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TYPES OF MOULDING AND METHODS OF ELIMINATING DRY ROT IN HISTORIC BUILDINGS: EXAMPLE OF SOBIESCY PALACE IN LUBLIN (BASED ON STUDY BY MIROSŁAW ZARÓD)

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Abstract

By presenting Sobiescy Palace in Lublin as well as results of mycological research conducted in the said premises, the authors describe hazards and dangers arising from damp present in historic buildings for a long time. Results of mycological research quoted in this article indicate that differences in levels of damp depend on the cardinal direction a specific wall faces. The authors also pay attention to reasons for which the described premises suffer from damp and provide programmes of treatment and prevention. Furthermore, the article gives the reader a detailed insight into multiple opportunities for improving technical conditions of historic buildings and, at the same time, raising their functional standards. However, one must not forget to treat such premises with proper respect.

Keywords: Sobiescy Palace, Lublin, mould in buildings, damp

1. INTRODUCTION

Values of historic buildings undoubtedly have great influence on identity and development of cities. Moreover, such premises represent past achievements and merge with urban areas. Depending on the age of premises, applied construction materials,as well as local conditions, the technical condition of the

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buildings in question may be defined as 'poor'. Problems that need to be discussed include: various types of mould, mould-related dangers, and dry rot elimination methods applied in antique restoration. Capillary action of water as well as lack of ventilation, damp insulation, and waterproof courses may result in microbial corrosion. Sobiescy Palace in Lublin is of utmost importance not only due to strong influence of microorganisms but also because of transformations that took place in the area in which the building is located. The authors of this article present one of the most frequently occurring sprout mould as well as methods of drying walls and eliminating dry rot.

2. GENERAL OUTLINE

Sobiescy Palace was listed in heritage register under the number A/489 on 22 March 1971 [5] . Hence, no works can be carried out without permission granted by Historic Preservation Officer for Lublin Province. Nowadays, Sobiescy Palace Complex consists of 11 buildings including the main structures: the palace building, two outbuildings, two guardhouses, and administrative edifices. The entire complex is accessed from Bernardyńska Street through a gate. Not only the Palace, but also K. Vetter Brewery and Good Samaritan Hospice (already extended) are important in the history of Lublin City [10, 11].

3. HAZARDS RESULTING FROM DAMP

Moisture occurs in buildings due to numerous reasons and it may cause multiple damages. If damp insulation and waterproof courses are not applied, what frequently occurs in the case of the abovementioned buildings, one can observe capillary action of water, up to considerable height. Precipitation has also substantial impact not only on capillary action of water but also on dampness, which depends on rainfalls, wind strength, and condition of walls and masonries. One must also take frequent roofing leaks into account, which may result in damp patches. This problem is more serious when a building is founded shallowly. Furthermore, vapour condensation is also adverse [12].

There is a considerable number of direct and indirect consequences following from damp: decreased durability of materials, which also get older and deteriorate; increased amount of adverse chemical substances, more stimulated growth of fungi and mould, as well as higher susceptibility to diseases suffered by users of the building [12]. It is worth mentioning the damages resulting from frost, i.e. freezing water expanding in cracks and empty spaces, or salt applied in order to melt ice [4, 2].

Mycological research conducted in basements revealed mould fungi, e.g.: *Aspergillus* or *Chaetomium* [13] that can occur on moist wood. *"They grow on surface and create colourful mycelial coating. (...) These fungi nourish from various kinds of organic materials (cellulosic), size colour, organic pollutants in paint, as well as organic dust covering surfaces."* [8].

There are plenty of dangerous consequences, e.g. allergy, mycosis, [6] arising from staying in rooms affected by mould fungi. It has been stated that the fungi growing in Sobiescy Palace may cause asthma. Moreover, mould fungi may lead to various types of mycosis, including the most serious ones, i.e. generalised and organ-attacking mycosis [6].

