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BRINE GRADUATION TOWERS – A MODERN TAKE ON TRADITION

TĘŻNIA SOLANKOWA – FENOMEN TRADYCJI W NOWOCZESNYM WYDANIU

Abstract

Cultural identity is built upon a longing for the past and considering tradition as sacred. Reaching for the past in designing contemporary buildings leads to an architecture immersed in tradition – such as the form of a brine graduation tower, a traditional form reproduced in numerous, contemporary ways. More and more often, town hall officials decide to build such objects of small-scale – though in reality, often quite large – landscape architecture objects. They tend to be quite popular and integrate local communities within public space. Simultaneously, the traditional form of the brine graduation tower speaks to our longing for tradition and the past.

The subject of this essay is the appraisal, on the example of the graduation tower, of the ways in which cultural patterns – the material elements of Polish history – function in Polish society today. My research methods include an analysis of historical literature, a review of information published on the Internet, an exploration of current architectural projects and conveying their basic features in a form of a table. I also include an analysis of my own, recent experience in designing graduation towers – a tangible reference point for the scientific analysis of the phenomenon of graduation towers, currently built all over the country by various municipalities. The results of my research are discussed in a detailed conclusion, however, they can be summarised as follows: the reduction of the scale of former graduation towers from government-funded to municipal investments has strongly limited their basic functionality: first, in terms of brine concentration and what follows, a significant change of the microclimate within Park Zdrojowy [Spa Park]. Currently, the 'small-scale' graduation towers constructed by municipalities do not serve their primary functions – they do not collect brine and are too small to create a reasonable microclimate – but as objects of municipal 'landscape-architecture', combining tradition with the ecological trend, they are excellent.

Keywords: brine graduation towers, tradition, landscape architecture, small-scale architectural objects, public space

Streszczenie

Tradycja jako świętość, tęsknota za przeszłością tworzy tożsamość kulturową. Sięganie do niej w realizacjach współczesnych budynków tworzy architekturę zanurzoną w tradycji – jak forma tężni solankowej, która jest tradycyjną formą odtwarzaną obecnie na wiele sposobów w nowoczesnym wydaniu. Włodarze miast coraz częściej decydują się na tworzenie takich obiektów małej (często w rzeczywistości dużej) architektury.

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Cieszą się one dużą popularnością i integrują społeczność w przestrzeni publicznej. Tradycyjna forma tężni odpowiada na tęsknotę człowieka za tradycją.

Tematem pracy jest aktualizacja jak dziś funkcjonują w polskim społeczeństwie wzorce kulturowe jako materialne elementy polskiej przeszłości na przykładzie tężni. Metody badawcze to kwerenda bibliografii historycznej i przegląd informacji w Internecie, analiza aktualnych realizacji i tabelaryczne ich zestawienie ad ich podstawowych cech, własne, aktualne doświadczenie w projektowaniu tężni jako realny punkt odniesienia do naukowej analizy takiego zjawiska jak tężnia – obiekt w znaczącej ilości dziś realizowany przez gminy. Rezultatem badań są szczegółowe wnioski, ale sprowadzające się do podsumowania, że zmniejszenie skali dawnych tężni jako inwestycji rządowych do skali inwestycji gminnych mocno ograniczyło ich podstawową funkcjonalność (stężanie solanki i wtórnie: znacząca zmiana mikroklimatu w ramach „Parku Zdrojowego"). Obecnie realizowane przez gminy tężnie w skali „małej architektury" nie zbierają solanki i są za małe do stworzenia sensownego mikroklimatu, ale są znakomitymi obiektami w skali właśnie „małej architektury", którą jest w stanie zrealizować gmina, łączącymi tradycję (tężnie) z trendem ekologicznym.

Słowa kluczowe: tężnia solankowa, tradycja, architektura krajobrazu, mała architektura, przestrzeń publiczna

