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Revitalizing the Sacral Complex of the Parish of the Sacred Heart of Jesus in Gdynia: A Comprehensive Restoration Project in Alignment with Monument Conservator's Guidelines and Technical Prerequisites

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Abstract

Religious complexes, due to their monumental character, belong to the group of facilities in which carrying out renovation works is difficult. Very often, construction works carried out as part of planned renovation work include not only modernization but also repair works, including those related to the reinforcement of structural elements. Renovation work in sacral buildings is particularly difficult when they are located in the area covered by conservation. The paper is a case study of the existing religious complex of the Parish of the Sacred Heart of Jesus located in Gdynia, consisting of a church building and a bell tower. The church building realized in the 1960s and the belfry located in its immediate vicinity built in the 1980s after many years of use showed not only signs of operational decapitalization which lowered their aesthetic value as a monument containing elements of modernist architecture, but also all were characterized by damage to construction and finishing elements, which posed a threat to the safety of the structure and use.

Keywords: renovation, modernization, sacral buildings, conservation's requirements

1. Introductoin

Sacral complexes, due to their monumental character, belong to the group of objects where it is difficult to carry out renovation works. Very often, construction works carried out as part of planned renovation works include not only modernization works, but also repair works, including those related to strengthening structural elements. Conducting renovation works in sacral buildings is particularly difficult when they are located in an area under conservation protection.

The paper is a case study of the existing Sacral Complex of the parish of Sacred Heart of Jesus (so called: NSPJ in Polish, SHoJ in English) located in Gdynia, and consisting of a church building, a rectory building and a belfry tower. The church building, the construction of which was completed in the early 70s of the twentieth century, and the reinforced concrete belfry tower located in its immediate vicinity, built in the 80s of the twentieth century, after many years of use, not only showed signs of exploitation depreciation, which lowered their aesthetic value as monuments containing elements modernist architecture, but locally they were also characterized by damage to structural and finishing elements, which in the absence of commencement of repair work created a potential threat to the safety of the structure and safety of use.

The paper presents a description of the technical condition of the church building and the bell tower adjacent to it after many years of operation, including the impact of the current use of the buildings and the impact of the scope of renovation works carried out in the past period on their technical condition. The impact of the technical solutions applied during the implementation period on the current limitations related to the modernization of the complex of the sacral building of the parish of the Sacred Heart of Jesus in Gdynia. The implemented technical solutions for the

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renovation and modernization of the Sacral Complex were presented, taking into account its historic character and including: renovation of the bell tower, presbytery covering, roof, stone cladding of the wall at the main entrance, revitalization of the plinth, cleaning of the facade and works related to the installation of underfloor heating in the church .

2. History of the Parish of the SHoJ in Gdynia

In the first years after Poland regained independence in 1918, Gdynia belonged to the parish in Oksywie. In 1924, the newly built church at ul. Świętojańska St. Blessed Virgin Mary Queen of Poland, and in 1926 Gdynia was excluded from the parish of Oksywie and an independent parish was created. Soon, however, this newly built church (now the Basilica of the Blessed Virgin Mary, Queen of Poland) turned out to be insufficient for the growing population. It was then that a decision was made to build a branch church at ul. Stefan Batory. The author of the project, covering both the architectural and construction industries, was Eng. Bernard Dulny of Kartuzy. This church, which was named the Sacred Heart of Jesus was put into use in 1929.

Military action in September 1939. did not damage the church. During the German occupation, the church building was not damaged either. Throughout the war, in the years 1939 - 1944, masses were held in the church and services were held in accordance with the liturgy of the Roman Catholic Church.

In the winter of 1945 During the retreat of the Nazi troops from Gdynia, an incendiary bomb fell on the church. The fire completely destroyed the temple building. Thanks to the generosity of parishioners in 1948, In the place of the destroyed one, another church building was built and put into use, part of the external walls of which were made as the so-called half-timbered wall, i.e. a wooden post-and-beam structure with ceramic brick infill. The author of the project covering the architectural and construction industries was mgr inż. Waclaw Rembiszewski. This church could accommodate up to 4,000 people, but the church authorities obtained permission to use it for only 5 years.

January 1, 1949 Bishop of Chełmno, Fr. Kazimierz Kowalski established an independent parish of St. Sacred Heart of Jesus, and its first pastor was appointed Priest Hilary Jastak, who was entrusted with the mission of building a new church.

3. Construction of the Buildings of the Sacral Complex of the Parish of SHoJ in Gdynia

A serious organizational problem in the work of the parish was the lack of social and economic facilities for priests, nuns and civilian employees. In the spring of 1952 the then authorities issued a building permit for the presbytery. Construction works related to the construction of the presbytery were repeatedly suspended as a result of inspections carried out by state authorities (militia, Public Security Office). During the construction, it was repeatedly suggested that the design of the presbytery building should be changed, arguing that it was often invented, non-existent regulations and requirements.

In 1956, on the wave of the so-called After the thaw after the death of Joseph Stalin, preparations for the construction of a new church began quickly. The development of the architectural design was undertaken by prof. arch. Jan Borowski and prof. PhD Eng. Arch. Leopold Taraszkiewicz (Fig.1). According to the idea of Priest Jastak, the newly designed church was to refer to the unrealized idea of building the Maritime Basilica in Gdynia, which, according to pre-war concepts, was to be located on Kamienna Góra. There was even a very intensive search for the foundation stone of the Maritime Basilica, consecrated in 1934, which was to be moved under the building tower of the new church. The available archival materials clearly indicate that these activities were not favorably perceived by the then authorities - there was no political consent for these activities.