4. FORMER METHODS OF APPLYING DAMP INSULATIONS

Buildings currently recognised as historic are mistakenly thought to be equipped with damp insulations and waterproof courses. It is worth mentioning the research results produced by Marek Iwaniec, who analysed curtain walls in Zamość Fortress. This researcher pointed out the wrong view on wall insulation; He stated that until the building became mechanically damaged, clay and tar could have insulated it successfully and protected it from precipitation. Iwaniec also pays attention to properties of clay: the fact it easily absorbs water and, consequently, expands, make it a perfect insulation material. The researcher discusses also how water is drained in draining systems.

Iwaniec also emphasises the fact that frequently such insulations or draining systems are destroyed during renovation works that ruin the existing insulation and hence, lead to damp occurring quickly in the restored buildings. This results in destroyed premises. This fact proves the importance of damp insulations and their proper selection [3].

The authors of this article present modern insulation materials applied in historic buildings, which, when applied, does not damage historic layer of a building, but improves technical condition of walls.

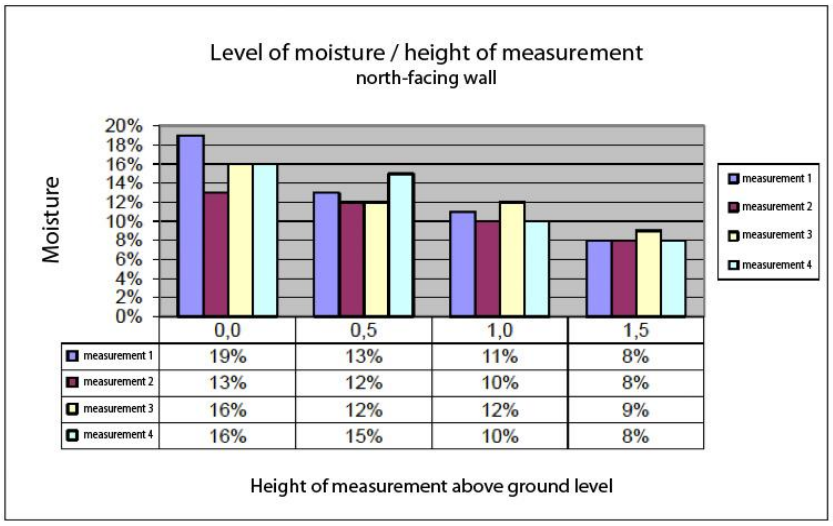
5. TECHNICAL CONDITION OF THE BUILDING

"Revalorisation and modernisation works carried out in former Sobiescy Palace at 13 Bernardyńska Str. for education purposes on Architecture and Urban Planning" project resulted in conducting numerous researches and analyses in the years 2008-2009. A conceptual project of redeveloping the premises, which assumed implementing new functions to the premises, i.e. building an auditory hall for 200 persons, a two-storey underground parking space, lecture rooms,

drawing rooms, a cafe, and others, was developed (group work: E. Przesmycka, J. Wrana, B. Kwiatkowski, K. Petrus, N. Przesmycka, E. Pytlarz, K. Janus, M. Mysiak). However, even though it respected the existing premises, it has not been implemented due to legal issues. Technical condition of all buildings included in Sobiescy Palace Complex deteriorates each year. It is worth emphasizing that majority of historic buildings face similar problems [9].
The ground, as well as the first and the second floors are still used by employees of Lublin University of Technology. A part of the building serves administrative functions. Expertise conducted in 2008 assessed foundations and foundation requirements. Lack of damp insulation and waterproof courses, as well as presence of penetrating damp were stated. Excessively shallow foundation of the building needs to be tamped. It is also worth mentioning that foundations of the round tower are placed higher than foundations of the palace [1, 11].

