commonly by long-term use, wind pressure, subsidence, etc.[5]

With the course of time, the role of inventory has changed, among others, for use in the management of historic resource and operation of facilities. Therefore, it turned out necessary to prepare drawings in a digital format. Thus developed documentation allows efficient calculation of areas and volumes of objects and individual rooms, and thus cost planning and preparing conservation and repairs. The use of digital technology also allows the construction of models of spatial objects in 3D technology, greatly expanding the scope of the use of inventory. This aspect has already been signalled in 2005 by prof. M. Brykowska.[6]

A similar approach to measuring techniques are presented by Ulrich Schaaf, Maciej Prarat from the Department of Conservation at Nicolaus Copernicus University in Torun in a study *"Inventory measurement and drawings of wooden monuments in the process of conservation – main problems and proposal of standardization."*

Digital paintings in vector notation, however, do not reflect the nature of old and irregular forms of objects and elements. The scope of inventory studies was extended by a necessary photographic documentation that accurately and fairly reflects the historic nature of carpenter works in terms of form and material – its colour, texture, state of preservation. In the case of wooden architecture, it also allows a large reduction in the number of measurement notes necessary for conventional measurement techniques.

Digital photography has a multilateral application. When taking pictures with higher resolution, using the centimetre scale allows you to:

– accurately resize images, details,
– backup details of woodcarvers, as well as larger items,
– obtain enlargements of the smallest details such as traces of insect feeding,
– digitally process images, e.g. sharpness correction, brightness, colour.

Equally important was also the need for manual drawn elements and details of buildings and structures. They were usually made individually, so they have unique, irregular forms – extremely difficult or even impossible to draw in vector notation.

Another experience was noticing the need to instil the context of immediate surroundings of buildings and regional context. Wooden architecture shows its full value only in a natural cultural environment. As a result, the internship programme includes elements of freehand drawing with reference to the local landscape and the region of Podlasie.

After the experience of this year's practices, further goals can be formulated as follows:

Objectives of the internship: educational, conservation, utilitarian.

Educational purpose

Developing skills of preparing building measurement inventory on the example of a historic building whose form is generally complex and requires the student not only to know the standard measurement methods, but also the analysis of architectural forms and specific structural elements.

The ability to make building inventory and identify cultural features of historic buildings is the basis for collecting baseline information for project tasks.

Purpose of conservation

Transmission of knowledge about the history, cultural values of wooden buildings, regional tradition and "philosophy" of conservatory thinking while making the inventory.

The utilitarian objective

Providing tools for planning and programming investment, repairs, conservation of facilities, purchasing wood preservatives, purchasing wood to replace worn components, suitable metal for frames, etc.

Arrangements made as a result of determining of the purposes and adjusted to the educational requirements have been introduced into the inventory internship programme conducted by ZDASZ WAPW. Its scope, based on years of experience and traditional methods of inventory of historic architecture also incorporates modern techniques of measurement, recording and utilization.

[5] Ibidem, p. 44-45.

[6] Ibidem, p. 47-48.

Teaching methods, forms of teaching

1. Instructional lecture introducing students to the method of doing an inventory of buildings. Familiarizing students with the measuring equipment used while doing an inventory. Determination of safety rules when performing measurements.
2. Works on the premises: carrying out freehand sketches for required set of measurement drawings (floor plans, sections, elevations, detail drawings etc.); preparing photographic documentation of the measured building as an auxiliary material for the inventory.
3. Measurement works with the use of measuring instruments and equipment and manual introducing the measurements on freehand inventory sketches of buildings.
4. Freehand drawing of a building, its elements, details and context (surrounding, landscape) as an exercise in perception skills of specific features of historic architecture.
5. Electronic records of data from measurement notes. Verification of the measurements in the building and correction of electronic records.
   Execution of measurement documentation drawings in AutoCAD.

Tasks to be performed

Inventory – (measurements and drawings) of given objects;
Submission form of the inventory:
– measuring notes and details of construction done by hand,
– computer drawings (AutoCAD) – in a digital format on CD,
– digital photographs: the object, the object elements of details,
– work in groups of 2-3 people.

Freehand drawings – buildings, the surrounding terrain and landscape – performed as a complement to the inventory with respect to:
– elements and details of facilities, mainly handicrafts, difficult to measure – also showing the characteristics of the material,
– the building and immediate surroundings integrally associated with the object as its cultural context,
– landscape as a broader cultural context.

Note – freehand drawings are executed under the supervision of academic staff of the Studio of Drawing, Painting and Sculpture. The type and number of drawings will be agreed on with the supervisors.

Guidelines – on an example chosen

In order to illustrate the effects of inventory works, an example of documentation of a wooden facility made in the context of student internship was presented. The cottage in Tymianki Moderki was selected, which is located outside Ciechanowiec, is not used and is under a real threat of destruction.

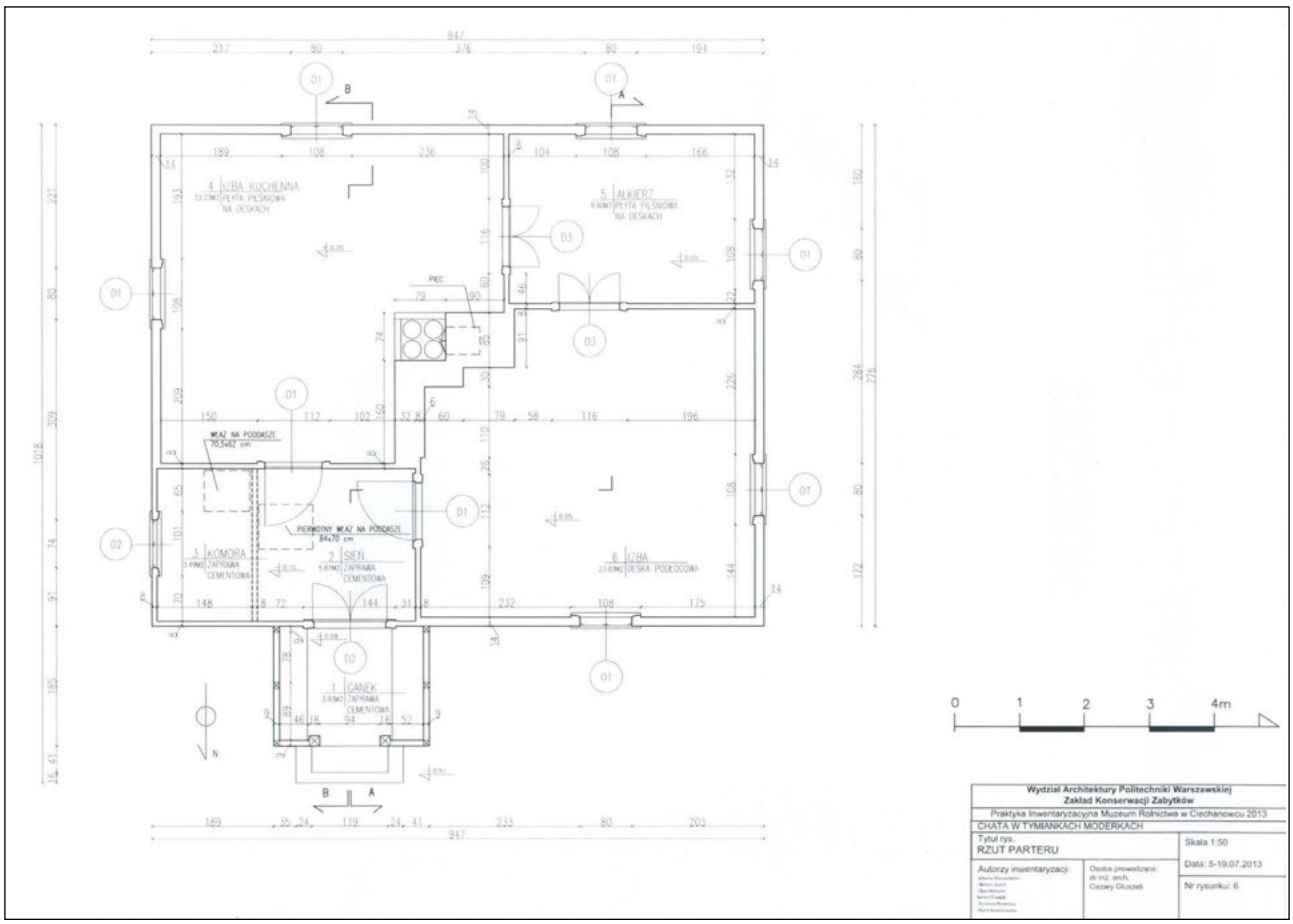


Fig. 1. Cottage in Tymianki Moderki. Ground floor plan, DWG, 2013.

Fig. 2. Cottage in Tymianki Moderki. Southern elevation, Digital Photography, 2013.

Fig. 3. Cottage in Tymianki Moderki. Door lock detail, digital photography with tape measure, 2013.