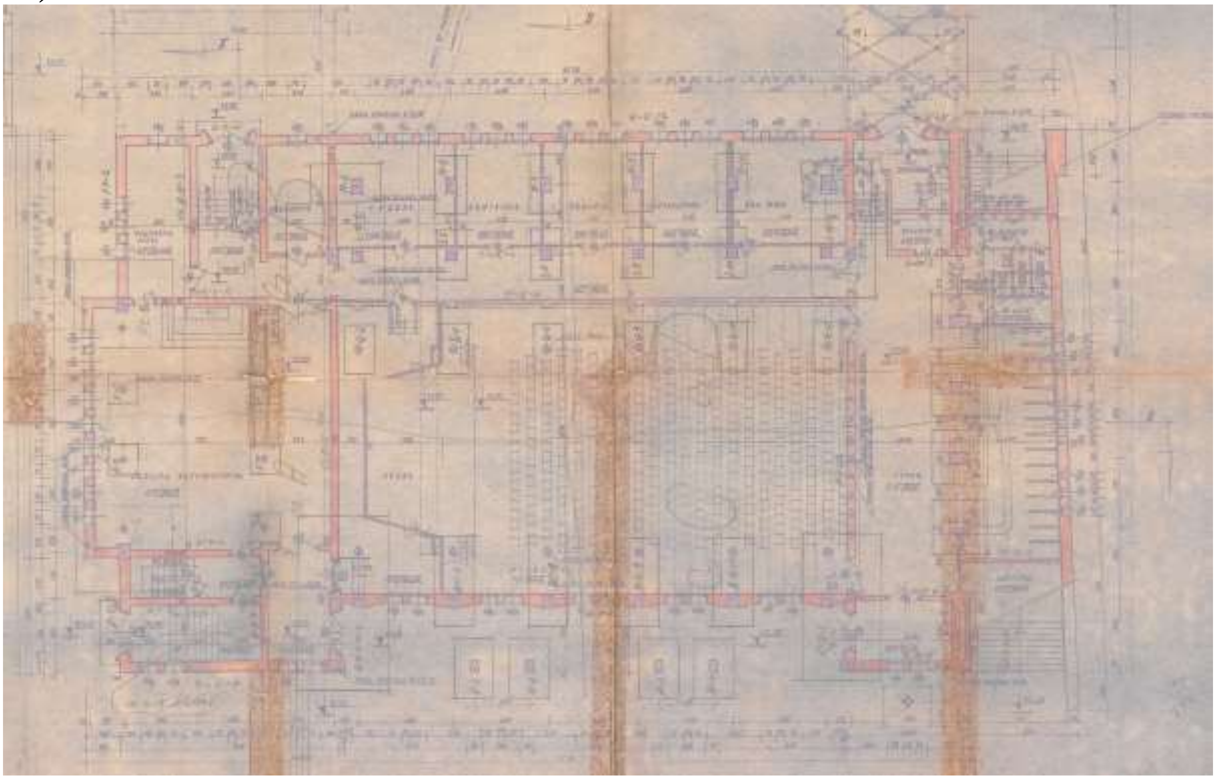
In the spring of 1957 The Provincial National Council approved the initial design of the church. In July 1957 all of the projects were approved by the Presidium of the Gdynia National Council and permission was obtained to start construction works. The new church was to be erected in the place of the old one, therefore the construction had to be carried out in stages, so that the liturgy could be celebrated in one part of the old church, and demolition works were carried out in the other. The parishioners were largely involved in the construction work.

The lower church was built first and was consecrated on June 10, 1959. and only then began the construction of the upper church, which was put into use in a raw state in December 1961. For five years, finishing works were carried out, including plastering, assembly of the organ and construction of the altar. a link was also added between the existing presbytery and the newly built church, thanks to which additional apartments were acquired.
The church was consecrated on October 31, 1966. as part of the celebration of the 1000th anniversary of Christianity in Poland.

After 1966, construction works continued, related to the execution of external facades. In 1972, a mosaic was created on the main wall of the presbytery and construction of the choir began.

The construction of the belfry tower (campanilla) lasted the longest, which started in 1973 and was completed in 1981.

a)



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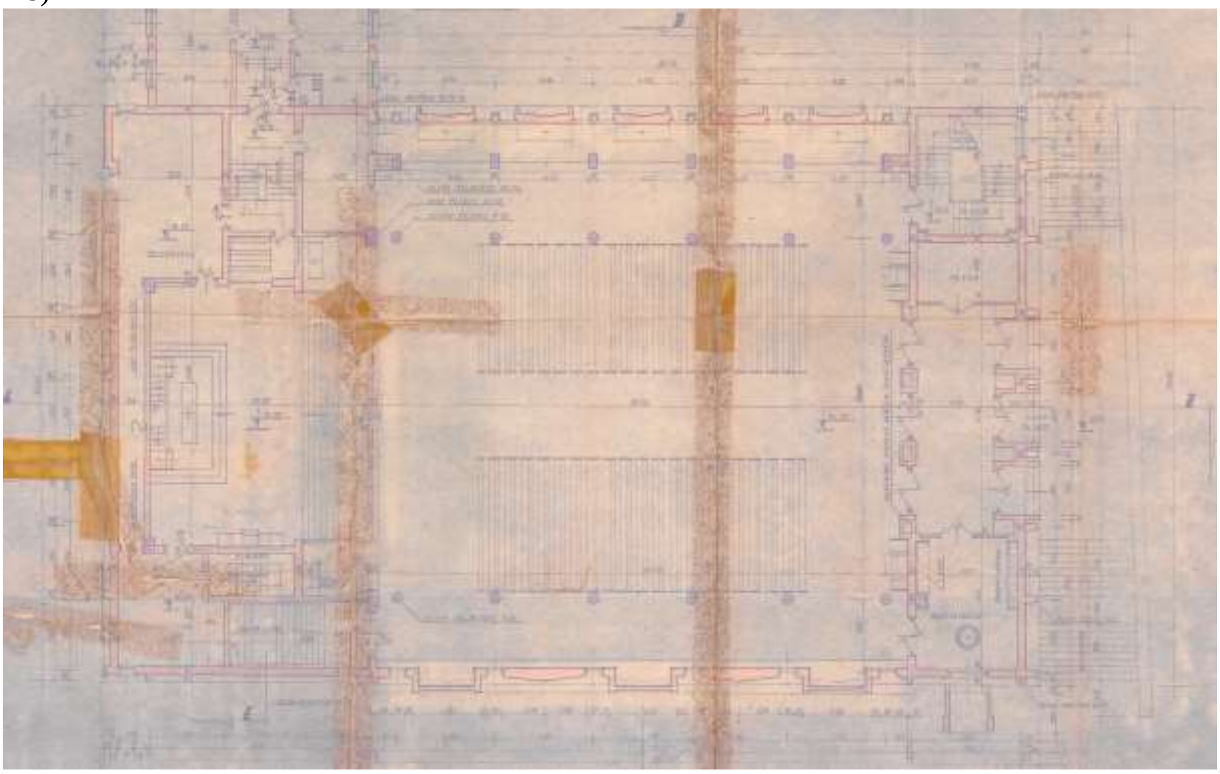