1. INTRODUCTION

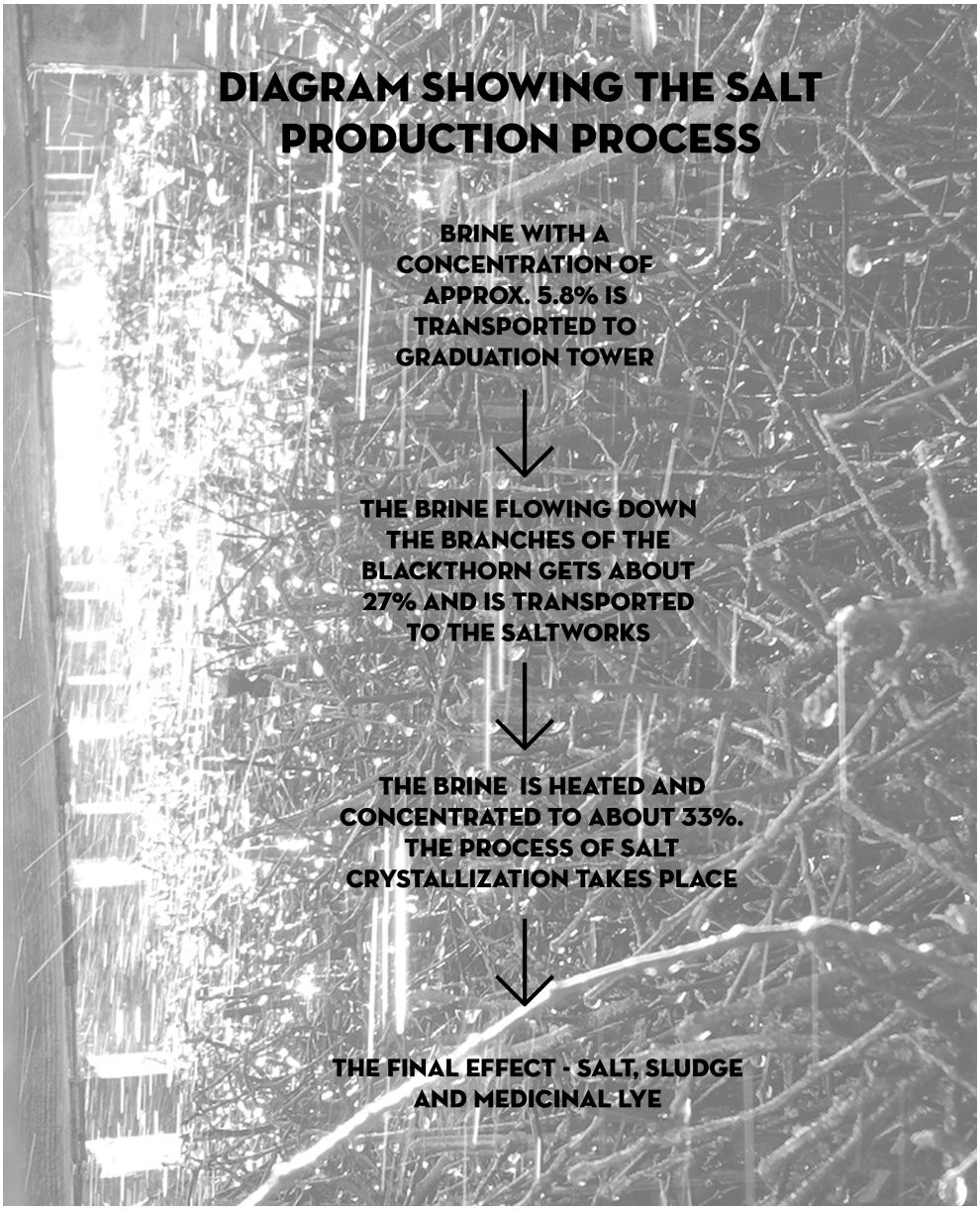
Cultural identity is built upon a longing for the past and considering tradition as sacred. Reaching for the past in designing contemporary buildings leads to an architecture immersed in local tradition that is easier to identify with than 'global' architecture. Such architecture plays a significant role in integrating the community, which perceives it as more friendly. A necessary condition for such 'stylised' architecture is its real usability. A current example of the renaissance of the traditional form is the brine graduation tower, currently recreated and reinterpreted in various new ways.

The name 'graduation tower' comes from the word 'grade' and is associated with the technology of graduation tower work, i.e. increasing the saturation of salt in the saline solution. In the past, salt content used to be defined in 'grades', thus the name derived from 'grading', the raising of the 'grade' of brine. Another name for graduation tower is a graduation house. They are occasionally referred to as thorn houses. In the past, they were used primarily for the production of salt, but nowadays they serve health and wellness purposes. Graduation towers are often built in public spaces as landscape architecture that is meant to integrate residents. In order for the solution it produces to have a therapeutic effect, the object must be of substantial height (about 9 m) and length (over 100 m), such as, for example, the graduation towers in Ciechocinek and Inowrocław. The microclimate that is created at larger facilities is conducive to the treatment of respiratory diseases such as emphysema, sinusitis, allergies, and hypertension. According to research conducted by Aleksandra Burkowska-But, Agnieszka Kalwasińska and Maria Swiontek Brzezinska,[3] the number of individual bacteria in the vicinity of the graduation tower in Ciechocinek is even four times smaller than in the town centre. However, graduation towers built nowadays are usually only up to 4 m high and therefore their therapeutic functions are negligible.