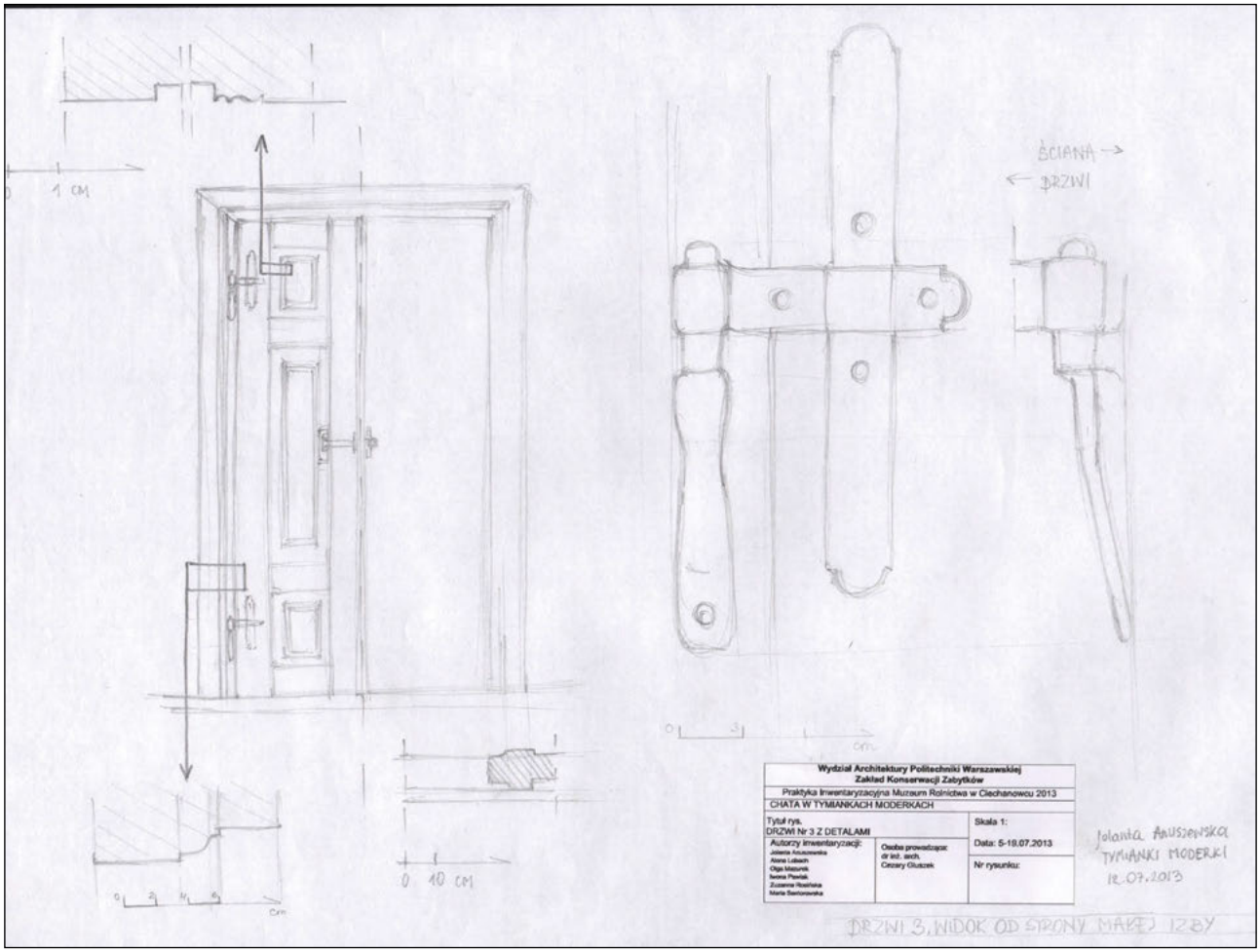


Fig. 4. Cottage in Tymianki Moderki. The doors with a hinge, handwritten sketch, 2013.

Fig. 5. Open-air museum in Ciechanowiec, outbuilding. A detail of an element with its immediate surroundings, freehand drawing, 2013.

Fig. 6. Open-air museum in Ciechanowiec, Watermill. A facility with the landscape in the background-an attempt to show a broader cultural context, freehand drawing, 2013.

Cezary Głuszek, dr hab. inż. arch.

Assistant Professor in the Department of Architecture and Art Heritage, Faculty of Architecture at Warsaw University of Technology. He graduated from the Faculty of Architecture at Warsaw University of Technology; specialist in protection of monuments in the army in the years 1979-1989; research and teaching staff at the Faculty of Architecture at Warsaw University of Technology since 1989. President of the OW TPF 1998-2003; Secretary of the Council for the Protection and Conservation of Defence Architecture at GKZ 1999-2002; Chairman of the Military Architecture Commission ICOMOS since 2009. Author of many publications and dozens of scientific and conservation studies, especially on military architecture; Fortress in: Modlin, Warsaw, Torun, Kłodzk, Osowiec, Boyen in Giżycko.

Sylwester Czołomiej

Edwin Andrzej Wilbik
Anna Wiśniewska

The needs of the Museum of Agriculture in Ciechanowiec with respect to monitoring and managing wood construction facilities. Conclusions from the project.

On December 2015, Krzysztof Kluk Museum of Agriculture in Ciechanowiec will complete the project "Documentation and monitoring in the management of wooden objects in Krzysztof Kluk Museum of Agriculture in Ciechanowiec and Ryfylke Museum" – funded by Financial Mechanism of the European Economic Area 2009-2014, the aim of which was to develop modern standards of management of wooden architecture facilities with respect to documenting and monitoring their bio-technical, architectural and aesthetic condition compatible with the rules of protection of historic wooden buildings, developed by the International Committee of the Woods ICOMOS.

A working group, whose main pillar was Head of Rural Construction mgr inż. Sylwester Czołomiej was responsible for the proper execution of the project on behalf of our museum. The task of this team was to prepare guidelines to create Poland's first professional program to keep comprehensive records, documentation and monitoring of historic wooden facilities. Thanks to the professionalism and vast experience in the field of protection and conservation of wooden buildings of mgr. inż. Sylwester Czołomiej, all the objectives of the project were completed, resulting in an application that, as a rule, is intended to raise the level of protection of historic buildings. Unfortunately, the project is being finished without the participation of Sylwester Czołomiej, who passed away on April 1, 2015.

Fig. 1. Project inauguration meeting, 4 June 2014, fig. B. E. Murawska-Dereweńko.

Fig. 2. W Ryfylke Museum, September 2014, fig. G. Jakubik.

Fig. 3. Seminar on determining the extent of information necessary to develop a model for monitoring wooden facilities at the Museum of Agriculture, November 2014, Fig. A. Warchala.

1. Location and scope of operation of the Museum

Krzysztof Kluk Museum of Agriculture is located in the city Ciechanowiec in the commune of Ciechanowiec, Wysokie Mazowieckie district, Podlaskie Voivodeship.

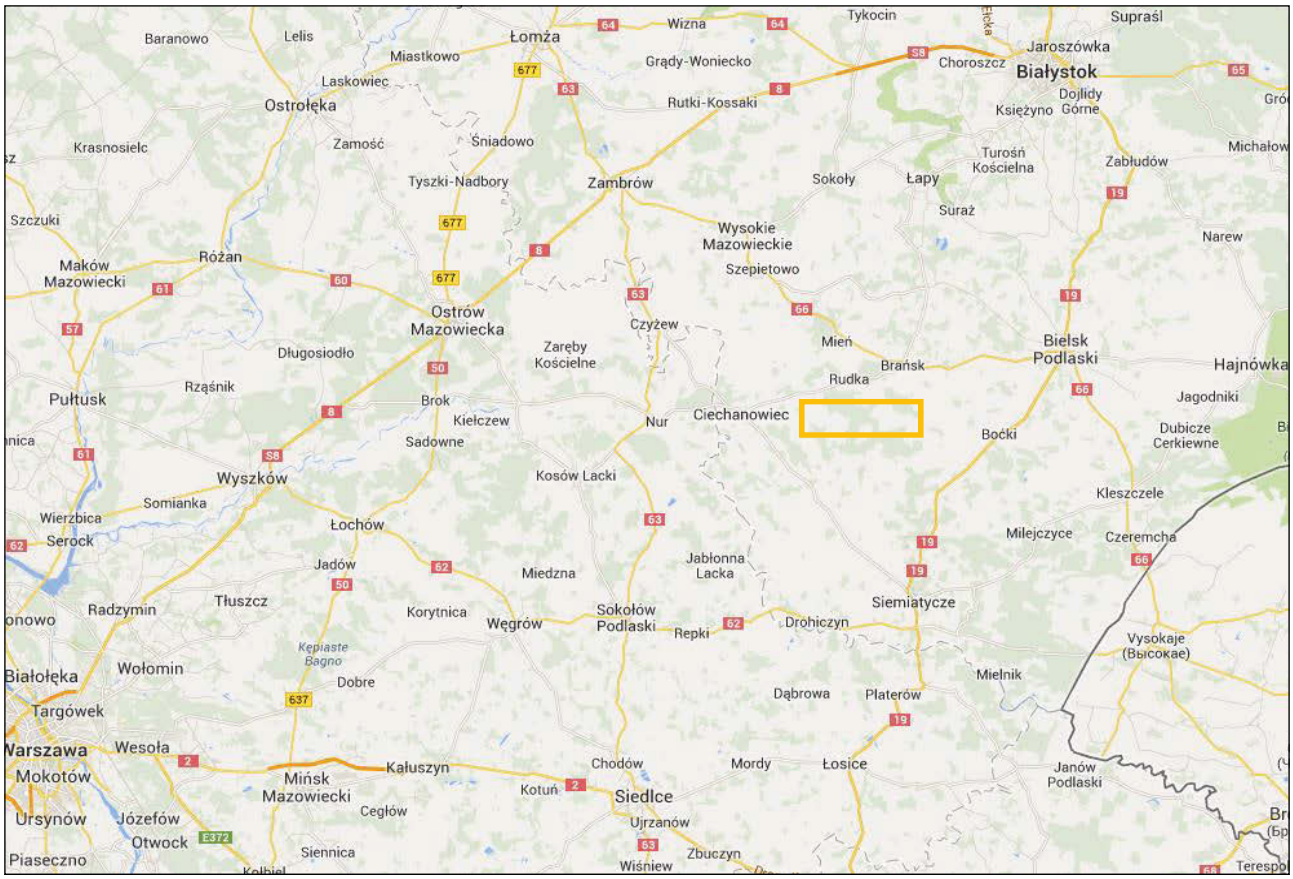


Fig.1. Location of Ciechanowiec on the road network. source: maps.google.com.

Ciechanowiec commune is located in the south-western part of the Podlasie Voivodeship in Wysokie Mazowieckie district. The settlement system forms the city and 37 villages assigned to 31 villages. The area of the commune is 20 119 hectares, of which the largest share falls on arable land and orchards (50.27%), forests (25.51%) and grassland (17.17%).

The area is shaped by two plateaus: Wysokomazowiecka, located in the north-western part and Drohiczyn, including central and eastern area of the municipality. Valley Nurzec is a natural border between them. Its lower approx. 8-kilometer stretch is located within the Protected Landscape Area Valley of the Bug and Nurzec, whose total area is 2070 hectares. Meanders and bends of the river winding through the fields and forests are a refuge of many valuable species of animals living by the water: beavers, otters, rare birds and an attractive tourist trail for canoeing lovers. Beside the interesting and nature undestroyed by human activity, the potential of the area is determined by 25 objects and groups of objects included in the register of monuments of Podlaskie Voivodeship.