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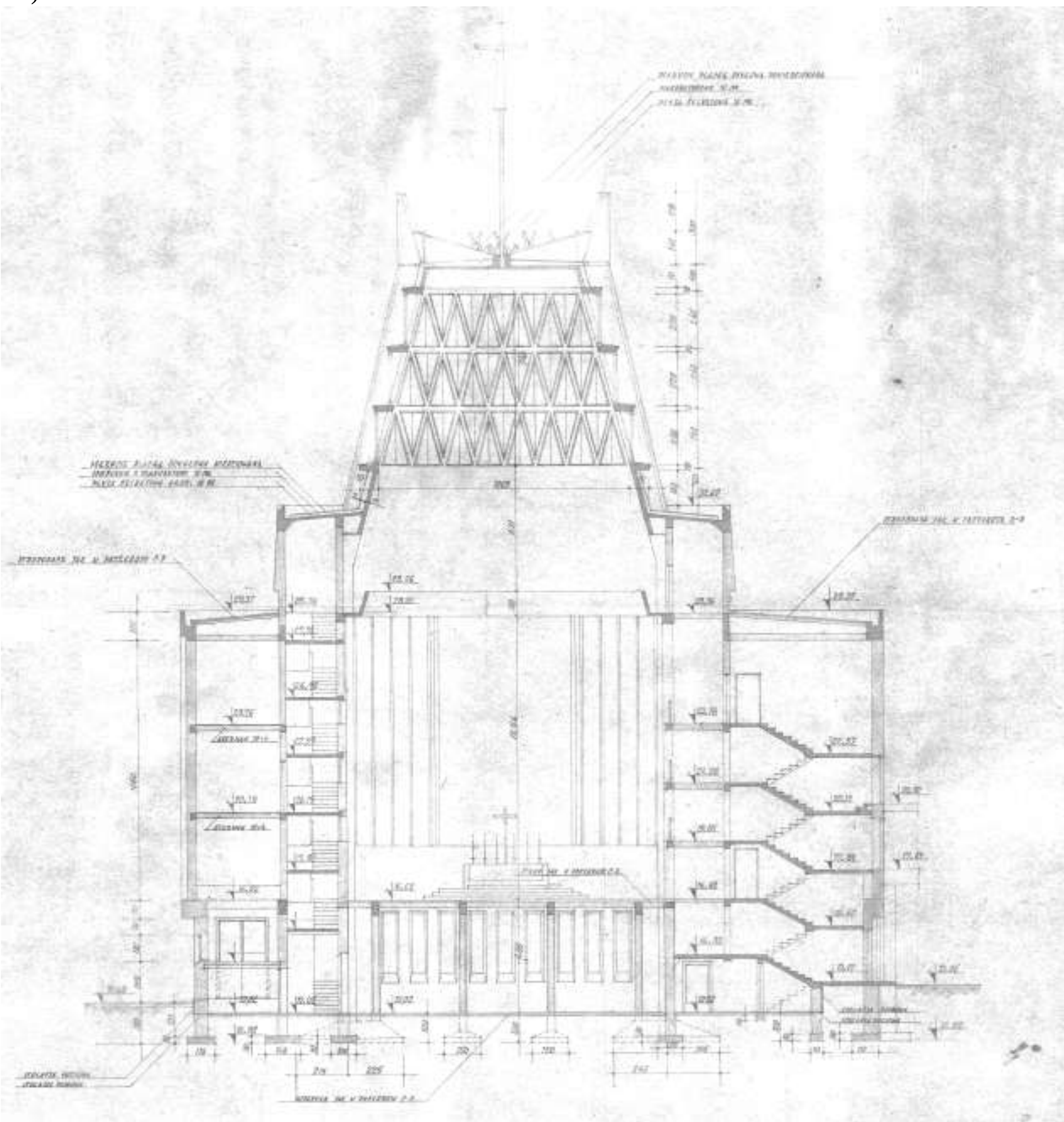


Fig. 1: Church of the SHoJ in Gdynia - horizontal projection: a) ground floor, b) high ground floor, c) vertical section (based on archival design documentation)

In May 1988 design documentation for the presbytery superstructure was developed. The author of the architectural design was PhD Eng. Arch. Mirosław Bartoszewicz, while the author of the design for the construction industry was Eng. Stanislaw Bartoszewicz. After developing the design documentation and obtaining the relevant administrative decisions, the construction of the superstructure began immediately.

Currently, the Sacral Complex of the parish of SHoJ in Gdynia consists of the following facilities:

- the church building with facilities,
- rectory building,
- bell tower.

4. Architectural Prototype of a Contemporary Parish Church

The architectural prototype of the contemporary parish church, commonly referred to as the SHoJ in Gdynia was a block of the never realized Maritime Basilica. The idea of its construction was born in the early 1930s. The author of the concept of building the Basilica was priest PhD Stanisław Wojciech Okoniewski, Bishop of Chełmno. The basilica was planned to be located directly on Kamienna Góra. Thanks to this location, it was supposed to be a visible symbol of the city from afar. In order to implement this idea, the Society for the Construction of the Maritime Basilica was established.

The building was to have the form of a three-aisle basilica crowned with a system of 3 towers growing on a common nave, symbolizing the 3 partitions connected after Poland regained independence. In the form of a complex of 3 towers, the maritime symbol of the basilica was to be included - the shape of a three-masted ship (Fig.2).

a) b)