Nevertheless, the reputation of the therapeutic character of the buildings still influences their popularity. Small graduation towers built by municipalities are often besieged by local

[3] Burkowska-But, A., Kalwasińska, A. i Swiontek Brzezinska, M., *The role of open-air inhalatoria in the air quality improvement in spa towns*, International Journal of Occupational Medicine and Environmental Health, 2014, no. 4, pp. 560–570.

residents convinced of their health properties. However, the genuine activation of urban spaces compensates for the seeming misuse of slogans advertising the health properties of graduation towers. And so, municipalities-investors announce further tenders for graduation towers built on a small, communal scale.



Ill. 1. Diagram showing the salt production process[4]

[4] Author, own drawing

2. THE HISTORY OF GRADUATION TOWERS IN POLAND

The invention of the graduation tower was related to the need for salt – the basic spice and means of preserving food. Even in the 20th century, it was still used as a means of payment in what is now Ethiopia. Before the saltworks period, salt was obtained through the evaporation of seawater *via* a system of linked ponds. By the final pond, the solution was sufficiently concentrated so that the salt crystallized on the pond's floor and could be collected.

The next era saw extracting salt from brine solution, i.e. natural waters containing high amount of salt. For this purpose, graduation towers were used as structures that concentrated brine to the content of about 25% of the solution. The technology consisted in pumping the brine through the entire tower several times. The pumps brought the fluid to the top, and then the brine would flow down through a system of troughs, breaking down into smaller drops against blackthorn twigs enhancing the process of evaporation. Then the brine was brought up again in order to repeat the process. Once it reached appropriate concentration, it was discharged to saltworks, where it was heated and concentrated to 33%; the crystallization process would follow. The result of the process was not only salt, but also sludge and bathing lye, useful in therapeutic procedures.[5] This technology was so promising that on March 5, 1791, the Four-Year Parliament passed a resolution that supported the construction of graduation towers: 'We recommend to the Tax Commission of both nations that places where there are salt works, or where they can be built, shall be controlled. If necessary, the Commission shall lend money to the founders of such works, or set a reward for every barrel produced and in all events shall bring help to such works.' In the same year, drilling in Słońsk began, but the development of the graduation tower was scuppered by the partitions of Poland. The Prussians continued the development, and during the Congress Kingdom the government became involved in the mining of salt in Ciechocinek.

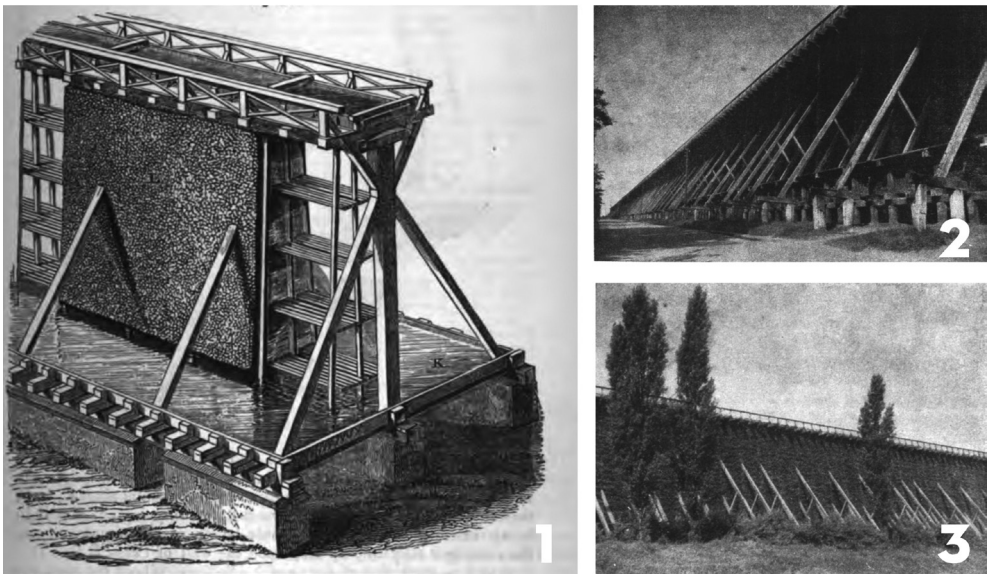
The technique of obtaining salt by evaporation was first used at the beginning of the 15th century in Lombardy. Joachim Friedrich Freiherr van Beust, who initiated the construction of the graduation tower in Bad Salzugen (1740) and Bad Salzuflen (1767),[6] is considered to be the inventor of the currently known graduation tower construction. Since then, several facilities of comparable dimensions have been built in Germany and Poland, e.g. in Kołobrzeg, Busko-Zdrój, Solec Wielka near Łęczyca, and the largest and most popular in Ciechocinek. Until 1978, these were the only existing graduation towers in Poland.