The most important ones include:

– Parish Church dedicated to Holy Trinity – built in the years 1731 to 1737 thanks to the foundation of Francis Maximilian Ossoliński, built under the direction of Jan Krzysztof Kluk. It is an interesting example of architectural and urban planning assumptions. The compact unit includes: a baroque church located in the middle of the cemetery surrounded by a wall with a decorative brick gate, two rectangular morgues in the corners of the fence and two bell towers flanking the front part of the fence,

– Orthodox Church dedicated to Ascension of the Lord – built in 1875,
– Synagogue – built in the late nineteenth century, now completely rebuilt,
– hospital – built between 1785-1788 in the northern part of the square churchyard in the classical style. It was founded for the Sisters of Mercy, brought in 1789 to Warsaw by Teresa Ossolińska of Lanckoronski – the governor Nurska and her daughter Katarzyna Jabłonowska,
– area of the former manor – related the manor house Kiszków, functioning in the sixteenth century to the north-east of the city, called the castle and destroyed during the war with Sweden. Another brick buildings were the seat of Ossoliński family; since 1806 until the beginning of XXth century the property of Szczuk family,
– palace and park complex – formed in the 2nd half of the nineteenth century, composed of neo-Renaissance palace built according to the project of a Warsaw architect Julian Ankiewicz, outbuildings which was the implementation of an Italian-type neo-Renaissance villa fashionable in the mid of the last century and out-buildings; surrounded by well-kept landscaped park,
– Open-air museum – a complex of rural buildings from the border of Mazovia and Podlasie, operating within Krzysztof Kluk Agricultural Museum,
– Parish Church dedicated to Stanislaus Bishop in Pobikry – built between 1857-1860 in neo-Gothic style designed by a Warsaw architect Ernest Bauman. Due to the time of its creation, the church in Pobikry is considered to be one of the first implementation of the "structural neo-Gothic" current in Polish architecture,
– Parish Church dedicated to Dorothy Virgin and Martyr in Winna Poświętna – built in the years 1696-1717, along with the original bell tower with corners decorated with rustication is a unique set of wooden baroque church architecture.

The most important cultural institution functioning in the southern part of the region of Podlasie is Krzysztof Kluk Museum of Agriculture

II. Characteristics of the place

Krzysztof Kluk Museum of Agriculture in Ciechanowiec and its integral part – an open-air museum of folk architecture from the border of Mazovia-Podlasie is located on the manor grounds of the palace and park complex, in which buildings and homesteads are located along traffic routes. During the establishment of the museum, it was not planned to reconstruct spatial arrangements of the village, but incorporation of moved objects in the existing structure of the palace and the park, divided into 3 sectors. Authentic objects of the first sector A, located in specific thematic blocks: court and religious buildings, farmhouses and nobility manors. Architecture of open-air facilities is rich in forms and technical, and functional solutions. Wooden monuments gathered here are evidence of regional differences, achievements and technical thought of generations of crafts-men. The basic building material since ancient times has been pine wood. Field stone, clay and straw played supporting role.

For centuries, joiners have distinguished between various species of wood and have taken into account its disadvantages. A good carpenter putting a framework of wood was able to predict a margin of material for drying, and above all oriented the object and planned its interior in consideration of its future functions.

Fig.4. Collection of museum objects forming a religious corner in the open-air museum, photo: A. Warchala.

Fig. 5. Hunting Manor around 1858, fig. A. Warchala.

Fig. 6. View of the farm, photo: T. Ołdakowski.

III. State of the documentation

All museum wooden objects have a so-called white card of a monument, of which only six buildings has a full documentation, i.e. a monument evidence card, an architectural inventory and a list of restoration works carried out. These are translocated facilities or renovated after 2009, i.e. the school, the church, the bell tower, the curate's house, the barn and the cheese storage building. Thanks to cooperation established in 2009 with the Museum of the Department of Architectural Heritage and the Arts of the Faculty of Architecture at Warsaw University of Technology, more than 50% of the buildings have an architectural inventory. In assessing this type of documentation, it seems that its preparation by museums should be mandatory, if only due to the fact that in the case of destruction of the monument, it will remain the primary document for its reconstruction. Having an inventory also gives us the ability to accurately mark changes related to ongoing conservation works.

Table 1. The current state of documentation of wooden structures of the Construction Department at the Agricultural Museum in Ciechanowiec

No.	Facility Name	Origin	Monitoring[1] – **O**pinion – **E**xpertise – **D**oc. **C**onser.	Monument Sheet[2] version: **E**lectronic **P**aper	Photo grammetry[3]	Inventory Architectural[4]
1	2	3	4	5	6	7
1	Lamus	Rudka	cons. doc.	No. 1 (P)	yes No. 6	has got 2012
2	Manege	Usza Duża	none	No. 2 (P)	yes No. 38	has got 2010
3	Smokehouse	Pobikry	none	No. 3 (P)	yes No. 24	has got 2010
4	Windmill	Niemyje Nowe	cons. doc.	No. 4 (P)	yes No. 33	none
5	Cottage	Żery Czubiki	cons. doc.	No. 5 (P)	yes No. 9	has got 2012
6	Barn	Tymianki Dębosze	cons. doc.	No. 6 (P)	yes No. 15	has got 2012
7	Manege	Tymianki Dębosze	none	No. 7 (P)	yes No. 16	has got 2014

8	Granary	Święck	none	No. 8 (P)	yes No. 13	has got 2012
9	Chlewek	Bujenka	cons. doc.	No. 9 (P)	yes No. 11	has got 2013
10	Cottage	Piętki Grężki	Exper. 2011	No. 10 (P)	yes No. 8	has got 2010
11	Cottage	Koce Schaby	cons. doc.	No. 11 (P)	yes No. 18	has got 2014
12	Cowshed	Tymianki Adamy		No. 12 (P)	yes No. 17	has got 2015
13	Manor house	Zaręby	cons. doc.	No. 13 (P)	yes No. 22	has got 2010
14	Kuźnia	Jałówka	ekspertise	No. 14 (P)	yes No. 29	has got 2010
15	Manor house	Kiersnowo	cons. doc.	No. 15 (EP)	yes No. 32	none (rec. project)
16	Cottage	Saki *(Bielorussian)*	cons. doc.	No. 16 (P)	yes No. 21	has got 2013
17	Granary	Dmochy Sadły	cons. doc.	No. 17 (P)	yes No. 30	has got 2014
18	Granary	Piętki Żebry *(carpenter)*	cons. doc.	No. 18 (P)	yes No. 26	none
19	Watermill	in situ Ciechanowiec	con. doc. eq.	No. 19 (P)	yes No. 31	has got 2011
20	Windmill	in situ Drewnowo	con. doc. eq.	No. 20 (P)	yes No. 33	has got 2012
21	Granary	Dąbrowa Wilki *(fish.)*	none	No. 21 (P)	yes No. 28	none
22	Cottage	Radziszewo Sieńczuch	none	No. 22 (P)	yes No. 35	none (rec. project)
23	Granary	Klepacze	none	No. 23 (P)	yes No. 27	has got 2015
24	Cellar	Reconstruction	none	No. 24 (P)	yes No. 12	none
25	Dovecot	Reconstruction	none	No. 25 (P)	yes No. 14	has got 2014
26	Bróg	Reconstruction	cons. doc.	No. 26 (P)	yes No. 10	has got 2009
27	Granary	Żebry Wielkie *(poultry house)*	none	No. 28 (P)	yes No. 34	has got 2014
28	Cowshed	Kiersnowo	none	No. 29 (P)	yes No. 36	has got 2015
29	The chapel	Reconstruction	cons. doc.	No. 30 (P)	yes No. 25	has got 2009
30	Manor house	Siemiony *(hunting)*	opinion	No. 31 (E)	yes No. 23	none (rec. project)
31	Cottage	Usza Mała	con. doc. eq.	No. 32 (EP)	yes No.	has got 2011
32	Barn	Wyszonki Wypychy	none	No. 33 (P)	yes No. 39	has got 2015
33	Barn	Łapcie	none	No. 34 (P)	yes No. 37	has got 2011
34	Granary	Olsza (braids)	none	No. 35 (P)	yes No. 40	has got 2010
35	Granary	Wykno Nowe *(leather)*	none	No. 36 (P)	yes No. 41	has got 2015
36	Lamus	Ruda Mazowiecka	none	No. 37 (P)	yes No. 5	none
37	Cottage	Dąbrowa Moczydły	none	No. 38 (EP)	–	none
38	Cottage	Drenowo Lipskie	cons. doc.	No. 39 (EP)	–	none
39	Cowshed	Kutyłowo Perysie	none	No. 40 (EP)	–	none
40	Granary	Drewnowo Ziemaki	none	No. 41 (EP)	–	has got 2014
41	Windmill	Dąbrowa Łazy	none	No. 42 (EP)	–	has got 2009
42	Granary	Lubowicz	cons. doc.	No. 46 (P)	–	has got 2009
43	Lavatory	Ruś Stara *(Mazury)*	cons. doc.	No. 47 (EP)	–	has got 2011
44	Forester's lodge	Wdowin	ekspertise	No. 50 (EP)	–	has got 1999
45	Granary	Miodusy Dworaki	none	No. 51 (EP)	–	has got 2009
46	Granary	Lubowicze	none	No. 53 (EP)	–	has got 2009
47	School	Winna Chroły	opinion on state of preservation	No. 54 (EP)	–	none (restor. proj.)
48	Church	Boguty Pianki	ekspertise	No. 56 (EP)	–	has got 2011
49	Bell Tower	Boguty Pianki	ekspertise	No. 57 (EP)	–	has got
50	Presbytery	Kulesze Kościelne	ekspertise	No. 58 (EP)	–	has got
51	Barn	Sobiatyno	ekspertise	No. 59 (EP)	–	Festgrupa2010
52	Sernik	Reconstruction	ekspertise	No. 60 (EP)	–	has got

[1] Column 4 includes conservation documentation, review of the technical condition or mycological and construction expertise made for each facility. Since 2010, the department of construction has kept conservation documentation of facilities where repair works were performed. Objects that have mycological expertise made in the last 3 years: Piętki Grężki cottage, the church of Boguty, the cottage in Usza Mała, the windmill of Drewnowo, the barn of Sobiatyn, the mill in situ, the blacksmith's of Jałówka.

[2] All open-air facilities have a white card of an immobile monument. Monument cards exist in a paper form (**P**), as well as in an electronic and paper form (**EP**), which is the case of approx. 50% of the facilities. Documentation existing in two versions (**EP**) was made during the last 3 years and is up to date. Paper version of the monument card was developed in the years 1976-86 by Jerzy Wilde (commissioned work), which should be updated in a form of supplementary attachments or new cards.

[3] In 1984, Geodesy and Cartography Enterprise from Bialystok made for existing facilities a geodetic and photogrammetric inventory.

[4] In the case of architectural inventory (column 7) marked for date, it has been made by students of the Department of Architecture of Warsaw University in the Auto CAD programme and in PDF format (electronic and paper version). Other inventories are in a paper form, at some points, there were additionally indicated construction projects, contained in the construction section that were made during the renovation of facilities.