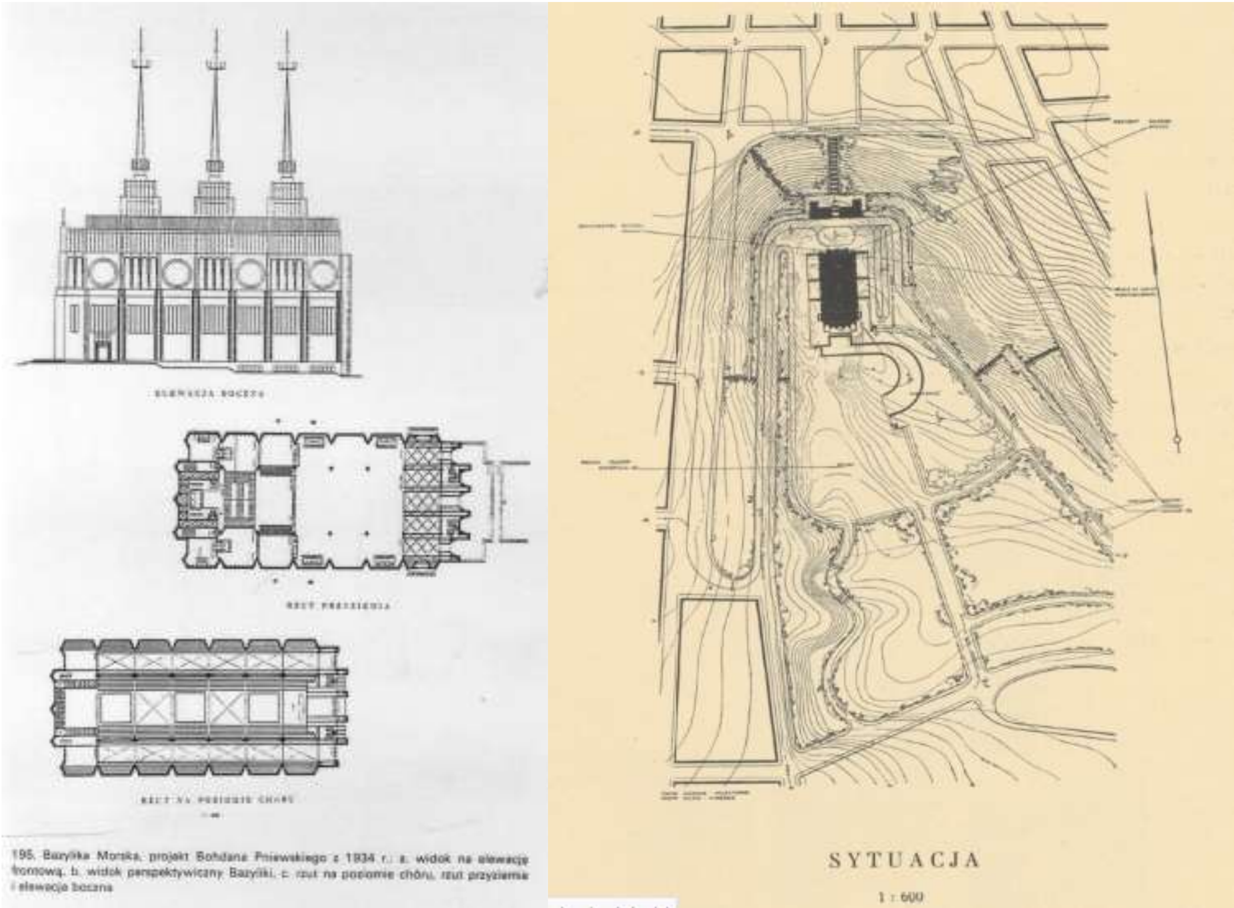


Fig. 2: Maritime Basilica in Gdynia - conceptual design: a) front elevation and projections, b) location on Kamienna Góra (*based on* [G1])

The project of MSc Eng. Arch. Bohdan Pniewski, who was the author of the winning study in the announced nationwide competition for project documentation. The construction of the Maritime Basilica began in 1934, when, during the Festival of the Sea, priest PhD Stanisław Wojciech Okoniewski consecrated the foundation stone. The ceremony was graced by the presence of the President of the Republic of Poland, Ignacy Mościcki.

Immediately after the start of construction, the problem of the subsoil bearing capacity arose: the available archival materials indicate that the area where the foundations had already been partly laid was not at the stage of preparing the structural design, which was carried out in a simplified form, which was characteristic of investments carried out at that time , sufficiently explored in terms of geological structure.

Problems with the safe foundation of the building resulted in a new concept for the location of the Maritime Basilica - this time it was to be built at the foot of Kamienna Góra. Work on the new project was interrupted by the outbreak of World War II in September 1939.

5. The Technical Condition of the Buildings of the Sacral Complex of the Parish of SHoJ in Gdynia

Intensive renovation works of the buildings of the Sacral Complex of the parish of SHoJ in Gdynia have been conducted since 2015. Earlier works were temporary and protective repairs. Renovation and repair works are carried out on the basis of repair documentation prepared each time, the degree of accuracy of which is adapted to the nature of these works. Due to the location of the objects in the conservation protection zone, construction works are carried out in agreement and with the approval of the Municipal Conservator of Monuments.

The scope of the renovation works carried out so far included recommendations on how to assess the technical condition of buildings [A1] - [A21].

The developed programs of repair works also took into account the cases of defects and damage to structural systems [B1] - [B31] described in the literature.

The repair documentation also included information on pre-failure states, failures, as well as the operation, renovation and modernization of historic buildings, including historic sacral buildings [C1] - [C55].

Particular emphasis, due to the proximity of the communication system, both road and railway, was placed during the analysis of the scope of renovation works for individual objects on the negative impact of vibrations on structural systems [D1] - [D16]. At the same time, there were no visible faults and damages on the structural and finishing elements of the buildings of the Sacred Complex, the morphology of which would indicate a negative impact of the nearby communication systems. Since no perceptible vibrations of the ground around the buildings of the Sacral Complex have ever been found, measurements of ground vibrations were abandoned, assuming that their results would not bring significant information for further analysis of their technical condition and planning renovation works.

The scope of repair works developed each time took into account the aspects related to the deformation of the subsoil as well as the methods and manner of securing buildings located in areas characterized by complex foundation conditions [E1] - [E20]. The objects of the Sacral Complex did not show external signs indicating their excessive subsidence.

During the construction of the buildings of the Sacred Complex, no trees with a significant trunk or crown size were removed from the adjacent area. Also, no new tall-stem trees and shrubs were planted. Thus, there were no grounds to conclude that the root system of the existing stand will have an impact in the future on the occurrence of faults and/or damage to the foundations of the buildings of the Sacral Complex, which in turn could damage their structure, as well as to formulate a thesis that the roots of the stand will contribute to disturbance of ground and water conditions in the area around these facilities [F1] - [F4].

In addition, the paper uses information on the implementation of the buildings of the Sacral Complex of SHoJ in Gdynia [G1] - [G4].

6. Renovation and Repair Works of the Buildings of the Sacral Complex of the Parish of SHoJ in Gdynia - Selected Examples

Renovation of the bell tower

Church bell tower SHoJ was implemented on the basis of socially developed project documentation (Photo 1). The author of the architectural design was MSc Eng. Arch. Julian Demczuk, while the author of the structural design was MSc Eng. Henryk Płociński. The function of the structural design verifier was performed by MSc Eng. Władysław Buczkowski. The spatial, openwork structure of the tower was designed and made as reinforced concrete, monolithic, made of concrete class R_w=170 atm., reinforced with ribbed steel bars A-III class 34GS (structural reinforcement) and smooth bars made of A-0 steel, St0 mark (stirrups). In cross-section, the tower has the shape of an equilateral triangle, in the corners of which there are reinforced concrete, monolithic columns with a V-shaped cross-section (pole designation: A, B, C) (Fig.3).

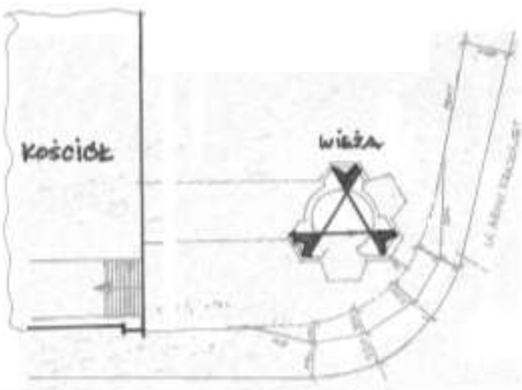


Fig. 3. The bell tower of the Church of the SHoJ in Gdynia - cross section

a) b)

Photo 1. The bell tower of the Church of the SHoJ in Gdynia: a) general view, b) close-up of the internal staircase (*photo by Maciej Niedostatkiewicz*)