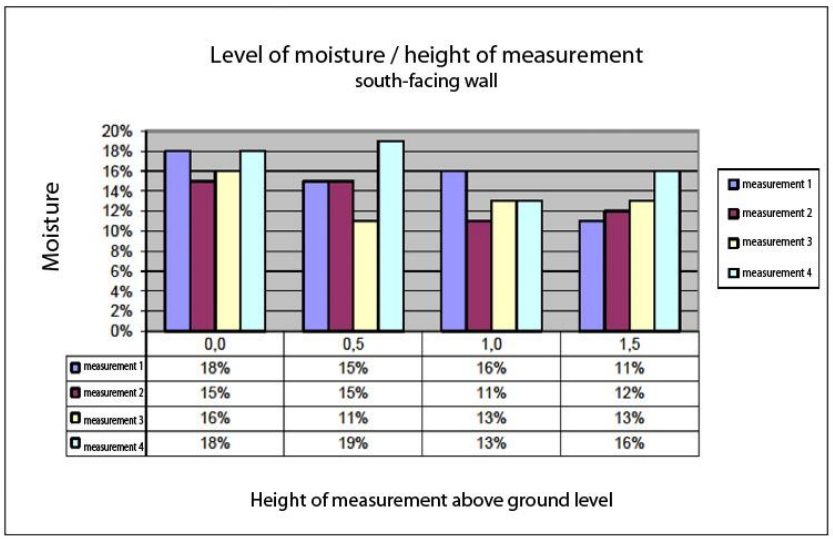
6. DETAILED ANALYSIS OF PROBLEMS AFFECTING SOBIESCY PALACE

The abovementioned information shows how deteriorated the condition of the entire complex is and how destructive the influence of moisture and damp on specific elements became. Basing on analyses and expertise conducted in the recent years in Sobiescy Palace, the authors of the study would like to outline characteristics, occurrence, impact, and consequences of dampness, fungi, and mould, as well as methods of preventing their occurrence. Damp in walls was measured (by applying Surveymaster SM meter) in conjunction with conducting mycological expertise. This analysis revealed penetrating damp in walls of around 13-19% at the base of the wall and damp of 6-16% at the height of 1.5 meters. These results prove that the level of damp exceeds the acceptable limit of 3% for space occupied by humans (classification of wall moisture according to DIN standard) [13]. Moreover, type and concentration of salt have been measured in the Palace. In this case it was crucial to take detailed measurements (presented in the tables below) and analyse all available technologies that would preserve the current condition and improve it by avoiding destruction of the historic layer. Selecting a wrong method may result only in short-term improvement or, even worse, may damage the building [13].
Moisture measurement in Sobiescy Palace:



	0,0	0,5	1,0	1,5
measurement 1	19%	13%	11%	8%
measurement 2	13%	12%	10%	8%
measurement 3	16%	12%	12%	9%
measurement 4	16%	15%	10%	8%

Fig. 1. Level of moisture / height of measurement – north- facing wall. Bar graph as per information in Zaród [13]



	0,0	0,5	1,0	1,5
measurement 1	18%	15%	16%	11%
measurement 2	15%	15%	11%	12%
measurement 3	16%	11%	13%	13%
measurement 4	18%	19%	13%	16%

Fig. 2. Level of moisture / height of measurement – south- facing wall. Bar graph as per information in Zaród [13]

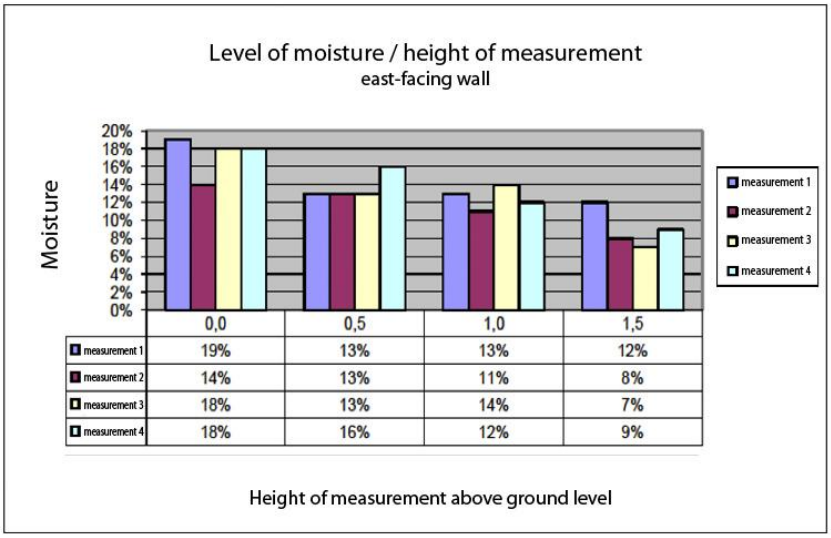


Fig. 3. Level of moisture / height of measurement – east- facing wall. Bar graph as per information in Zaród [13]