Analysing the data presented in the table above we can also see that each open-air facility has documentation regarding its conservation state. Unfortunately, this documentation is not unified and comprehensive.

The basic document describing the state of preservation of the historic facility which confirms the degree of biological corrosion and its causes is mycological and construction expertise. It seems essential that it is done in the initial phase of conservation monitoring and recording. Determination of the state of preservation and conservation recommendations will be an excellent base for monitoring the facility. Expertise additionally should describe the history of the monument, its current maintenance and preservatives used. One should remember to assess, often overlooked in expertise, surface wood degradation. Such factors as sunlight (photodegradation) and water cause superficial cracks, and this is what is important in the evaluation of historic wood. The expertise should introduce preventive mycological-construction solutions without compromising the historic structure (e.g. horizontal insulation). The location and nature of the substrate on which the monument was mounted are of great importance to the preservation of the facility. You might think of carrying out geotechnical investigations of land that will accurately determine the right approach and will help choose the right impregnation method.

IV. The need to complete the documentation – monument evidence card

In order to properly document the history of a facility, it is important to determine its most accurate history. This can be done on the basis of the state of the facility, and after getting acquainted with archive materials and accumulated bibliography. Analysing museum monument cards, we see that the facilities for which cards were established before 1988 do not have historical research conducted and do not contain information on conservation works carried out, and yet over a long period that has elapsed since the translocation of the facility on the grounds of the museum, in some cases there have been fundamental changes related to its design, construction and purpose of the building.

An example of changing the foundation and the structure is the Granary of Klepacz that in 2012 was translocated from the museum sector A of the museum to sector B. In the course of these works, the original design of the roof structure was restored and hipped roof was turned to gable roof. It is astonishing that during the creation of a monument evidence card in 1988, it did not contain any information on the granary's roof structure before the translocation. This is another proof of the need to update records in cards produced before 1988.

Fig. 7. Granary of Klepacz, photo: A. Warchala.

It should also be noted that documentation gathered earlier was not always sufficient to fully prepare the monument evidence card and the only solution turned out to be re-interviewing the former owner or his family, which sometimes could completely change the collected information about the building. An example might be a granary by which it was noted that the museum had been moved to the Museum from the city of Drewnowo Lipskie and documentation gathered about it confined to an entry in the book inventory, the owner's address and the date of purchase. So as to supplement the information to compile the monument evidence card, the former owner of the monument was visited. In the course of the interview, it turned out that the building had been built in the early twentieth century, not as it was previously assumed in Drewnowo but in Boguty-Żurawie. The founder of the property was the informant's father-in-law, who had owned a farm in Boguty-Żurawie. In the years 1959 to 1960, the family decided to resettle on their own colony in Drewnowo, where they built a house and basement, while the wooden barn and the cowshed with a part of storehouse were moved. The building barn, which included a granary, was of a log cabin construction type and consisted of 4 chambers. At the time of purchase of the granary by the Museum, three chambers had already been demolished

and that is why they are not included in the photographic documentation of 1985. According to the informant, dismantled rooms had an entrance from the longer wall, i.e. the threshing floor. The granary was the last room on the right side of the facility with an entrance from the gable end. Demolition of non-existing rooms was carried out from the side of a room adjacent to the granary. The back wall was cut parallel to the rear end of the front wall, leaving a portion of beams from the adjacent room, which, after translocation of the building to the Museum, formed an arcade. Door opening was blinded, moving the entrance to the recessed arcade, which was supplemented with patches at the ends of the walls and pillars in the middle of the arcade. Due to the lack of facilities with a full gable recess, in the granary the entrance was converted, using the wall left of the adjacent room. Most likely, the cause of such a drastic change of the facility was the accomplishment of an objective to show in the museum all types and design solutions found in granaries on the border of Mazovia – Podlasie.

V. Conservation documentation

As already mentioned, objects translocated to the Museum in recent years have detailed conservation documentation with photographs and drawings, specifying:

- the type of works carried out,
- their order and location,
- how it was made,
- materials and resources together with a description of recipes, original names,
- conditions in which conservation works were performed,
- findings of the conservation teams,
- results of additional tests carried out during and after conservation,
- experts' assessments or opinions.

All conservation works were preceded by historical research of facilities. Mycological and construction expertise, and inventory of the facility were carried out.

In the case of an old church, 2 expertises and two architectural inventories were made – one set in situ and the other after translocation from Boguty Pianki to the Museum. On the drawings and photographs were marked all, even the smallest new elements built during its reconstruction. The collected documentation contains evaluation of the facility, not only in terms of architecture, but also for the heritage contained in the treatment of wood. The objective of identifying a historic wood treatment is to retain it through conservation. Unusual dovetail corners connections were investigated that only after the demolition of the church revealed the high art of local carpentry. Construction solutions applied e.g. in some parts the wood beams are secured against turningwith round or swuare wood profiles. This system can only be encountered in the region of West Podlasie. Wood treatment method was also analysed. Framework beams from the nineteenth-century facilities were processed manually with a Thracian saw. In the case of skeletal construction, wood was processed with axes. Analysing the used wood of varying quality, it should be emphasized that local carpenters showed a good knowledge of wood structure.

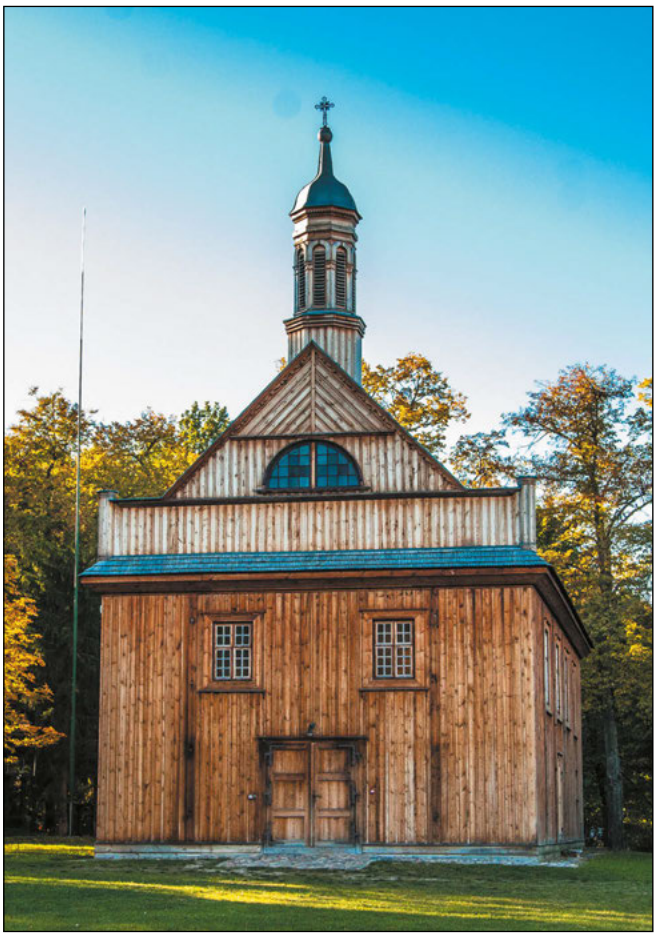


Fig. 8. Church dedicated to All Saints, photo: A. Warchala.

VI. Surveillance

Monitoring of open-air objects should be considered with great care for wider understanding of the surroundings of facilities. Adequate conditions for historic buildings, as well as for exhibits exposed on display must be provided.

Conservation works should focus on preventive maintenance, which must take into account different environments found in facilities, because climatic conditions that will occur in a heated facility, e.g. in the court of Siemiony, are different than those encountered in a hall-type facility, like a church, while still others will occur ina cottage. All factors stated above will be essential for temperature and humidity levels in rooms, conventionally called the interior climate. In the long-term surveillance of facilities, comparison of research of the annual cycle will allow to draw practical conclusions on the basis of which appropriate action is taken. The resulting yearly environmental parameters prevailing in the facility will allow for the proper development of preventive prophylaxis, which will consist in reducing the humidity of the environment (e.g. using moisture absorbers) and ensuring adequate ventilation and air flow. The main preventive tasks include effective anti-fungal prevention and prevention of destruction of structural elements by insects. Prevention should also apply to the building surroundings and take into account for example good drainage of rainwater outside the facility, surface runoff waters (land declines), as well as isolation from groundwater.

As you can see monitoring of wooden structures is a complex subject that requires many consultations of specialists from different fields and the development of consistent standards that must be considered for specific objects. Assumptions of monitoring should be preceded with mycological and construction expertise, which will give rise to the development of an individual monitoring programme. Based on the current architectural inventory, an assessment of the technical state of construction of the monument must be performed. Monitoring the state of preservation of wooden facilities consists in regular measurements, observations of structures and substances carried out by qualified personnel regularly and in time. Observation, cyclical examination of the facility and measurement, measuring deformation, dynamic loads will allow to recognize the design parameters of such building. An important factor often overlooked in expertise, in addition to specifying the nature and classification of wood is its quality, because not all historic buildings as commonly believed, were made of old trees. Study of the structure of wood used, the density of grain or taking into account natural disadvantages helps determine natural resistance of the material. Difficulties in monitoring will occur in the facilities adapted for functions other than exhibition. Facilities adapted to hotel infrastructure (cottage of Radziszewo, Kiersnowo and Dąbrowa Moczydeł), where installation of water and sanitation was introduced increase the risk because the thermal heating system and the introduction of internal space warming changed the original climate of the facility.

Table of scale of conservation status of wooden structural elements was based on the recommendations of Peter Kozarski that have been adapted to facilities in our museum. It contains a six-scale of destruction and conservation works in relation to the state of preservation of wood. Determination of the technical condition and repair project takes into account the historic value, because we will try to save at all costs even a badly damaged monument.

Monitoring of roofs is one of the most important purposes of the appropriate care for a historic facility. The roof, like no other part of a building is exposed to extreme weather conditions and, therefore, as the most sensitive element requires special attention.