The columns at the height are connected with horizontal, reinforced concrete transoms located at the height of the tower in 6 levels: level 1 at a height of +6.00 m above sea level, level 2 at a height of +12.00 m above sea level, level 3 at a height of +18.00 m above sea level, level 4 at +24.00 m above sea level, level 5 at +30.00 m above sea level and level 6 at +36.00 m above sea level. In the cross-section, the bolts had the shape of a rectangle measuring 40×45 cm. The spaces between the transoms (from level 1 to level 5) were filled with decorative prefabricated reinforced concrete posts, which are set on horizontal transoms. The number of posts set on one transom (side) is 6 pcs. The posts in the cross-section had the shape of a rectangle with dimensions of 15×30 cm, the axial spacing of the posts was 25 cm. In the middle of the tower, reinforced concrete, prefabricated screw and column stairs were made, enabling the belfry staff to climb to the top of the tower. The load-bearing element of the stairs is a reinforced concrete monolithic column on which the prefabricated steps were mounted (prefabricated step plates with an opening constituted the formwork of the monolithic load-bearing column). From level 6 (+36,00 m above sea level), a steel structure of the spire was made of profile steel covered with copper sheet. The total height of the tower is +62.00 m above sea level. A bell with a weight of 2.5 t is suspended from the structure in the technical level no. 6. The tower was placed directly on the ground at the level of -3,0 m below ground level. on a circular, reinforced concrete, monolithic foundation plate with a diameter of 10,8 m. In the places where the columns rest, a circumferential ring was constructed on the plate, from which the reinforcement of the columns was led. Up to level 1 (+ 6.0 m above sea level), reinforced concrete walls of the ground floor casing were made on the ring. The thickness of the foundation slab under the columns was 2,0 m (thickness of the slab with the perimeter ring), in the remaining part the slab was 1,0 m thick. At the foundation level, there were non-cohesive soils - medium sands (Ps).

The construction of the tower was carried out in an economic way, as a result of which it was carried out with many imperfections, among others, it was characterized by the lack of verticality of some column elements and the lack of proper cover of the reinforcement bars. The construction of the tower was assumed to have the texture of raw concrete. At the execution stage, the concrete surface was not protected in any way against weather conditions, which over many years of concrete exposure to the harmful effects of aerosols containing salts, including those from sea water, led to extensive corrosion of the concrete. Progressive carbonation combined with frost damage to the concrete resulting from moisture caused, among others, by the lack of flashing of reinforced concrete elements, led to damage to the concrete cover of the reinforcement bars. At individual levels (from 1 to 6) no cracks or cracks of mullions and transoms were found. On the other hand, there was massive loosening of the cover of the main reinforcement and stirrups as a result of corrosion of the bars and stirrups (Photo 2, Photo 3 and Photo 4).

a)

b)

c)

Photo 2. Examples of damage to reinforced concrete, monolithic columns of the belfry tower: a), b), c) detachments and losses of the concrete cover and corrosion of the reinforcement bars (*photo by Maciej Niedostatkiewicz*)

a)

b)

c)

Photo 3. Examples of damage to the monolithic reinforced concrete bolts of the belfry tower: a), b), c) losses of the concrete cover and corrosion of the reinforcement bars (*photo by Maciej Niedostatkiewicz*)

a)

b)

c)

Photo 4. Examples of damage to the reinforced concrete prefabricated pillars of the belfry tower: a), b), c) losses of the concrete cover and corrosion of the reinforcement bars (*photo by Maciej Niedostatkiewicz*)

Corrosion damage at levels 4-5 and 5-6 was more intense than at levels 2-3 and 3-4. Occurring damage to the tower made it necessary to shut down the carillon, which had been operating continuously for almost 35 years, due to the danger of moving around the internal staircase in order to activate the bell. Vertical cracks were visible on the column formed from the assembly of prefabricated stairs, in the section between levels 2-3 (Photo 5).

Photo 5. Outlined, in the line of the axial anchorage, prefabricated steps of the spiral stairs leading to the top of the belfry tower (*photo by Maciej Niedostatkiewicz*)

The assessment of the technical condition of the bell tower included the analysis of the results of: a) concrete pH tests, b) sclerometric tests and c) static and strength calculations.

pH testing

The most popular, but at the same time the least accurate method of estimating the depth of carbonation in hardened concrete is the phenolphthalein method, described in detail in [N7]. Standard regulations and technical literature recommend that the color change of the non-carbonated zone be measured within 30 seconds of wetting with the solution. It should be emphasized that the color change of the concrete fracture from colorless to red-violet occurs at *pH* ≈9,0. At a *pH* value of 11,8, concrete loses its natural ability to protect steel against corrosion, and at a *pH* value of <11,2, corrosion processes are initiated on the steel surface. Using the phenolphthalein method to determine the extent of the carbonation front, it is possible to significantly overestimate the extent of the zone of reduced protective properties of concrete in relation to the reinforcement. More accurate measurement results are obtained by using liquids (reagents) dedicated to concrete to determine the depth of concrete carbonation. In the case of the church belfry tower, the measurement solution of Germann Instruments, the so-called Rainbow Test (Fig.4). The measurement consisted in spraying a liquid solution on the concrete surface (fresh break of the sample taken), which changed its color depending on the pH value of the concrete. The assessment of the depth and degree of carbonation was made by comparing the color of the sprayed sample (Photo 6) with the template (Fig. 4). The transition of the color palette from violet (*pH*≈11) to green (*pH*≈9) signals a decrease in pH below the value considered as the limit value and signals a potential corrosion threat to the reinforcement (Fig.4):

- 11-13 - concrete free from carbonation effects,
- 11 - limit value (reduced cover ability to protect reinforcement against corrosion),
- ↓9 (< 9) - reinforcement corrosion hazard,
- ↓7 (< 7) - corrosion of reinforcement bars.

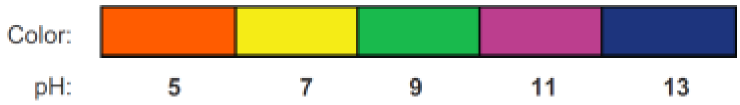


Fig. 4. Concrete discoloration chart for the control liquid - Rainbow Test (*based on materials from Germann Instruments*)