Graduation towers share a characteristic form, refined in the 19th century – all such constructions from that period were similar. This was due to the fact that their primary function was to concentrate the brine, for which the optimal form was developed in the then timber technology. The basic feature necessary for the proper functioning of the graduation tower was its height, which would allow for a sufficiently long way for a drop of brine to fall onto the lower drip tray. The water evaporated, and the brine became more concentrated. It trickled down over brushwood walls made of blackthorn, additionally reinforced along its entire length, creating a characteristic rhythmic sound. The entire structure of the graduation tower was made of timber, perfectly preserved by the saline solution. After years of using the facility

[5] Korzeniewski, B. R., *Polskie tężniogrody*, Wydawnictwo PressForum, Polanica-Zdrój 2019.

[6] Engelhardt, H.-J., *The graduation tower of Bad Kösen (Germany) – a centre of salt production, therapy and recreation*. 2015 [Online] Available at: http://www.gradierwerk-bad-koesen.de/dokumente/Vortrag_Gradierwerk_Badoesen.pdf (access: 21.06.2019).

in Ciechocinek, the only elements that needed to be replaced were those that were not constantly exposed to salt – the external beams and blocks.[7] The second characteristic feature of a graduation was its length. For obvious reasons, it was not possible to build higher graduation towers, so the dripping surface of the brine was enlarged by extending its length. As a result, horizontal, monumental forms in the shape of elongated rectangles, supported and intersected by slanted fasteners, were created. Graduation towers occupied large areas, and recreational parks and saltworks were created in their vicinity.



Ill. 2. 1 – Plan of a graduation tower structure;[8] 2, 3 – View of the rhythm of wooden struts in the horizontal view of graduation tower in Ciechocinek[9]

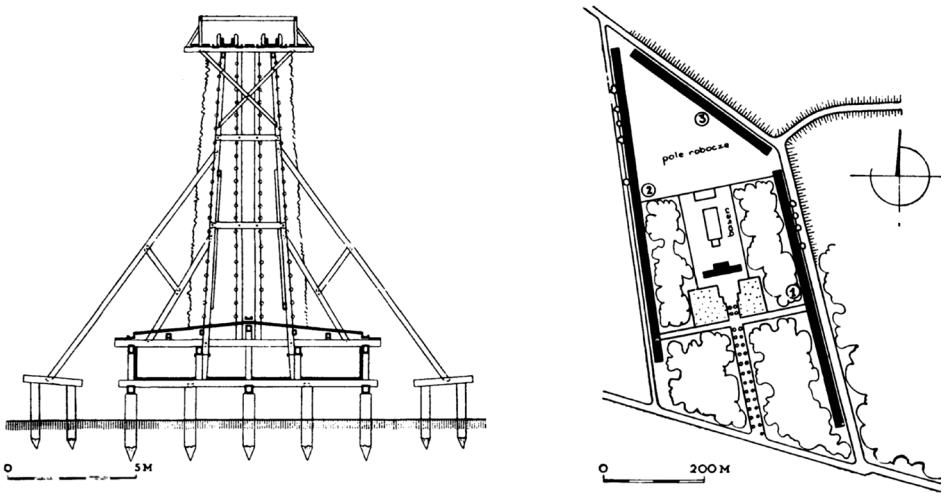
As a result of the development of mining technology in salt extraction, graduation towers' popularity has come to an end. But the development of Balneotherapy in health care has eventually led to the rediscovery of graduation towers' benefits. Attracting tourists, large towers were created in Konstancin in 1978, and in Inowrocław in 2001. There was also a surge in interest in Ciechocinek, whose climate (sunshine, small difference in temperatures, low rainfall, and calm winds) also contributed to the development of spa tourism.