Table 2. Roof description of the objects of Building Department according to inventory book

No.	Name of the object	Origin	Type of roof	Year of replacement	Side Entirely (m^2)	Area m^2	Condition	Type of roofing	
1	Lumber room	Ru Rudka	Hip roof	2010	entire	268	Good	Shingle	A
2	Manege	Usza Duża	Conical	2007	entire	110	Satisfactory	Straw	B
3	Smokehouse	Pobikry	Conical 6p	1980	entire		Satisfactory	Shingle	A
4	Windmill	Niemyje N.	Gable roof	2014	entire	10	Good	Boards	B
5	Cottage	Żery Czub.	Hip roof	–	2012 gables		Satisfactory	Straw	A
6	Barn	Tymianki D.	Gable roof	2009	2nd side 2014	360	Good	Straw	A
7	Manege	Tymianki D.	Conical	2015	entire	120	Very Good	Straw	A
8	Granary	Święck	Gable roof	2009	entire	45	Good	Straw	A
9	Cowshed	Bujenka	Hip roof	2009	Entire	50	Good	Straw	A
10	Cottage	Piętki G.	Hip roof	2014	Entire	60	Good	Straw	A
11	Cottage	Koce Sch.	Hip roof	2007	1st side/east 50 m^2		Good	Straw	A
12	Cowshed	Tymianki A.	Hip roof	2008	Entire	160	Good	Straw	A
13	Manor	Zaręby	Hip roof	2006	2015/east	170	Satisfactory	Straw	A
14	Smithy	Jałówka	Gable roof	–	conservation 2011 r.		Satisfactory	Boards	B
15	Manor	Kiersnowo	Front-stall	2007	Entire	140	Satisfactory	Straw	B
16	Cottage	Saki	Gable roof	2008	2015/south	160	Satisfactory	Straw	A
17	Granary	Dmoch Sadły	Hip roof	2005	entire	120	Good	Straw	B
18	Granary	Piętki Żebry	Hip roof	2008	2012 gables	50	Satisfactory	Straw	B
19	Watermill	in situ	Gable roof	2010	Entire	220	Good	Tile	B
20	Windmill	Drewnowo	Gable roof	1996	Entire	–	Satisfactory	Shingle	Z
21	Granary	Dąbrowa W.	Hip roof	2007	Entire	90	To change	Straw	B
22	Cottage	Radziszewo S.	Front-stall	2007	Entire	140	To change	Straw	B
23	Granary	Klepacze	Gable roof	2011	Entire	40	Good	Straw	B
24	Ground cellar	reconstruction	Gable roof	2009	Entire	–	Satisfactory	Straw	A
25	Dovecote	reconstruction	Conical	2012	Entire	–	Good	Shingle	A
26	Haystack	reconstruction	Hip roof	2009	Entire	20	Satisfactory	Straw	A
28	Granary	Żebry Wielkie	Gable roof	2004	Entire	40	Satisfactory	Straw	B
29	Cowshed	Kiersnowo	Hip roof	2010	1st side/west 100 m	220	Good	Straw	B
30	Shrine	reconstruction	Gable roof	1980	Conservation 2011 r.	–	Good	Shingle	B
31	Manor-house	Siemiony	Front-stall	2010	Entire	400	Good	Shingle	A
32	Cottage	Usza Mała	Gable roof	2006	1st side/east 60 m	–	Satisfactory	Straw	Z
33	Barn	Wyszonki W.	Gable roof	2010	Entire	250	Good	Straw	B
34	Barn	Łapcie	Gable roof	2010	Entire	150	Good	Straw	B
35	Granary	Olsza	Gable roof	2012	Entire	47	Good	Lath	B
36	Granary	Wykno N.	Gable roof	2008	Entire	80	Good	Straw	B
37	Lumber room	Ruda Maz.	Hip roof	2010	Entire	256	Good	Shingle	A
38	Cottage	Dąbrowa M.	Gable roof	2010	Entire	190	Good	Shingle	C
39	Cottage	Drenowo Lip.	Gable roof	2007	Entire	140	Satisfactory	Straw	B
40	Cowshed	Kutyłowo Per.	Gable roof	2015	Entire	160	Very good	Straw	C
41	Granary	Drewnowo	Gable roof	1998	Entire	–	Satisfactory	Tile	C
42	Windmill	Dąbrowa Łazy	Gable roof	–	–	–	Satisfactory	Boards	Z
46	Granary	Lubowicz	Gable roof	2012	Entire	64	Very good	Tile	B
47	Privy	Ruś Stara	Gable roof	2012	Entire	–	Very good	Shingle	A
50	Forester's cottage	Wdowin	Gable roof	1998	entire	160	Satisfactory	Tile	C
51	Granary	Miodusy D.	Gable roof	2004	Entire	28	Good	Tile	B
53	Granary	Lubowicze	Gable roof	2008	Entire	50	Good	Tile	B
54	School	Winna Chroły	Gable roof	2009	Entire	–	Good	Shingle	Z
56	Church	Boguty Pianki	Gable roof	2010	Entire	–	Good	Shingle	A
57	Bell-tower	Boguty Pianki	Hip roof	2010	Entire	–	Good	Shingle	A
58	Presbytery	Kulesze Koś.	Gable roof	2010	Entire	–	Good	Shingle	A
59	Barn	Sobiatyno	Hip roof	2010	Entire	200	Good	Straw	A
60	Pole cheese-dryer	reconstruction	Hip roof	2012	Entire	6,5	Very good	Lath	A

The table shows the condition of roofs from 2013, which are monitored in our museum a minimum of 2 times a year (April-May, October-November). There are ceramic, wood and straw roofs, the last of which have the shortest durability, and the making cost of which, in recent years, is the greatest. Durability of straw roofs in favourable conditions is approx. 15-20 years, while part of the roof sheathing on the ridge requires repairs every 5 years. One should also take into account violent and unpredictable vagaries of weather, which in many cases can shorten the roof sheathing life. Optimal conditions cannot always be met, especially when thatch in the course of time gets a coat of algae and mosses, which retain moisture, and the biochemical processes of living organisms destroy the main ingredients of straw – cellulose and silica. This increases the absorbability of the shell and it loses its hydrophobic resistance. This process occurs intensively from the north side or if it is in a shade of trees, which by nature is more humidified and less exposed to sun rays. Ridges and the collapse of roof surfaces are the places to which we must pay close attention, because those are areas where leaks appear most often. In such cases, we should check the plating thickness, absorption of thatch and condition of the straw. The optimum thickness of measured thatch should be between 20-40 cm, permissible between 15-30 cm depending on the angle of the roof 40-600.

VII. Aim of the project

The main task of monuments' owners is to protect and maintain the facilities in pristine condition, conducting scientific research and documenting conservation works carried out, as well as disseminating knowledge about the monument.

Accurate recording of all activities at the historic building will be extremely important in the future when the facility will again be subjected to conservation works. A thorough analysis of previous corrective actions will help us to verify selected methods and materials used in the conservation process, which change over the years. Gathering comprehensive documentation of a monument is necessary for later renovations. On the basis of gathered information, we can complete the facility with architectural elements that were removed and obliterated its original appearance. The monument has only value when it documents the era in which it was created, when it is authentic and not converted.



Fig. 9-11. Monitoring open-air historic facilities during the project, April 2015, photo: A. Warchala.

Summary

Krzysztof Kluk Museum of Agriculture in Ciechanowiec is an institution in which all wooden architecture facilities are translocated objects, not reconstructed, which requires on our part a right approach to monitoring and protection of these priceless monuments.

A coherent strategy of regular monitoring and conservation is crucial for the protection of historic wood structures and their cultural significance.

Until 2015, we did not have a programme that in the right way would allow us to properly plan conservation works and management of human activity and allow us to develop an appropriate course of action in terms of conservation. We did not have the appropriate tools to manage wooden architecture facilities. Therefore, our priority is to create a system which will be aimed to develop modern standards of facilities management of wooden architecture facilities with respect to documenting and monitoring their bio-technical, architectural and aesthetic condition that will be compatible with the standards of protection of historic wooden buildings developed by the International Committee of the Wood ICOMOS.

Another factor, and one of the most important that determined our activity was the law imposing specific activities and responsibilities in order to maintain the technical and aesthetic values of historic buildings[5]. Therefore, in 2014, together with the Ryfylke Museum, we started the project: "Documentation and monitoring in managing wooden objects in Krzysztof Kluk Museum of Agriculture in Ciechanowiec and Ryfylke Museum"

The main result of this project is an application that will fully comply with the guidelines that have been established, with an emphasis on preventive maintenance against unfavourable changes. It will allow us in the future to fully monitor historic buildings. This will allow the introduction of a completely new organization of work and will standardize documentation of works carried out by employees. These modern standards of facilities management is a tool that gives us the guarantee to preserve knowledge about collections that remain under our custody.

We hope that in the future, this innovative management system will help to create a single strategy for all open-air museums, regardless of the diversity of monuments of wooden architecture.

Sylwester Czołomiej, mgr inż. (1964-2015)

Head of the Section of Rural Construction at Krzysztof Kluk Museum of Agriculture in Ciechanowiec in 2010-2015. Graduate of the Faculty of Wood Technology at the Warsaw University of Life Sciences (SGGW), a member of the Polish Association of Construction Mycologists

Edwin Andrzej Wilbik, mgr

assistant in the Section of Rural Construction at Krzysztof Kluk Museum of Agriculture in Ciechanowiec since 2015. Graduate of the Faculty of Cultural Education at the University of Bialystok

Anna Wiśniewska, mgr inż.

Deputy director of the Krzysztof Kluk Museum of Agriculture in Ciechanowiec since 2015.Graduate of the College of Agriculture and Education in Siedlce, Postgraduate Museum Studies at the Jagiellonian University.

[5] The Act of 23 July 2003 on the protection of monuments and care of monuments (Dz. U. 2003. No. 162, item 1568, as amended).

Marcin Górski

Documentation and monitoring in the management of timber objects in the Museum of Agriculture in Ciechanowiec – a summary of the project

The rationale of the project

The tradition of wood architecture in Poland, dating back to the beginning of the settlement, currently faces serious risks from civilization processes occurring at an increasing pace. In cities and towns wood construction has been almost entirely supplanted by masonry, steel and glass structures. The longest and most beautifully wood technologies persist in rural building of the eastern territory of Poland. According to statistical data, cited by Professor Ignacy Tłoczek in the 80s of the twentieth century[1], it appears that even in 1925 the percentage of wood buildings in the country ranged from 75-95% and only slightly changed before 1957. In the second half of the twentieth century, buildings of wood were erected more and more rarely, and thus it was only a matter of time and of technical condition of these buildings that the supply of wood buildings began to drastically shrink.

Trend to go away from wood construction is a complex, rooted in the historical, economic and cultural process, supported by legislation through the implementation of fire and safety regulations. In the Construction Law Act of 1928 there appeared a division into refractory and non-refractory buildings. The Act greatly reduced the possibility of erecting non-refractory buildings and of roofing with such materials. At the same time, it was determined that non-refractory buildings could not hold more than two floors (ground and one floor), while the attic above the floor could not be residential. This decided that within a few decades, wood buildings were displaced completely from the cities and towns. Longer chance to survive had individual buildings of the village.