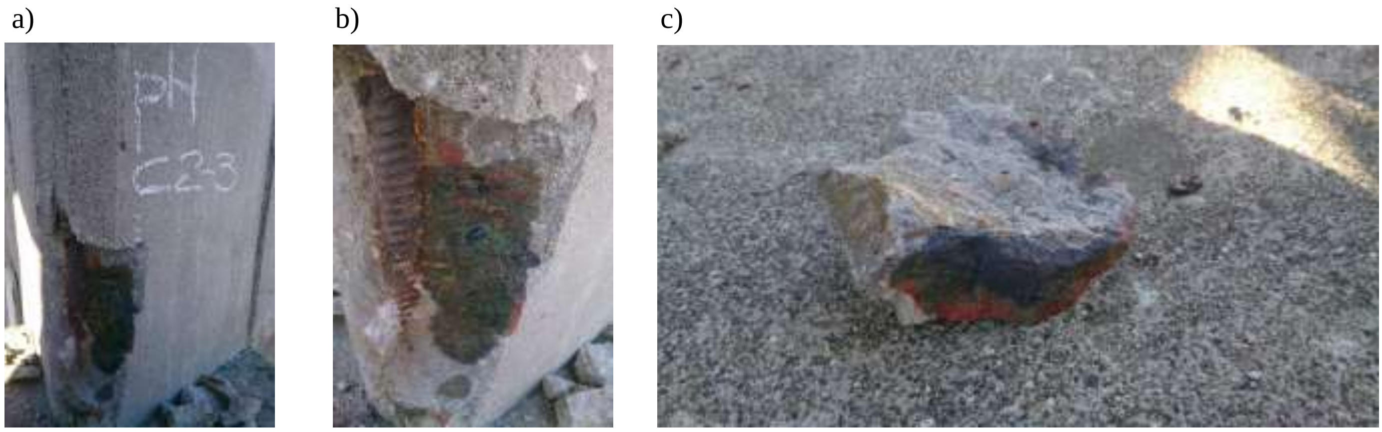


Photo 6. Exemplary results of measurements of the degree of concrete carbonation in the performed open pits: a) and b) discoloration of concrete on the main pillars of the bell tower from *pH*=5 to *pH*=11 and c) discoloration of the forged fragment of the concrete cover of the transom reinforcement bars from *pH*=5 to *pH*=13 (photo by Maciej Niedostatkiewicz)

Based on the tests performed, the results were obtained, below are representative results:

- pole A3-4 (level 4) *pH* =7,
- column C3-4 (level 4) *pH* =7,
- column C2-3 (level 3) *pH* =9,
- column A1-2 (level 2) *pH* =11.

The obtained test results allowed to conclude that the concrete in the near-surface zone (cover) lost its ability to protect the reinforcement bars against corrosion [N7]. In the excavations, corrosion of the reinforcement bars was found: the measured corrosion losses of the bars were up to 2 mm in diameter of the main reinforcement bars and up to 1.50 mm in diameter of the transverse reinforcement bars (stirrups).

a) b) c)

Photo 7. Reinforced concrete belfry tower during renovation works: a) general view, b), c) close-up details of the scaffolding (photo by Jacek Bramorski)

Sclerometric examinations

Due to the insufficient technical condition of the spiral stairs, the collection of concrete samples for destructive testing using a drilling rig was abandoned. In order to estimate the strength of concrete, a number of comparative sclerometric tests were performed [N6].

The testing of concrete in columns and transoms at individual levels (from No. 1 to No. 6) was carried out using a non-destructive method using a Schmidt type N hammer. All measurements were made on exposed concrete after grinding its surface with a high-speed grinder.

The following results were obtained during the tests:

a) columns (results averaged over the entire height of the column (levels 1-6):
   - column A: $f_{c,cube}$=20.90 MPa, sufficient homogeneity,
   - column B: $f_{c,cube}$=23.00 MPa average homogeneity,
   - column C: $f_{c,cube}$=19.10 MPa average homogeneity.

b) bolts (exemplary results for selected bolts):
   - R2 transom, level 2, between columns B-C: $f_{c,cube}$=24.60 MPa, medium homogeneity,
   - R3 transom, level 3, between columns B-C: $f_{c,cube}$=25.40 MPa good homogeneity,
   - R4 transom, level 4, between columns B-C: $f_{c,cube}$=34.10 MPa, sufficient homogeneity,
   - R5 transom, level 5, between columns B-C: $f_{c,cube}$=21.90 MPa, sufficient homogeneity.

In the available archival design documentation, it was assumed that the tower structure would be made of concrete of the R_w=170 atm class, which roughly corresponds to the B15 (C15/20) concrete class. The obtained test results showed that the concrete in the columns and transoms of the tower had a higher compressive strength than assumed in the design, but it was characterized by high heterogeneity.

Verifying static and strength calculations

Based on the analysis of the available archival design documentation, the following was established:

- at the stage of static and strength calculations, the spatial layout was simplified to a flat frame,

- nomograms (approximate method) were used to design reinforced concrete elements with a triangular cross-section,
- due to the monumental nature of the structure, the principle of increasing the cross-section of vertical reinforcement in the tower columns by 50% (columns in the A, B and C axes) was adopted,
- a bell with a mass of 5.00 t was assumed for the calculations.

Verifying static and strength calculations were made for the following parameters (assumptions):
- analysis of a bar spatial model (3D) using a program based on the finite element method (FEM),
- dimensioning of reinforced concrete sections was carried out according to the rules set out in [N1] - [N4], [N8],
- the exact (real) distribution of stresses in the cross-section for the triangular columns of the tower in the axes A, B and C was taken into account,
- during the calculations, the actual corrosion losses of the main reinforcement bars were taken into account, assuming bars with a diameter smaller by 2 mm in relation to the nominal diameter,
- a bell with a mass of 2,50 t (implemented solution) was adopted for the calculations instead of 5.00 t as in the designed state.

The results of the calculations showed that the structure of the belfry tower does not pose a threat to the safety of the structure, safety of use and that there is no risk of losing the stability of the tower as a whole. The maximum determined effort level for the main columns was 47%, and for the horizontal girders - 54%.

Construction works related to the renovation of the belfry tower were carried out in the following scope:
- structural elements (main columns in the axes A, B, C, prefabricated auxiliary posts, as well as transoms and beams at the level of technical platforms from 1 to 6) were reprofiled with the use of PCC and PCC II repair compounds,
- scratches on the column of the spiral stairs between levels 2-3 were secured by the use of adhesive injection. It was assumed that if the cracking of the column reappeared, it would be necessary to strengthen it and protect it by gluing carbon mats, creating the form of closed rings around the column between the prefabricated steps of the stairs,
- after the reprofiling, the surfaces of the reinforced concrete elements were covered with hydrophobing agents that minimize the migration of moisture and compounds contained in the air into the concrete, at the same time minimizing the progress of concrete carbonation.

The repair works of the reinforced concrete belfry tower were carried out in accordance with the requirements specified in [N5].

Renovation of the chancel roof

Due to the leaks occurring for many years inside the church, the so-called renovation works were carried out. lighthouse located above the presbytery of the so-called upper church.

The scope of renovation works included the disassembly of the existing glazing (single glazing), reprofiling of the so-called concrete joinery constituting a grid for glazing and re-assembly of small-sized elements of glass panes. As part of the repair work, painting work was also carried out in the inner part of the tower.