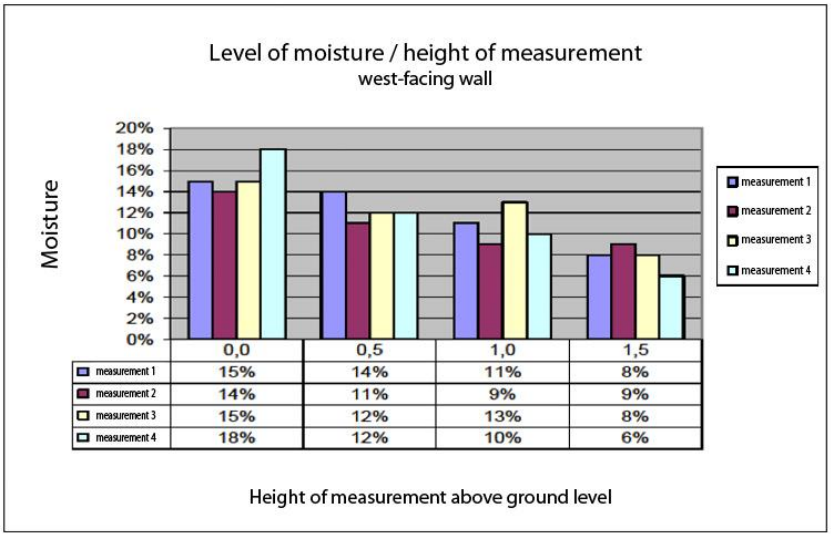
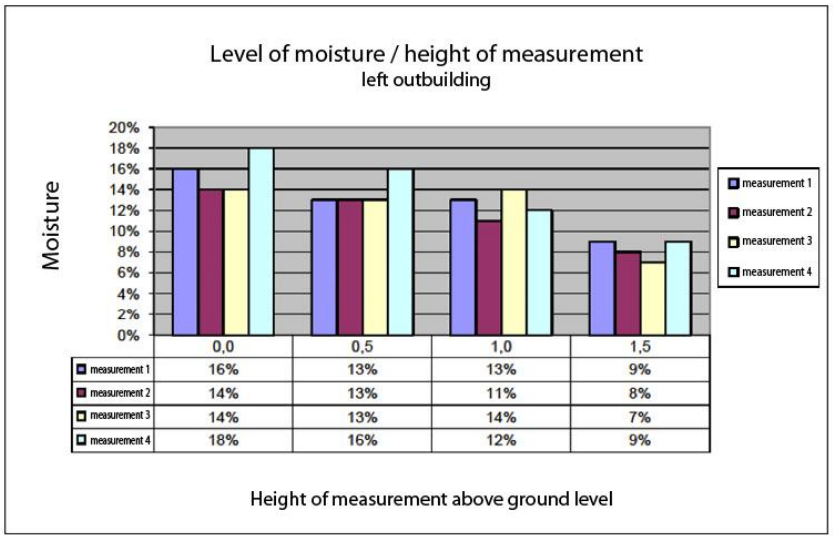
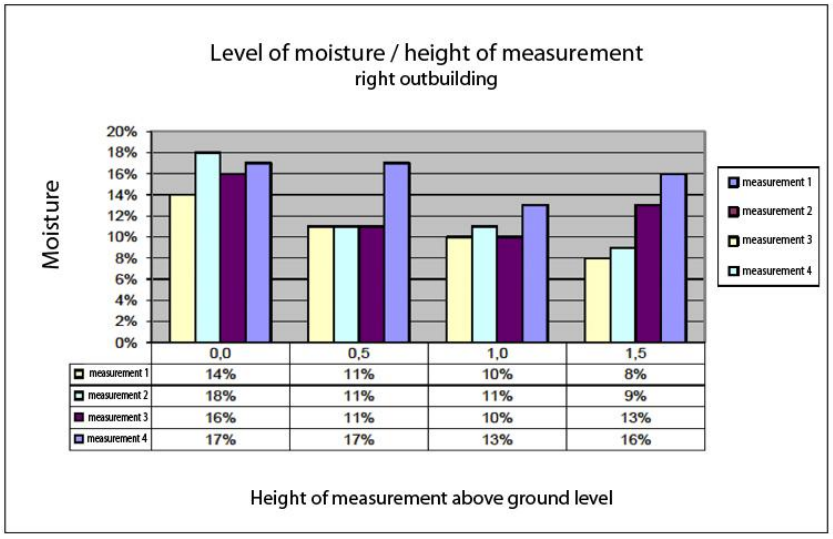