Currently villages with the overwhelming number of wood buildings have become the exception on the Polish map. The number of surviving but abandoned by inhabitants wood houses is steadily growing. General problems with conservation of the resource of wood buildings include:

– generational change (their absence) and migration of population from rural to urban areas - the associated risk of losing the continuity of using objects (especially cottages, but in the future it may also involve sacred objects that remain abandoned due to lack of the faithful)
– technological advances and the related impairment of utilitarian values of objects of wood architecture, not only residential but also "industrial" (i.e. mills, windmills) and farmhouse (e.g. storing hay in a field in foil-wrapped cubes, and not in barns)
– ownership changes related to the takeover of wood objects by new owners – (e.g. urban population) do not have knowledge of the specific characteristics of regional architecture – consequently allowing the seizure of these characteristics during repair works,
– technical problems related to wood architecture conservation:
  • disappearance of traditional technologies,
  • lack of knowledge (by owners and professionals) on contemporary methods of preserving wood,
  • choice of the cheapest technologies and materials resulting in the disappearance of authentic elements to the additions of low technical and aesthetic value (e.g. tight PCV woodwork – lack of ventilation – mould).

These processes can only be generally characterized as, at least in the area of operations of the Museum of Agriculture in Ciechanowiec, which is on the eastern Podlasie and Mazovia, there have not recently been carried out any studies allowing to estimate the total resource of traditional wood buildings. Failure to identify the resource makes it impossible to take coordinated protective measures, including proper selection of objects to be transferred to open-air museums.

Displacement of an object to a museum is one of the ultimate forms of protection of wood architecture, taken at a time when the possibilities of in situ conservation are exhausted. Transfer of a building is not the end of struggle for its preservation. Translocation to an open-air museum which is often the only chance to

[1] I. Tłoczek, *Polskie budownictwo drewniane*, Zakład Narodowy imienia Ossolińskich Wydawnictwo, Wrocław, Warsaw, Kraków, Gdańsk 1980, p.7.

protect the object is also a drastic change of the environment in which it was built. These changes apply both to physiographic conditions (climate, water conditions, topography, geological structure, the animal world and vegetation), functional (change of use, drastic increase in the number of people staying in the facility) as well as formal and legal (legal regulations to which objects and museum exhibits are subject). According to developed in 1999 by the International wOOD Committee ICOMOS Principles for the Preservation of Historic Timber Buildings[2], crucial for the protection of historic timber structures and their cultural significance is a coherent strategy of regular monitoring and resource management in the inevitable process of change.

A task which for one or more objects in the yard, with its host, seems clear and instead of scientific papers it requires simply a "farmyard eye", in the case of open-air museums often caring for dozens of buildings is a major challenge. Hence, the concept of care and protection is increasingly replaced by the notion of "management". The concept of management means that in the matter of care and conservation of resources there are a number of targets requiring definition and assigning priorities, being part of effort to ensure maximally long duration of heritage of wood architecture and values represented by them. Thus understood dynamic protection of monuments is planning based on interdisciplinary biotechnical, aesthetic and architectural knowledge, also from social sciences such as ethnography, history or economics, but mainly local building tradition.

At Krzysztof Kluk Museum of Agriculture in Ciechanowiec, there are now more than fifty objects of historic (XVIII – the beginning of XX) rural building from the border of Masovia and Podlasie. Although the Museum of Agriculture in Ciechanowiec is almost a unique culture unit in Poland, as one of the two dealing with issues of the village, it lacks a coherent strategy for managing wood objects. Practical experience shows that in addition to the inventory and historical materials for the proper conservation and protection of objects of wood architecture is required full information about their method of use, previous repairs and restoration activities. During the long period that has elapsed since the translocation to the museum until today, in some objects major changes have been made for the foundation, functions and architecture. Preparation of conservation works is often associated with risky task of traceability of renovations located in different publications and archival collections. Also, when it comes to monitoring, the Museum has no professional "warning" procedures. Rather basic methods are realized (e.g. roof surveys) and it is not systematic, which does not provide optimal protection for wood objects.

Realized within the framework of the EEA funds[3], coming from Iceland, Liechtenstein and Norway, and the Podlasie Region budget, project: Documentation and monitoring in the management of timber objects in Krzysztof Kluk Museum of Agriculture in Ciechanowiec and Ryfylke Museum is an attempt to create a systemic management instrument tailored to the needs of open-air museums. Implementation of the project stems from the need to develop tools to facilitate management of information about the historic resource of wood architecture and enable to act in the context of anticipated negative degradation processes. The main objectives of the project were determined:

– developing for the museum modern standards of management of wood architecture facilities regarding documenting and monitoring their biotechnical, architectural and aesthetic condition,
– developing a computer application to collect information on monitoring objects,
– developing, within the framework of the monitoring, a system allowing to anticipate (to stop the negative processes) called "early warning and response",
– publishing the results for possible wider action for the resource of wood architecture.

[2] Principles for the Preservation of Historic Timber Buildings, Mexico 1999, http://www.icomos-poland.org/index.php/pl/dokumenty-doktrynalne.
[3] European Economic Area.

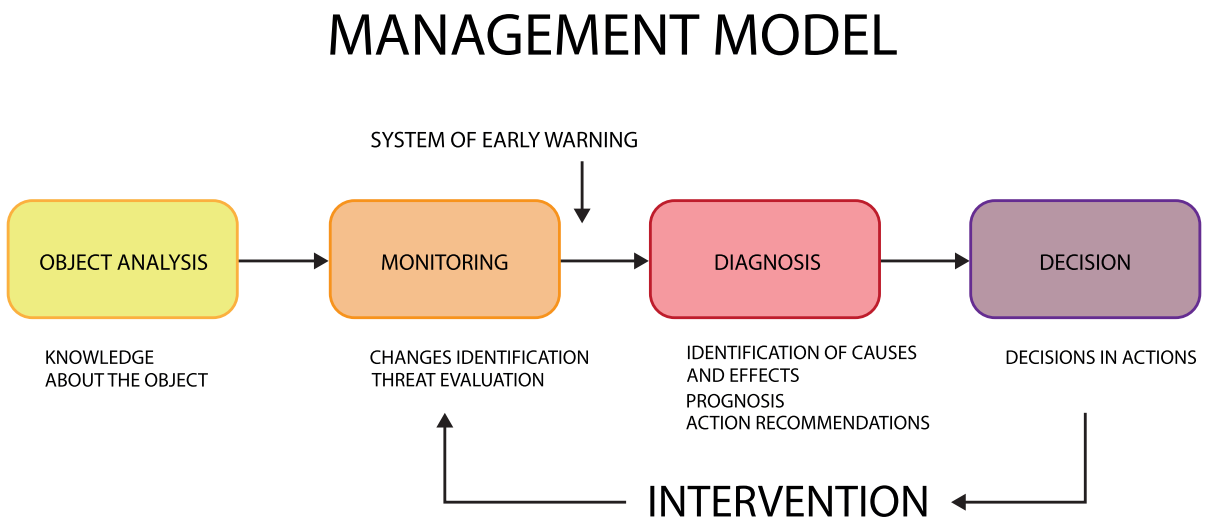


Fig.1. Management model developed for the project. M. Górski 2014.

Implementation of the project

The project was implemented in scientific cooperation with academic employees of:
- Faculty of Architecture at Warsaw University of Technology,
- Department of Wood Technology SGGW in Warsaw,
- Faculty of Architecture of Bialystok.

Implementation of the task was divided into three stages:
- preparative, including gathering guidelines for the development of applications,
- executive, including the development of appropriate software application,
- implementation, including installation of applications on the museum server, training the staff and publishing the results of the project.

In the first phase of the project were developed four reports relating to standard for documenting and monitoring of wood objects in Poland, as well as Norway. A study visit to Ryfylke Museum was organised, including familiarization with documentary practices and standards applied in the Norwegian museum.

On the basis of the produced scientific materials and examination in the course of a study visit to Norway, the first action in the second step was to determine the scope of information required to develop a model to monitor objects in the Museum in Ciechanowiec. In this task, Ryfylke Museum representatives took an active part, interested in comparing documenting and monitoring standards in Poland and in Norway, sharing in the context of a two-day seminar organized in April 2015 by the Museum in Ciechanowiec, their practical comments on the use of computer software for the management of museum objects.

The main point of this stage was to develop a model to monitor together with its practical verification. In this task, we developed an "object card" tailored to the needs othe Museum and instructions for its filling. During the seminar was conducted a working test of the "card" on selected buildings. Based on the gained experience, we proceeded to achieving the main objectives of the project,that is developing a computer application.

The third phase of the project is primarily implementation activities associated with installation and training devoted to the use of the application. It also consists of defining procedures of "early warning" and "response" with regard to the monitoring of objects.

The Museum of Agriculture – Ryfylke Museum two strategies of protection – one goal

Objects belonging to Ryfylke Museum in Norway are located over the area of eight municipalities. The care of wood houses differs significantly from a typical open-air museum, as in the case of the Norwegian museum, objects were not transferred but left in their location. A small number of permanent staff (12-14

people), as well as long distance between groups of buildings (farms) averaging tens of kilometres require good organization and an efficient management system of the museum.

Preparation of a system of documenting and monitoring wood objects began in the Norwegian museum in 2005-2006. The main objectives of the new monitoring system were as follows:

– creation of source data: observation, research, interviews, descriptions, photographs, drawings,
– collecting existing sources – literature, archives, old photographs,
– organizing data by systematizing and archiving,
– data sharing: presentations, reports, research,
– using the data for educational purposes.

Works on the resource management system of wood architecture in Ryfylke Museum is divided into three main stages:

– establishment of a manual describing methods of documentation of historic buildings,
– internal application development,
– web application development for all museums in Norway also including movable monuments.

However, the first step to systematise the knowledge about objects was to catalogue the resource. Each farmhouse received a serial number, each of the buildings a successive number and the last number in a row to each interior.

The monitoring system contained in the manual consists of thematic forms and checklists. Checklists are used to verify the scope of the monitoring carried out or, for example, check the extent of the documentation developed for the object.

The main role in the preparation of documentation and reports, working on the current documentation act craftsmen employed at the museum. In addition to their obligations related to the implementation of conservation works, find time for learning, documenting conservation works and planning future repairs. Such division of responsibilities reflects the high prestige enjoyed by the Norwegian museum carpenters.