Carrying out renovation works required the construction of scaffolding with intermediate working platforms, enabling the repair of windows at different levels of the lighthouse. The built scaffolding, the base of which was placed in the presbytery (Photo 8), was convergent upwards and adjusted to the inclination of the outer walls of the lighthouse. The erection of the scaffolding was made on the basis of the developed design documentation, taking into account the need to stamp the ceiling above the basement in the area of the presbytery room.

a) b)

Photo 8. Preparatory works for the renovation of the presbytery cover: a), b) scaffolding assembly (*photo by Jacek Bramorski*)

Roof repair

Renovation of the roof over the central (central) nave, the so-called the construction of the upper church was the next stage of the long-term scope of renovation works. As part of the repair work, local repairs were made to the cracked plaster of the base of the lantern above the presbytery, locally the plaster was replaced with a new one, with the structure of the so-called cyclins (Photo 9).

a) b) c) d)

e)

f)

Photo 9. Roof of the Church of the SHoJ in Gdynia: a) general view towards the so-called lantern over the presbytery, b) cracks in the plaster of the lantern plinth, c), d) cracks in the plaster of the attic along the lantern, flashings of the attic along the lantern: e) before and f) after the replacement
(photo by Maciej Niedostatkiewicz and Jacek Bramorski)

The renovation works also included the replacement of the existing, intensively depreciated flashings. The main scope of renovation works on the roof over the central nave included reprofiling the reinforced concrete gable beams of the roof slopes - the beams had numerous corrosion damages, the concrete cover of the reinforcement bars was falling off and extensive moisture damage was visible (Photo 10). The repair works included the reprofiling of reinforced concrete elements with the use of PCCI and PCC II repair compounds, taking into account the use of passivating materials for corroded reinforcing bars. The scope of renovation works also included the replacement of flashings and flashings of the roof slopes and the replacement of existing downpipes.

As part of the repair work on the reinforced concrete elements of the roof slope above the central nave, the reinforced concrete beams supporting the cross placed on the roof, visible from the side of the front façade, were also reprofiled (Photo 11).

a)

b)

c)

d)

e)

f)

Photo 10. Shed roof over the nave of the Church of the SHoJ in Gdynia: view: a) general, b) close-up, c), d), e), f) examples of damage to the roof cornice (photo by Maciej Niedostatkiewicz)

a)

b)

Photo 11. Reinforced concrete, monolithic beams of the grate supporting the cross from the west elevation (along 3 Maja Street) - condition: a) before, b) after renovation (street names as of 2023) (photo by Maciej Niedostatkiewicz)

Works related to the renovation of the roof were carried out on the basis of the developed repair documentation, which took into account the selection of materials for the reprofiling of reinforced concrete elements in accordance with the requirements specified in [N5].

Renovation of the stone cladding of the wall at the main entrance

Renovation of the stone cladding of the wall at the main entrance was another stage of the renovation works of the Church of the SHoJ in Gdynia. The wall constituting the outer partition of the rooms located in the lower level of the church had a cladding made of pebbles, some of which were split. The cladding, made at the turn of the 1960s and 1970s, looked like a wall made of natural stones, locally made as a wild wall (made of unsplit stones), with local redecoration as a cyclopean wall (made of split stones). Machined stones were used in particular in lintel bands and in convex corners (Photo 12). The cladding was built on a fine-grained cement mortar, at the stage of its implementation, no elements were used to anchor the stone cladding with the structural wall made of stainless steel or galvanized steel. Also, no horizontal relief shelves were made at the height of the wall, no vertical or horizontal expansion joints were used. The foundation of the wall was made on the widened footing of the external wall.
Over the years of operation, the stone cladding underwent natural decapitalization - the joints underwent carbonation, pores opened in them and capillaries through which water began to penetrate into the space between the cladding and the wall. In the middle of the height of the wall, the cladding was scratched, its lower part was buckling. The stability of the cladding was preserved thanks to its inclination in the direction "from the street", which was ~ 100.

Photo 12. Damage to the stone cladding of the wall at the entrance from the west elevation (along 3 Maja Street): a), b), c), d) wall cracks, e) stone falling out from the outside, f) cracks from the inside (street names as of 2023) (photo by Maciej Niedostatkiewicz)

Decorative elements made on the cladding - religious symbols in the form of a heart and a cross and the date (year of completion of the construction of the Church) have not stratified over the years of operation (Photo 13), but it was noted that the date is detached from the structural wall.

As part of the renovation works, the cladding was dismantled, locally down to the foundation level (Photo 14a), its stable fragments were left along part of the length of the wall. The cladding was rebuilt with recovered stones, after their prior mechanical cleaning and bathing in a paste solution with the addition of ammonium fluoride. A vapor-permeable, low-shrinkage packaged mortar with a reduced amount of lime was used to build the stone cladding. The laying of the cladding was preceded by the implementation of anti-moisture insulation on the footing and on the outer wall in the ground zone (Photo 14b). The insulation was made of a mineral mortar based on polymer-modified microsilica. As part of the work related to the execution of insulation, a facet was profiled at the junction of the continuous footing and the structural wall.

As part of the renovation works, the terrazzo cap of the wall was also renovated: existing cracks were furrowed, repaired with a filling injection, and after mechanical grinding of the terrazzo cap, a protective hydrophobic coating was applied on its upper and side surfaces.

a)

b)

c)

Photo 13. Characteristic symbols made in the stone cladding of the wall from the west elevation (along 3 Maja Street): a) heart, b) cross, c) 1969 (year of completion of the construction of the church) (street names as of 2023) (*photo by Maciej Niedostatkiewicz*)

a) b)

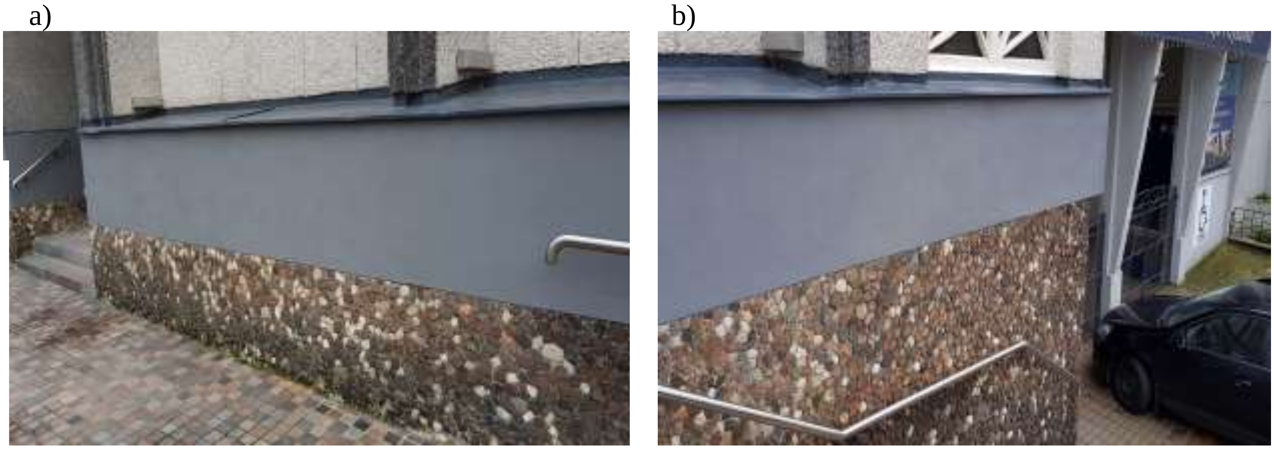
Photo 14. The wall at the entrance from the west elevation (along 3 Maja Street) during renovation works: a) dismantled cracked stone cladding and implementation of vertical damp-proof insulation, b) repaired cracks in the terrazzo cladding of the wall cap (names of the street as of 2023) (*photo by Jacek Bramorski*)

Works related to the renovation of the stone cladding were carried out on the basis of the developed renovation documentation, which took into account the selection of materials in accordance with the conservation guidelines.