Fig. 4. Level of moisture / height of measurement – west-facing wall. Bar graph as per information in Zaród [13]



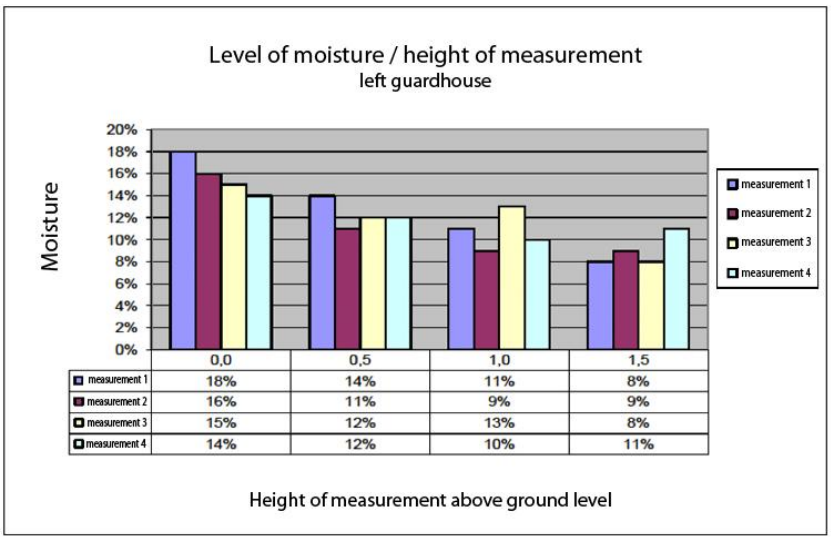
	0,0	0,5	1,0	1,5
measurement 1	16%	13%	13%	9%
measurement 2	14%	13%	11%	8%
measurement 3	14%	13%	14%	7%
measurement 4	18%	16%	12%	9%

Fig. 5. Level of moisture/ height of measurement – left outbuilding. Bar graph as per information in Zaród [13]



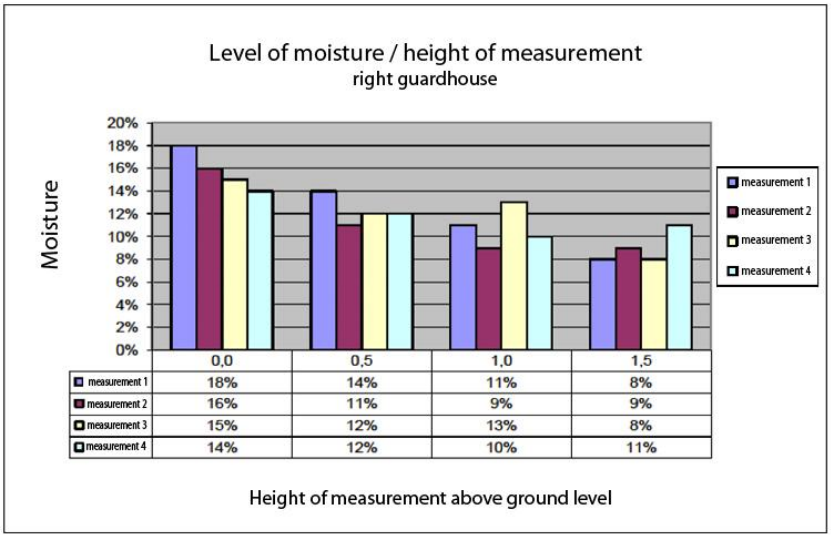
	0,0	0,5	1,0	1,5
measurement 1	14%	11%	10%	8%
measurement 2	18%	11%	11%	9%
measurement 3	16%	11%	10%	13%
measurement 4	17%	17%	13%	16%