2.1. GRADUATION TOWER IN CIECHOCINEK

The creation of the graduation tower in Ciechocinek was led by the involvement of: the Minister of Treasury of the Congress Kingdom – Prince Ksawery Drucki-Lubecki; the Director of the Department of Industry and Ores – Father Stanisław Staszic; and the magnate – Konstanty Leon Wolicki. At Staszic's persuasion, the Minister allocated vast funds from the State

[7] Tłoczek, I. F., *Tężnie ciechocińskie*, Ochrona Zabytków, 1958, no. 42–43, pp. 212–219.
[8] Knapp, F., *Chemical Technology or Chemistry, Applied to the Arts and to Manufactures*. First American Edition, with Notes and Additions. ed. Chesterland, General Bookbinding Co., Ohio, USA 1848.
[9] Tłoczek, I. F., *op. cit.*, pp. 212–219.

Treasury for this purpose. Wolicki bought two pieces of salt land, which he then transferred to the Congress Kingdom. As a result, in 1824 the construction of Ciechocinek graduation towers – according to the design of engineer Jakub Graff under the leadership of engineer Karol Knake – has begun. In five years, two objects of were built: 651.5 m and 723.8 m length respectively, and by 1959 the third one was added. The total length of all three buildings is 1741.5 m and each is 15.8 m high. The entire construction, with the exception of brick foundation, was made of as much as 19,000 m^3 spruce and oak wood.[10]



Ill. 3. Plan of the graduation tower structure in Ciechocinek – cross-section; Situational plan of the graduation tower[11]

The development of Park Zdrojowy [Spa Park] in Ciechocinek does not consist only of graduation towers. The very source of brine – the spring from which brine has been obtained – was enclosed with a mushroom-shaped fountain, Grzybek, designed by Jerzy Raczyński. Together with the saltworks located at a distance of 1.5 km and the graduation towers themselves, it forms one technological line.[12]

The therapeutic properties of the graduation tower in Ciechocinek were quickly discovered, and as early as 1836 Park Zdrojowy was used commercially for therapeutic purposes. Since 1867, when Ciechocinek has been connected to the railway network, the town has become very popular. In 1932, the Park was complemented by an outdoor swimming pool with salt water, designed, alongside its adjacent buildings, by Romuald Gutt. The outstanding value of this project has been inscribed in the history of world architecture. Currently, although in poor condition, it figures in the register of listed monuments and awaits modernization.

Park Zdrojowy has one more unique element – anthropological salt marches, a habitat of halophytes, i.e. salt-tolerant plants. Endangered species such as common glasswort *Salicornia europaea* (dominant, characteristic species), salt sandspurry *Spergularia salina,* seashore aster

[10] *Ibidem.*
[11] *Ibidem.*
[12] Korzeniewski, B. R., *op.cit.*

Aster tripolium, sea milkwort *Glaux maritima*, seaside arrowgrass *Triglochin maritimum*, saltmarsh rush *Juncus gerardi,* and others grow in the storm trenches draining brine from the graduation tower. It is the only such place in Poland, currently protected as a natural reserve.[13]

The majority of the development, i.e. the Grzybek fountain, the saltworks, Graduation Tower and Spa Parks, were awarded the title of Monument of History by the President of the Republic of Poland on 22 November 2017.

3. TABLE: COMPARISON OF SELECTED, NEWLY CREATED GRADUATION TOWERS IN POLAND

Ill. 4. Location of the studied graduation towers on the map of Poland[14]

[13] Spałek, K., *Koncepcja ochrony gatunków i siedlisk solniskowych na terenie gminy Wołczyn*, BIO--PLAN Pracownia ochrony przyrody i ekologii, Krasiejów 2017.

[14] Author, own drawing.