Revitalization of the plinth

The plinth of the church building consisted of two parts: the lower one in the form of a cladding made of pebbles and the upper one made of plaster dyed in the mass (Photo 15).

a) b)



c) d)

Photo 15. Base cornice after completion of renovation works: a), b) along the western elevation (from the side of 3 Maja Street), c) from the southern elevation (along Armii Krajowej Street), d) along the eastern elevation (from the side of Monsignore Hilarego Jastaka Street), e), f) from the northern elevation (along Stefana Batorego Street) (street names as of 2023)
(photo by Maciej Niedostatkiewicz)

The lower part had damage similar to damage to the stone cladding of the wall at the main entrance. The stones were dirty, covered with a coating. Single stones were loosened, some of the joints were chipped. As part of the renovation works, the entire surface of the lower part of the plinth was first wetted with water at a temperature of ~ 30^0C, and then a thin layer of ammonium fluoride-based cleaning paste was applied to the surface of the plinth using a bench brush and the plinth was again washed with warm water. After cleaning, loose stones were glued in, and then the jointed stone cladding was supplemented with the materials used to repair the stone cladding of the wall at the main entrance.

The upper part of the plinth had damages in the form of plaster burns from the concrete base, the entire surface of the plaster was discolored and faded. As part of the renovation work, the scalded plaster was chipped off and restored. The new plaster was made as a layered plaster, with a primer layer and a top layer, after prior priming of the substrate and making a bond bridge. The top layer of the plaster was made as colored in the mass, with the use of fine quartz aggregate, with the use of a trass mortar dyed in the mass. The newly made external plaster on the plinth was made as rubbed plaster, with a structure matched to the structure of the plaster fragments left. After the local plaster repairs were completed, its entire surface was secured with an additional protective paint coating, in accordance with the conservation guidelines - a silicone facade paint was used, characterized by high water vapor diffusivity. As part of the repair work, the flashings on the upper surface of the plinth were also replaced. The original flashings were made of zinc sheet, joined with the use of reflected and smooth coils, they were replaced with flashings made of steel-titanium sheet joined with standing seams.

Facade cleaning

The next stage of the renovation works of the Church building was the cleaning of the elevation (Photo 16). All facades of the building were subjected to restoration works, which were cleaned using the hydromonitoring method (Photo 17), using hot water at a temperature of 30^{0}C. As an addition to the purification, an agent with a neutral *pH* was used, containing surfactants, i.e. surfactants that lower the surface tension of water. Thanks to the emulsifying properties of the agent used, the washed dirt and impurities were bound, especially the layer of grease and dust accumulated over the years of operation on the surface of the plaster made as the so-called. scraper. After cleaning, the facades were not additionally secured with a protective paint coating with the addition of anti-algae and anti-fungal agents, it was assumed that the protection would be provided by preservatives used in the production of the detergent in order to obtain its durability.

a) b)

Photo 16. Church facades during their cleaning: a) western (from the side of 3 Maja Street) and b) eastern (from the side of Monsignore Hilarego Jastaka Street) (street names as of 2023)
(photo by Jacek Bramorski)

Photo 17. Comparison of the structure and color of the facade a) before and b) after its cleaning - on the example of the eastern facade (from the side of Monsignore Hilarego Jastaka Street) (street names as of 2023) (photo by Jacek Bramorski)

Works related to the installation of underfloor heating in the church

Underfloor heating has been installed in the so-called upper church. Loops with a heating medium were arranged under three rows of benches - the installation of underfloor heating did not require changing the arrangement of the benches, functioning in the so-called the upper church in an unchanged form until it is made available to the faithful. The implementation of the water-type underfloor heating was carried out on the basis of a design study - an executive design. During the works related to the installation of underfloor heating, special attention was paid to the fact that the thickness of the layers of thermal insulation material and the concrete screed was selected in such a way as to protect the heating installation against the possibility of heat loss (thickness of the thermal insulation material) and the possibility of damage to the heating loops (thickness of the concrete screed (anhydrite)), on the other hand, so that the installation of underfloor heating does not make it necessary to rebuild (raise) the existing platforms under the benches. The heating center was installed on the level of the upper church. The individual stages of work related to the installation of underfloor heating in the so-called the upper church is shown in Photo 19.

a) 

b) 

Photo 18: The condition of the facade from the south (along Armii Krajowej Street) after cleaning: a) view of the facade plaster, b) concrete window frames after revitalization (name of the street as of 2023) (photo by Jacek Bramorski)

a) b) c)



d) e) f)



Photo 19: Installation of underfloor heating in the Church of the SHoJ in Gdynia in the rooms of the so-called of the upper church: a), b), c), d), e), f) stages of work (photo by Jacek Bramorski)

7. Conclusions

Despite the further rapid development of civilization, traditions, including those related to building customs, should be respected. Tradition is an intangible value, it is completely incalculable, but it determines the quality of life in a very significant way.

Superstitions and the consequent building habits should be approached reasonably, it is impossible to lead to a situation where irrational premises will determine the quality of life, limiting the possibility of conscious decision-making.

Nowadays, the most popular are the superstitions and customs related to the construction of the building and the start of living in it. The most popular, belonging to the first group, is the custom of hanging a topping out (wreath) after the end of the so-called shell of an open building. Also common is the custom of a celebration after moving into a building, commonly referred to as a housewarming party, belonging to the second group of superstitions and customs used in the construction industry.

During the period of operation, elements of the Sacral Complex of The NSPJ in Gdynia has been rebuilt and modernized many times.

Each time, the scope of renovation and repair works took into account the historic nature of the buildings.

Due to the cyclical construction works carried out on the premises, due to the current technical condition, none of the elements of the Sacred Complex show a direct threat to the safety of the structure and safety of use.

Church of Sacred Heart of Jesus in Gdynia has recently been recognized as one of the best-kept monuments in Poland. June 20, 2023 in Warsaw, was the winner of the "*Well-kept Monument*" competition in the category "*Preservation of the historic value of the building*".

"*Well-kept Monument*" is a prestigious competition of the Minister of Culture and National Heritage, on whose behalf the General Conservator of Monuments is responsible, and the National Heritage Board of Poland is responsible for the competition procedures. It has been organized for over half a century in order to promote historic buildings, where construction, conservation, restoration and adaptation works are carried out in an exemplary manner, as well as systematic actions for their proper maintenance in accordance with the highest research and executive standards.

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