Fig. 6. Level of moisture / height of measurement – right outbuilding. Bar graph as per information in Zaród [13]



	0,0	0,5	1,0	1,5
measurement 1	18%	14%	11%	8%
measurement 2	16%	11%	9%	9%
measurement 3	15%	12%	13%	8%
measurement 4	14%	12%	10%	11%

Fig. 7. Level of moisture / height of measurement – left guardhouse. Bar graph as per information in Zaród [13]



	0,0	0,5	1,0	1,5
measurement 1	18%	14%	11%	8%
measurement 2	16%	11%	9%	9%
measurement 3	15%	12%	13%	8%
measurement 4	14%	12%	10%	11%

Fig. 8. Level of moisture / height of measurement – right guardhouse. Bar graph as per information in Zaród [13]

All elements of the Complex are affected by penetrating damp. Moreover, it is interesting that wall moisture levels are slightly different, depending on cardinal direction that each wall faces (detailed measurements taken in the palace complex). Although it can be said that uneven daylight luminance distribution

may create differences in moisture levels, particularly between southern and northern walls. It is also worth mentioning that at the level of 1.5 m above ground level, moisture in the southern wall is higher than in the northern wall [13].

Table 1.Classification of construction-damaging salt (as per DIN norm) [13]

Salinity level	Chlorides	Sulphates	Nitrates
High	> 0,50 %	> 1,50 %	> 0,30 %
Medium	0,20 - 0,50 %	0,50 - 1,50 %	0,10 - 0,30 %
Low	< 0,20 %	< 0,50 %	< 0,10 %

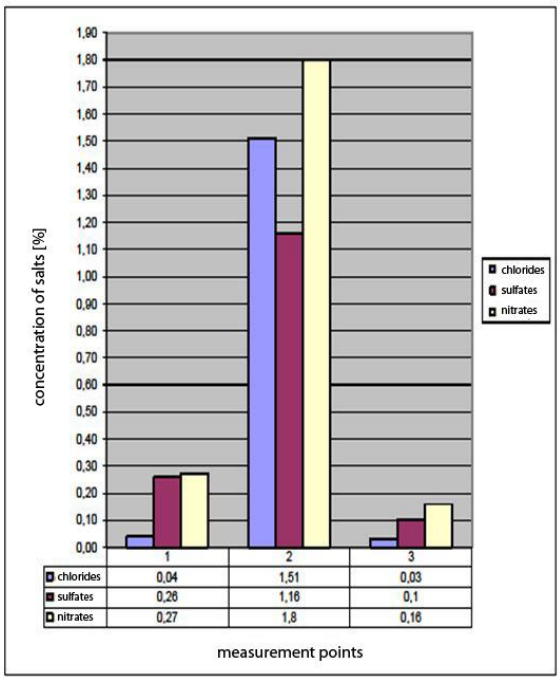


Fig. 9. Results of analysis showing salt concentration in Sobiescy Palace. Bar graph as per information in Zaród [13]

7. SUGGESTED TECHNOLOGIES APPLIED IN COUNTERACTING DESTRUCTIVE EFFECTS

Selecting an appropriate technology is of particular importance as it is to protect Sobiescy Palace from progressive destruction. Providing safety to users of the