The next step after the completion of the manual was to prepare and implement the use of an internal computer application. Folders and bookmarks system has been adapted to the scheme contained in the manual. In addition to recording information on the state of the object and its technical state in the application one can be develop, for example, annual and long-term renovation and budged plans. In order to create a system dedicated to Ryfylke Museum, commercial database application Facilit was used.

The advantage of the new system is improved access to information, the ability of searching archives and creating summary reports. Since it is not a mobile application, the task involved development of notes and photos on the site, and then passing the information to a computer in the office.

Based on the experience gained with the creation of the internal application, together with the project carried out in Ciechanowiec, begun in Norway works on a computer programme that integrates information about museums in other Norwegian museums. The task financed and developed in collaboration with academic employees and Norwegian museums. In contrast to the Facilit programme, the new system is meant for documenting movable monuments as well. The objective is friendly and flexible solution tailored to small and large collections and rich in content. The application is also available in a mobile version for tablets and mobile phones which gives you the ability to modify data directly on-site at the facility.

The programme features provide the ability to:

– updating and reviewing the current state and damage to the objectsand plannig repairs and prioritizing works,
– full documentation of renovation and conservation,
– supporting management processes flow of information between craftsmen and users of the object,
– rapid search and editing data,
– fullaccess to photographs, films and documentation of objects.

The management model presented by Ryfylke Museum indicates a significant discrepancy between the Norwegian system and the expectations of Polish museums in the open air resulting from working surveys conducted by the authors of the reports made within the project. As indicated in the summary of his research Krzysztof Koszewski[4] on the basis of collected as part of a survey among Polish museums responses, these units await mainly reporting tools, then tools for collecting and managing information, and the final priority is to provide information about monuments. Rarely is taken into account the possibility of collecting tacit knowledge – i.e. habits, skills, techniques that in the case of vernacular architecture are fundamental.

[4] Recognising the existing applications for monitoring and management of information about historical buildings and architectural complexes, author: Krzysztof Koszewski, Warsaw 2015.

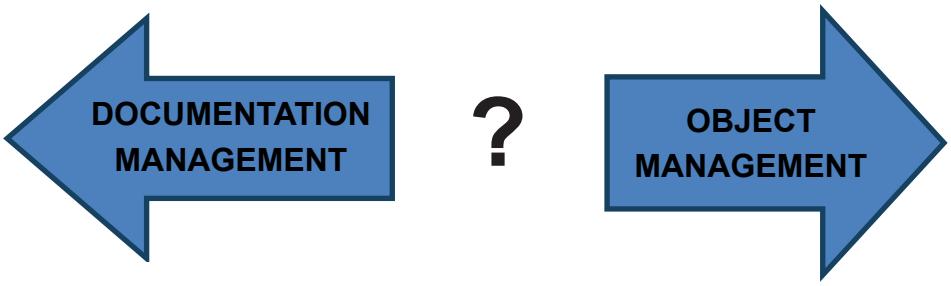


Fig. 2. What to manage?

Otherwise, in a Norwegian museum, the basis for documenting works is reproduction of traditional technologies and young craftsmen trainings, while management focuses on maintaining facilities in good condition with rational management of finances. The main role in this process is played by museum craftsmen responsible both for the quality of renovation and preparation of technical inspections of buildings. Management in this case is a horizontal process for exchanging information between employees of the museum.

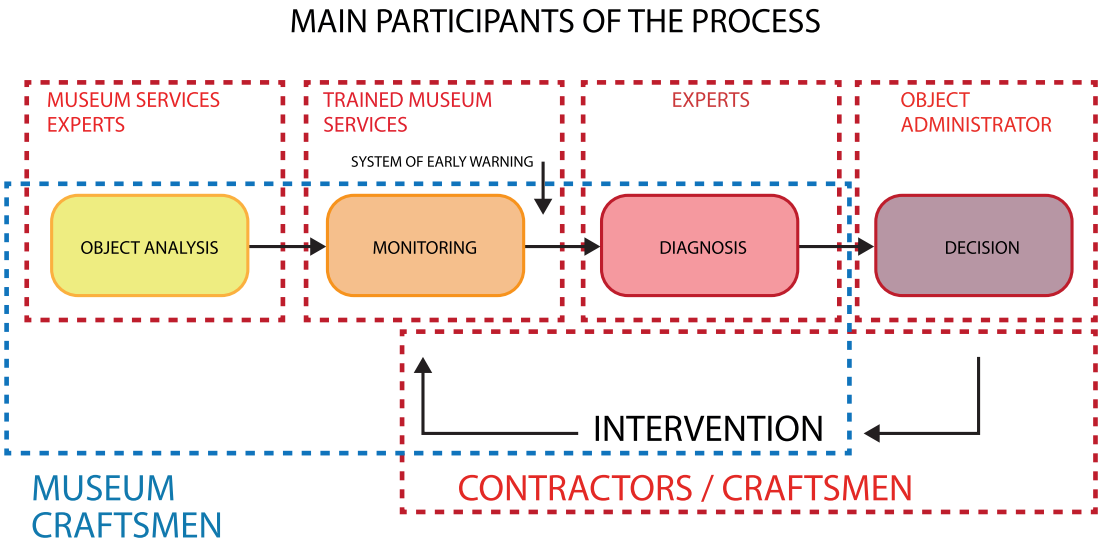


Fig. 3. Adopted management model of wood objects in the Museum of Agriculture in Ciechanowiec. In red were marked fields of responsibility in the Polish museum, in blue responsibilities of Norwegian craftsmen. M. Górski 2014.

Application

Gathered in the preparatory phase knowledge and experience, also from the Norwegian model of the museum, helped to develop the concept of a computer application. The content of the application is a compromise between the basic needs related to the administration of historic buildings, archiving information and current maintaining them in good condition. Due to the construction specificity of the museum resource, while creating the application, it was assumed that to support applications, a person is needed who has:

– knowledge of traditional timber construction,
– the ability to assess the basic technical state of elements of the construction of wood architecture,
– basic experience in repairs of wood building components.

The data set was divided into three main sections:
Documentation, Monitoring and Management.

In the section "Documentation" there are tabs representing the range of information adjusted to the form of a "white card" of monuments of architecture and construction and the building log book. Keeping method and content of both documents is determined by the law.

Analysis of specified by legal provisions content collected in both documents, carried out by authors of the report[5] pointed to their high utility for work on the application. Thus, on the one hand the resource and the form of archiving information about was defined meeting two basic legal conditions to which are subject building entered in the register of monuments.

The scope of information in the inventory tab has been adapted to the provisions of the Regulation of the Minister of Culture and National Heritage on keeping the register of monuments, national, regional and municipal register of monuments and national list of monuments stolen or exported abroad illegally of 26 May 2011 (OJ No. 113, item 661). The resource of information resulting from the Regulation was extended by a simple text tab related to the conservation valuation of historic buildings. The tab consists of two registers namely:

– field specifying the type of value such as: scientific, historical, ...
– text field to describe a given value.

The aim was to simplify the record and adapt it to different valuation models.

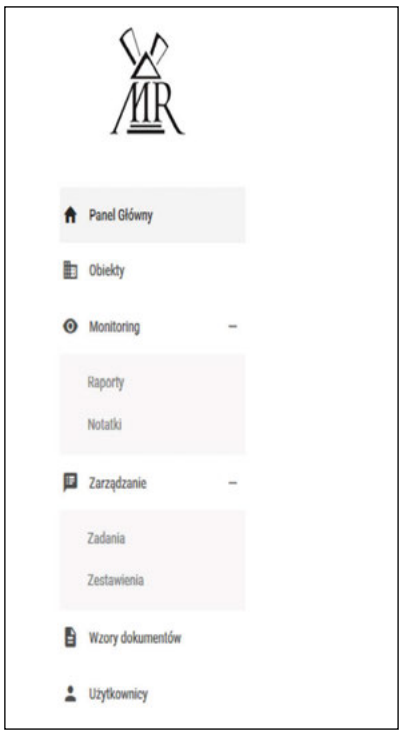


Fig. 4. Main computer application panel with thematic sections.

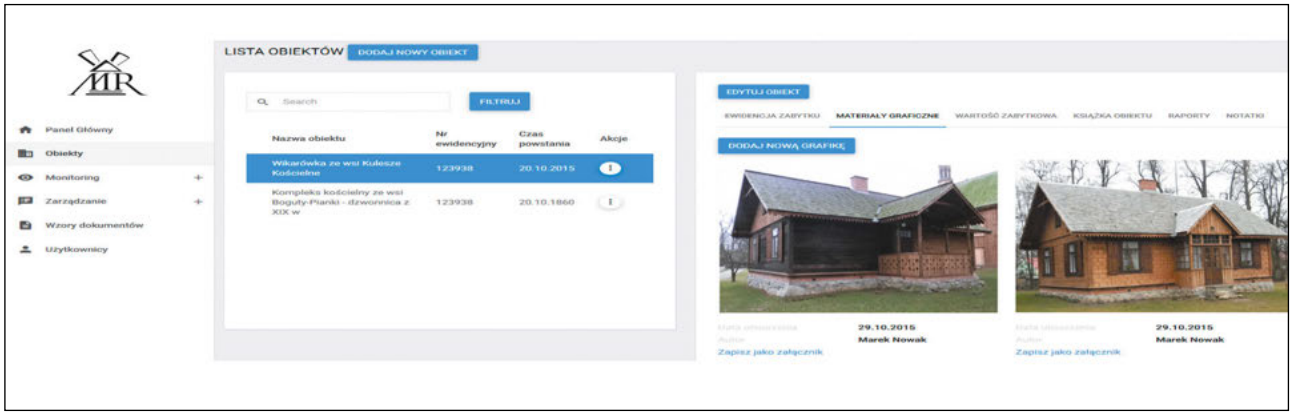


Fig.5. Inventory application tab.