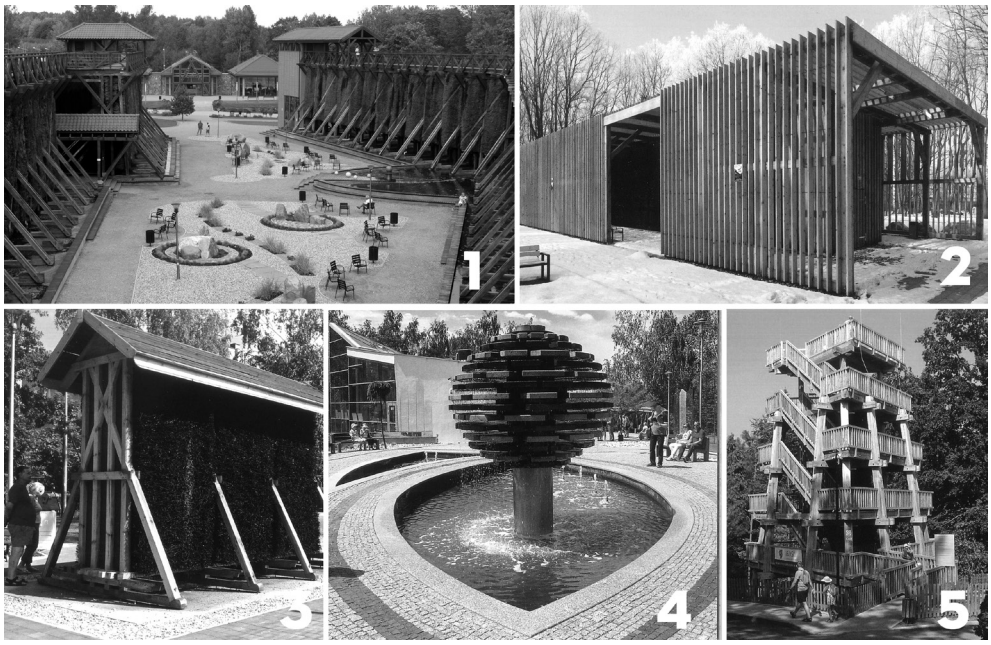
The objects were categorised by dimensions, location, date of construction, and shape. They have been divided into six types/categories:
A – Elongated;
A+ – Elongated with an additional awning for users;
B – Central;
B+ – Central with an additional awning for users;
C – Lookout tower;
D – Façade.

Table 1: Comparison of graduation towers in Poland

No	Year of construction	Location	Shape	Dimensions [m] L – length H – height	Saline from a nearby well (O) or imported (S)	Notes
1.	1824–1859	Ciechocinek, Kujawsko-pomorskie voivodeship	A	L – 651,5 / 723,8 / 366,2 H – 15,8	O	EXAMPLE salt
2.	1978 – 1980	Konstancin-Jeziorna, mazowieckie voivodeship	A	L – 40 H – 6	O	The second oldest existing, after Ciechocinek, inhalatorium in Poland
3.	2001	Inowrocław, Kujawsko-pomorskie voivodeship	A	L – 322 H – 9	O	Designed alongside the park complex – Park Solankowy [Saline Park]
4.	2005–2011	Józefów, mazowieckie voivodeship	D	H – circa 8m	S	The cube is a form added to a single-family house, an encased construction filled with blackthorn.
5.	2006	Grudziądz, Kujawsko-pomorskie voivodeship	B+	H – 8,2	O	Blackthorn post covered with a glass pyramid. High therapeutic properties despite the small size due to enclosed space
6.	2008	Zaragossa, Expo	D	circa 1000m^2	S	Pavilion for the EXPO 2008 world exhibition – external and internal facades both covered with blackthorn
7.	2009	Rabka-Zdrój, małopolskie voivodeship	B+	Diameter – 14 H – 10	O	Graduation tower linked to mineral water drinking facilities
8.	2012–2014	Gołdap, Warmińsko-mazurskie voivodeship	A	L – 220 H – 8	O	Large spa and park complex mineral water drinking facilities