premises is the priority of carrying out works improving not only technical conditions but also external appearance of the edifice. Considering destructive activity of water, fungi, and salt, it must be stated that applying traditional emulsion paint is inadvisable as it may result in increased amount of penetrating damp caused by limited water runoff. In order to improve technical condition of the facade, temporary agents, e.g. curtain walls should not be applied as they only increase the level on which capillary action of water occurs. Moreover, saline walls are commonly covered with traditional plaster while not being dried and de-salted [13]. In case of historic buildings it is of utmost importance to protect historic layers of a building. According to Zaród, in order to extend life span of the renovation plaster, horizontal diaphragms ought to be applied in external walls of the premises in question. There are numerous methods of applying the diaphragms: thermal injection, resinous injection, cutting walls, etc. They are characterised by varying scales of cost-effectiveness and invasiveness. Thus, it is recommended that low-pressure or no-pressure injection is the best method from technical perspective: two rows of holes are drilled and afterwards filled with silicon-based solution. Applying this method may result not only in drying the wall but also narrowing water-raising capillaries [13, 7].

As it turns out, drying the walls is not sufficient to improve the appearance of the facade. Applying new plasters and horizontal insulations is equally crucial and neither operation is simple. Implementing new vertical insulations involves digging up buildings, removing old insulations, and filling out any surface irregularities [13]. Preparing the foundation only in this way will guarantee appropriate insulation. According to the bar graph (fig. 9), salinity levels in the facades are high and, due to this, salt must be removed from all walls prior to carrying out refurbishment works. Mould and fungi are omnipresent in Sobiescy Palace Complex and hence, the walls in the entire premises should be disinfected. The above-mentioned methods and techniques can be applied not only in the main building but also in other premises included in the Complex. In case of damp, it is particularly crucial to provide rooms with enough amount of air. Plaster should be replaced with renovation plaster in rooms where the most penetrating damp occurs. [13].

8. SUMMARY

It is unquestionable that historic buildings must be preserved. Conditions of numerous premises deteriorate annually. There are plenty of edifices with rich historic background in Lublin and Sobiescy Palace Complex may be included into this group. These premises were redeveloped and rebuilt multiple times

and, consequently, their character and function were changed as well. However, these activities deprived the Complex neither of its values nor of its charm. The edifice is located in the centre of Lublin and is a greatly interesting element in the identity of Bernardyńska Street. Unfortunately, lack of appropriately conducted refurbishment works as well as inappropriate protection measures resulted in continuously deteriorating technical condition of the palace in question which becomes increasingly dangerous to its users. The main aim of this article is to pay reader's attention to particularly high levels of moisture, omnipresent fungi, damp, mould, and salt efflorescence. Insulations, their importance, and long history, are frequently ignored and, due to their significance, they must be discussed more thoroughly. Problems resulting from the lack of such insulations can be noticed in majority of historic buildings. Activities aiming at improving technical condition of the premises must be undertaken in order to regain former glory of the building. The analyses conducted in the building in question revealed extremely poor technical condition of walls, elements of roof structure or interior. Sobiescy Palace Complex perfectly shows how moisture and damp influence various construction materials and damage their structure, resistance, and appearance.

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ZAGRZYBIENIA I METODY ODGRZYBIANIA OBIEKTÓW ZABYTKOWYCH NA PRZYKŁADZIE PAŁACU SOBIESKICH W LUBLINIE (NA PODSTAWIE OPRACOWANIA DOKONANEGO PRZEZ M. ZARÓDA)

S t r e s z c z e n i e

W artykule przedstawiono zagrożenia tkwiące w długotrwałym narażeniu zabudowań historycznych na wilgoć na podstawie Pałacu Sobieskich w Lublinie oraz ekspertyzy mykologicznej. Zwrócono uwagę na różnice w wilgotności ścian oraz zależności wynikające z orientacji budowli względem stron świata. Opisano przyczyny występowania wilgoci w opisywanym założeniu jak również wskazano możliwości ich przeciwdziałaniu. Poprzez przedstawienie możliwych do zastosowania metod ochrony przed wspomnianymi czynnikami dowiedziono, iż możliwości poprawy stanu technicznego, a tym samym standardów funkcjonalnych obiektów zabytkowych jest wiele przy czym należy zachować szczególny szacunek do substancji zabytkowej.

Słowa kluczowe: Pałac Sobieskich, Lublin, zagrzybienia obiektów budowlanych, zawilgocenia

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