Construction Law also imposes on the owner or manager an obligation to keep for each building and construction work a building log book, which is a document to record tests and technical inspections, repairs and reconstructions over the entire lifetime of a building. To keep the building in good condition, one should regularly monitor its technical condition. Mandatory inspections are set out in the relevant legislation together with time limits when they need to be carried out. The decision to adjust a recording of documentation on objects of wood architecture to the form of a "building log book" was taken with the full knowledge that in many cases, from a formal point of view, as farmhouse objects or single-family houses do not need such a book. Introduction of a book model to an application, however, gives such opportunity, while maintaining a uniform form of storage for all objects. During use of the facility, the owner or manager should collect and store all design studies and technical documents of construction works carried out in the building during its use and records of inspections of the building and expert reports on its technical condition. The standard form of a building log book contains the following sections:

[5] Analysis of currently existing models of monitoring historical monuments of wood architecture as the basis for monitoring objects belonging to the Museum of Agriculture in Ciechanowiec, the authors: Piotr Kozarski Katarzyna Skiba, Grzegorz Basiński, Warsaw, December 2014, mps in the collections of the Museum of Agriculture. Analysis of currently existing national standards for conservation documentation of wood architecture objects as the basis for monitoring within the implementation of the cooperation project between Krzysztof Kluk Museum of Agriculture in Ciechanowiec and Ryfylke Museum in Norway, author: Jerzy Uścinowicz, Białystok-Ciechanowiec 2014, mps in the collections of the Museum of Agriculture.

I Person responsible for registration.
II Identification of the facility.
III Documentation included with the building log book of the facility.
IV Technical data characterizing the object.
V Map of the facility.
VI List of protocols of periodic inspections of the technical state of the facility.
VII List of protocols of periodic inspections of the technical condition and suitability for use of the building.
VIII.1 List of technical studies on the facility.
VIII.2 Data on technical studies on the facility.
IX.1 List of acceptance protocols of renovation works in the building.
IX.2 Data on the technical documentation.
X List of accidents and disasters protocols of the facility.
XI List of permissions to change the purpose of the facility.

The standard model was enriched with Chapter XII adapted to the specific nature of historic buildings including the list of other studies (conservation, research, archives). In addition to the list of documentation, image files can be archived in tabs, e.g. scans of recorded studies.

Another section of the computer application is "Monitoring". A coherent strategy of regular monitoring and maintenance of facilities is crucial for the protection of historic timber structures and their values. Periodic inspections of the technical condition required by virtue of the construction law are generally carried out by external experts with adequate powers, but usually unprepared to assess open-air vernacular architecture. Rarely (especially in the tendering procedure) is it possible to find engineers with knowledge about traditional carpentry and able to use it when identifying repair methods. While working on the application, periodic annual and five-year inspections conducted by a person with appropriate building qualifications were abandoned. The basis of the adopted system for monitoring are forms of internal inspections conducted by a qualified Museum employee.

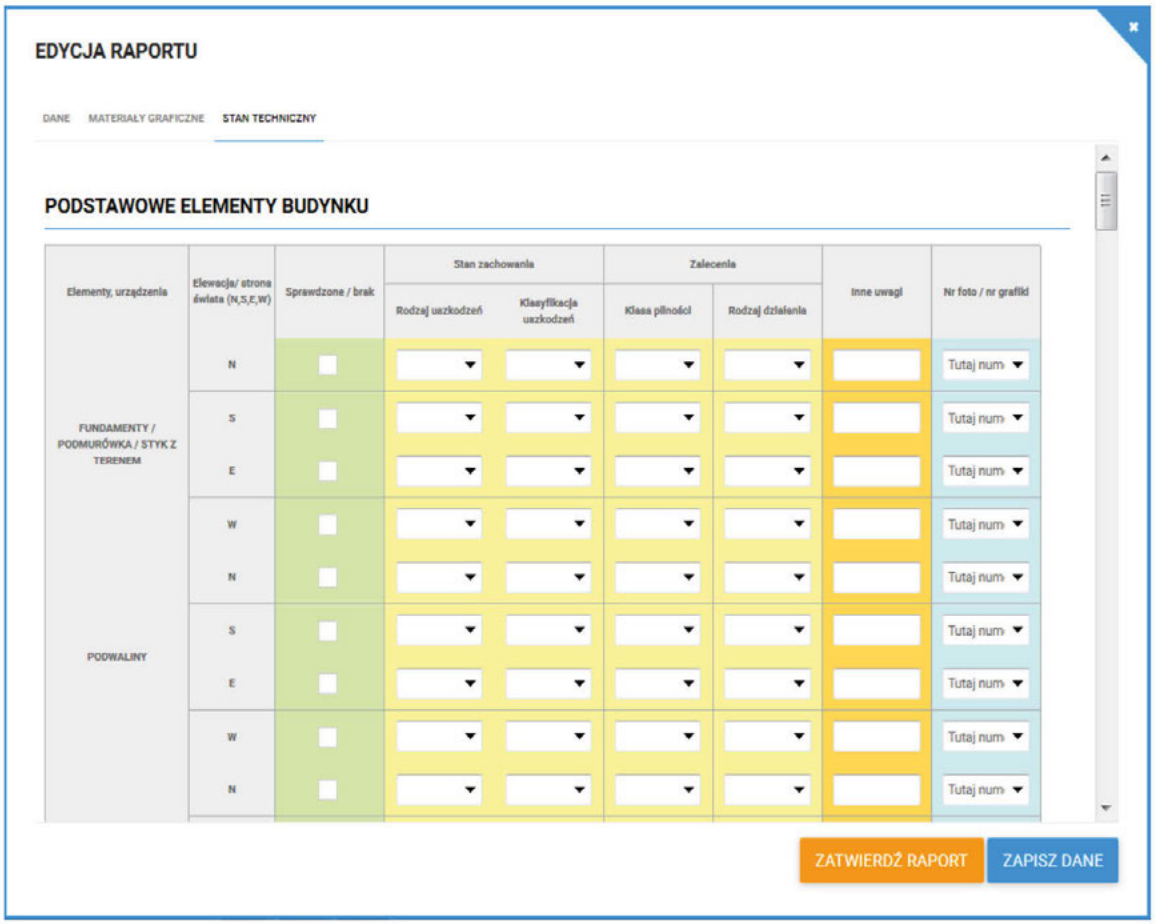


Fig. 6. Excerpt from a form of an internal inspection.

The evaluation scheme has been adapted to the PN-EN 16096: 2013-02 "Maintenance of cultural goods – Review and description of the state of preservation of the architectural heritage". It is a harmonized European standard EN 16096 with the designation: 2012. The EU document was approved by the President of PKN on 8 February 2013. The standard was developed in line with European and international conventions, cards, declarations and guidelines in the field of conservation. In the sense of the standard, conservation status assessment is a management tool. Such a study of building structures and materials is the first step in the process of developing plans and actions necessary to preserve the architectural heritage in a stable, well-kept condition. It is the basis for the preferred preventive care, maintenance and immediate repair, as well as for more detailed planning and decision-making about further actions or studies.
Based on the content of the standard the level of precision of records of the state of preservation contained in the report allows:

1. classification of the state of preservation of elements,
2. risk classification because of the urgency,
3. classification of actions.

In addition to internal inspections, there is a possibility of introducing to the application short notes confirming minor defects[6].

The "Management" tab provides a possibility of creating tasks with determination of: urgency, completion date, description of activities and estimated costs. Completion of the task is effected after entering as-built information with a description and an attached image in the form of a photo during and after the task completion.

The application also allows the recording and collection of forms and templates useful in the administration of objects.
Working with the application is possible at four user levels:

– Administrator – has insight into all the fields, can edit notes (local visits), can create tasks, closes all the tasks, creates new user accounts,
– Operator – has insight into all the fields, can edit notes, edit reports, records of the monument, values and the building log of the facility, creates tasks, cannot close tasks,
– Museum employee – has access to objects and monitoring tabs, can create only his notes,
– Guest - has access to objects tab but cannot edit anything.

Conclusions

Finally created computer application in its original assumption is to constitute a tool: organizing information on wood objects in museums and supporting decision-making in the field of conservation and restoration. It combines many aspects of the management of historic buildings, while maintaining a fairly simple and intuitive interface.
Effective resource management of the entire museum of wood architecture requires:

– conducting technical monitoring of objects on the basis of a system of periodic internal inspections effected people responsible for buildings in the museum,
– introduction of a standardized system for recording information with regard to individual tabs for example: standard conservation valuation, standard inventory documentation, standard of grading the technical condition,
– directory system for all objects and their interiors,
– consistent application of the application or introduction in its resources information of all defects and repairs.

The usefulness of the application can be assessed realistically after the first months of its use. The first arduous task will be to develop a directory system corresponding to the buildings and all interiors. This requires a strong commitment on the part of museum staff, introduction of new lobar standards and consistency in current fulfilling successive tabs. However, no application is able to replace knowledge, technical skills and commitment of people connected with the care of wood construction.

[6] Detailed information on internal monitoring were included in this publication in an article by P.Kozarski and K. Skiba. Technical evaluation of objects of wood architecture as a basis for monitoring the conservation status and management.

MAIN PANEL	Objects	Reports	Last notes	Matches	Recent tasks	Document templates	Users

DOCUMENTATION										
Objects	List of objects				Monument inventory	Graphic materials	Historic value	Building log book	Reports	Notes
	Ffacility name	Registration No.	Time of creation	Actions						

MONITORING								
Reports	List of reports				General information	Graphic materials	Technical condition	Tasks
	Ffacility name	Author	Date of inspection	Actions				
Notes	List of notes				Visit data	Reports	Tasks	Matches
	Ffacility name	Author	Notes date	Actions				

MANAGEMENT									
Tasks	List of tasks					Task data	Graphic materials	Post-completion description / conclusions	Matches
	Ffacility name	Creation date	Author	Urgency / activity	Actions				
Matches	Matches						Data of the summary	Active tasks	
	Ffacility name	Active tasks	Incurred costs	Planned costs	Urgency	Actions			

DOCUMENT TEMPLATES						

USERS	User Name	E-mail	Phone number	Access level

Fig. 7. The architecture of a computer application for managing objects of wood architecture in Krzysztof Kluk Museum of Agriculture in Ciechanowiec. M. Górski 2015.

Marcin Górski, dr inż. arch.

He graduated from the Faculty of Architecture Warsaw University of Technology. He specializes in issues related to historical preservation. Author of several scientific publications. Co-author of a number of concepts and projects for the restoration of historical complexes and architectural objects. In 2007 he defended his doctoral dissertation: Theme Parks as a form of historical development of nineteenth-century fortification complexes in Poland (supervisor prof. zw. dr hab. inż. arch. Andrzej Tomaszewski) at Faculty of Architecture Warsaw University of Technology. Since 2008 Assistant Professor in the Department of Conservation of Monuments, currently in the Department of Architectural Heritage and the Arts Faculty of Architecture Warsaw University of Technology. Member of the Commission of Military Architecture ICOMOS. Co-founder of the studio Festgrupa in 2007. Qualified mycological and construction specialist by the Polish Association of Construction Mycologists.