9.	2014	Wieliczka, małopolskie voivodeship	A	Cubic volume: 7600m^3 H – building – 9 H – tower – ok 22,5	O	Designed alongside a park complex
10.	2014	Radlin, śląskie voivodeship	A+	L – 24 H – 8,2	S	First graduation tower in the industrial Silesia region, located at Rybnik Reservoir
11.	2014	Jaworze, śląskie voivodeship	B+	Surface area – 31,53m^2 H – circa 5	S	Integrated into a historic park
12.	2014	Jastrzębie-Zdrój, śląskie voivodeship	B+	H – 7	S (historical source exhausted by exploitation)	Integrated into a historic park
13.	2015	Legionowo, mazowieckie voivodeship	B+	Diameter of the core – 4 H – 6	S	First free-entry graduation tower, element of the park
14.	2016	Rymanów Zdrój, podkarpackie voivodeship	B+	Core 1,3x3 H – 7,5	O	Element of the park
15.	2017	Trzebnica, dolnośląskie voivodeship	2 x A	L – 6 H – 3,7	S	Element of the park
16.	2017	Warszawa – Marysin Wawerski, mazowieckie voivodeship	B	L – 2,5 H – 3,65	S	Element of public space
17.	2018	Warszawa – Anin, mazowieckie voivodeship	A	L – 7 H – 3,5	S	Element of public space
18.	2018	Rybnik, śląskie voivodeship	B+	Diameter 16 H – 11	S	Element of the park
19.	2018	Bełchatów, łódzkie voivodeship	B+	L – 8,59 H – 5,92	S	Element of the park
20.	2018	Kędzierzyn Koźle, opolskie voivodeship	A	L – 4,5 H – 3,65	S	Element of the park, in the future, plants planted next to the graduation tower should overgrow it, which should result in a higher concentration of aerosol in the air
21.	2018	Głuchołazy, opolskie voivodeship	C	L – side of the base 12,4 H – 15,6	S	Combined with a lookout tower
22.	2019	Jaworzno, śląskie voivodeship	A	L – 15,6 H – 6,5	S	Contemporary form of graduation tower integrated into a park

23.	2019	Katowice, śląskie voivodeship	A+	L – 37,5 H – 6,9	S	Contemporary form of graduation tower designed to match an adjacent park
24.	2019	Knurów, śląskie voivodeship	A+	L – 22 H – 9	S	Contemporary form of graduation tower integrated into a public square
25.	2019	Warszawa – Galeria Północna, mazowieckie voivodeship	A	L – 8m H – 4m	S	Graduation tower on the roof of a shopping centre



Ill.. 5. 1 – Gołdap[15], 2 – Katowice, 3 – Kędzierzyn Koźle, 4 – Graduation Tower in shape of a sculpture in Ustroń, 5 – Graduation Tower in the shape of a lookoout tower in Głuchołazy; Ill. 2–5[16]

4. CONCLUSION

Compared to investments such as the graduation tower in Ciechocinek (the change of investor from State Treasury to Municipalities), the scale of implementation of new towers has changed. The impact of a large, technological form in the surrounding landscape is no more,

[15] Dubin, M., *Widoki na gołdapskie tężnie* 2014. [Online] Available at: http://goldap.wm.pl/215884,Widoki-na-goldapskie-teznie.html (access: 30.06.2019).
[16] Korzeniewski, B. R., *op. cit.*

also leading to absence of characteristic elements of the construction – the slanted fasteners are unnecessary because the buildings are no longer as high and long as in the past.

Contemporary graduation towers are much smaller and serve different – mainly recreational and communal – functions. Municipalities cannot afford the construction of large facilities that would actually have therapeutic functions and have no need to obtain salt from graduation towers. Therefore, those built nowadays are typically up to 5 m high, also so that they can meet the amounts planned within local participatory budgets, in which residents decide on suitable new investments for their local areas. The price of construction of the smallest, but also the most popular graduation tower – 3.5 m high, elongated shape, for example the tower in Kędzierzyn Koźle – is about 100,000 PLN, which usually falls within the financial capacity of municipalities. Towns that already perform or intend to deliberately perform health resort functions, such as, for example, Gołdap can construct and maintain objects of therapeutic value.[17]

Apart from the spa towns in the Podkarpacie region, most of the graduation towers constructed between 2015–2019 were built in Silesia, probably because of the local awareness of the value of 'air'.

But graduation towers are increasingly being built in other places such as, for example, a family home in Józefów or the roof of Galeria Północna, a shopping centre in Warsaw. The location of graduation towers is no longer associated with nearby presence of a brine source. Currently, the 'liquid' for these investments is most often imported from Ciechocinek, Dębowiec, or Zabłocie.

Today, elaborate structural efforts are redundant; this translates into the creation of various shapes of graduation towers, where instead of structural elements affording tectonics, the 'traditional style' is replaced by adding purely decorative elements. As a result, there has been a departure from the traditional form of graduation tower – a long and tall building with industrial features, towards more diverse forms such as central and roofed buildings. In the past, it was not desirable to include roofs in the design of graduation towers – the sun shining directly onto the blackthorn accelerated the process of evaporation and brine concentration to a value suitable for further processing in the saltworks.

Climate change awareness, the lack of attractive public space, and smog in cities – all this encourages people to congregate at graduation towers. It is possible that the combined threats of global warming and severe air pollution in Silesia were the reason behind the construction of so many such objects in the region. Simultaneously, graduation towers are associated with Ciechocinek – a popular holiday and spa resort, promoted by the government of the Second Republic of Poland and later, after the war. City dwellers call their graduation towers 'little Ciechocinek'.

In general, the financial capacities of current investors (municipalities) are not sufficient for new graduation towers to serve actual therapeutic functions. The question remains to what extent new graduation towers do refer to tradition and their original functions in the sense of production of salt and health properties – creating a microclimate, and to what extent to their traditional technological form (elongated, high wooden structures)?

Academic research, as opposed to a simple account of an event/a description of a building, situates the subject in the abstract space of architectural theory. The micro-scale graduation

[17] Kardaś, A., *Aktywizacja funkcjonalna małych miast przy pomocy środków z funduszy europejskich na przykładzie miasta i gminy Gołdap*, Acta Universitatis Lodziensis. Folia Geographica Socio-Oeconomica, 2014, no. 18, pp. 105–116.

towers constructed with municipal means are the source of unlimited material to be confronted with the system that includes a comprehensive hierarchy of significant architectural elements – Christopher Alexander's book, *A Pattern Language.*

Alexander lists 253 units of architectural design language, calling them patterns. None of them is an isolated link and they only form a whole combined with the others. In graduation towers built since 2001, the following patterns may be found: SACRED SITES (24), ACCESS TO WATER (25), ACTIVITY NODES (30), HEALTH CENTRE (47), QUIET BACKS (59), ACCESSIBLE GREEN (60), SMALLL PUBLIC SQUARES (61), HIGH PLACES (62), POOLS AND STREAMS (64), COMMON LAND (67), PUBLIC OUTDOOR ROOM (69), STILL WATER (71), SOUTH FACING OUTDOORS (105), SHELTERING ROOF (117), ROOF GARDEN (118), ARCADES (119), PATHS AND GOALS (120), TREE PLACES (171), GARDEN GROWING WILD (172), TRELLISED WALK (174), SITTING WALL (243), CLIMBING PLANTS (246).[18]

Currently, the landscape architecture-scale graduation towers implemented by municipalities are located within PUBLIC OUTDOOR ROOM and relate to the environmental/ecological trend creating more or less effective HEALTH CENTRES. They are SACRED SITES, referring to once existing objects or create new ACTIVITY NODES engaging public life. People miss water (ACCESS TO WATER) and that is why they are so attractive to city dwellers. They combine STILL WATERS in the drip trough and running water dripping down the blackthorn like POOLS AND STREAMS. Graduation Towers are most often integrated into existing or newly created parks. As an element of small architecture, they add variety to the PATHS AND GOALS. Sometimes, their construction overgrown with CLIMBING PLANTS creates TRELLISED WALKS – the impression of QUIET BACKS and WILD GROWING GARDENS, and helps to increase the concentration of therapeutic aerosol, as does the fact that they are often SOUTH FACING OUTDOORS. Increasingly, they are COMMON LAND, even in ROOF GARDENS. The evolution of their features has allowed the introduction of SHELTERING ROOFS and ARCADES.

Today, graduation towers are, in a way, Poland's 'national good' and an export product. One has even become the main attraction of the award-winning Polish pavilion at the water-focused Zaragoza Expo. Simultaneously, graduation towers' functions have shifted from industrial to therapeutic and, nowadays, mainly recreational, and the tower often serves as both a symbol of environmental consciousness and a spatial sign enriching public space. It should be expected that the further development of these constructions, most likely in the form of municipal investments, would lead to the emergence of a new 'classical' form of graduation tower well suited to contemporary conditions.

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[1] Alexander, C., *Język wzorców. Mista – budynki – konstrukcja*, pierwsze w języku polskim, Gdańskie Wydawnictwo Psychologiczne, Gdańsk 2008.

[2] Burkowska-But, A., Kalwasińska, A. i Swiontek Brzezinska, M., *The role of open-air inhalatoria in the air quality improvement in spa towns*, International Journal of Occupational Medicine and Environmental Health, 2014, no. 4, pp. 560–570.

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