

PAPER • OPEN ACCESS

## Technical Limitations in Merging Secular and Sacred Functions in Monumental Churches

To cite this article: Ksenia Piatkowska 2017 *IOP Conf. Ser.: Mater. Sci. Eng.* **245** 052079

View the [article online](#) for updates and enhancements.

### Related content

- [Electromagnetic Grating Theories: Limitations and Successes](#)  
R. Petit
- [The technical aspect of colour tolerance](#)  
H W Ellis
- [Quantum limit of different laser power stabilization schemes involving optical resonators](#)  
P Kwee, B Wilke and K Danzmann

# Technical Limitations in Merging Secular and Sacred Functions in Monumental Churches

Ksenia Piatkowska<sup>1</sup>

<sup>1</sup> Gdansk University of Technology, Narutowicza 11/12, 80-233, Gdansk, Poland

kseniapiatkowska@gmail.com

**Abstract.** The abandonment of churches and their adaptation for secular purposes is a current subject in Europe and worldwide. Most cases involve objects that were desacralized and then rebuilt as a whole object for alternative functions. Thus far, the merging of secular and sacred functions in one monumental Catholic church has not raised any issues. The paper describes the case of St. Catherine's Church in Gdansk, Poland, where sacred function exists parallel to the new secular function being implemented. The study is based on the authentic, professional experience of the author. It describes the technical limitations arising from the need to ensure destinies for the optimal conditions of both sacred and secular function, while avoiding undesirable interference between them. The author further identifies architectural solutions most relevant to current requirements for protection of sacred zones in the church, for preservation of the monument, and for optimal function of a modern science museum. Significant design issues include: the inviolability of the sacred zone, preservation of the historical value of the monument, proper operation of new secular zones in compliance with contemporary standards of safety, performance of the assumed mission and profitability. The research indicates specific areas where the highest probability of collision exists between the sacred and profane and where technical problems are likely to occur.

## 1. Introduction

The issue concerning the secularization of Catholic churches in Europe and worldwide is a current subject, often described and discussed in diverse circles. Research focuses on temples for various reasons: lack of ownership causing the object to fall into ruin; damage caused by climate and random disasters (flood, fire); or simply abandonment of the sanctuary by believers, resulting in conversion of the object as a whole into secular function. The issue of faith and celebration of religious worship is a touchy one. The desacralization of a temple, which violates the previous order of the sacred zone is controversial and taken very personally by the majority of believers. It can even awaken public outrage, protests and demonstrations. Many examples of such controversial implementation within sacred objects exist and include: The Center of Contemporary Art in the Chapel of Briggittines, Brussels, Belgium; a car garage in Portichetto di Lussino Church, Lake Como, Italy; a hotel in San Marino Church, Matera, Italy; a hotel in Martin's Paterhof in Mechelen, Belgium; a theatre in San Felipo Neri Church, Aquila, Italy; a conference hall in Santa Filomena Church, Ugento, Italy; a bookstore in Boekhandel Dominicanen, Maastricht, Holland; Halo Bar Night Club, Leeds, Great Britain, etc.

Analysis of the architectural and technical solutions used in the above-mentioned examples reveals the handling of monumental tissue in former sacral objects in order to preserve historical values, and more specifically in order to honour the former sacred area and ensure the proper operation of the new



alternative function. However these examples are limited to those churches that have lost their sacred character according to canon law. What happens in the case where the object retains its sacred function and continues to operate in parallel to the introduced secular function? Is such coexistence possible? Thus far, the issues of merging secular and sacred functions in one monumental Catholic church have not been raised. This phenomenon is not yet described since there is no such type of architectural realization. The author describes the subject while pointing out the problems that were encountered during the execution of architectural design at St. Catherine's Church – in such a case where a sacred object dating from the thirteenth century continuously functions as a sanctuary, even after undergoing attic adaptation for secular purposes. The study is based on the authentic professional experience of the author. It describes the technical limitations arising from the need to ensure for both destinies the optimal, functional conditions, and avoid any undesirable interference between them. Particular design problems requiring alternative solutions during the design process are analyzed and discussed. Finally, the author identifies the most relevant solutions to meet the current requirements for the protection of sacred church zones, preservation of the monumental building, and implementation of function in a modern science museum.

State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results.

## 2. Research

The capacity of the sacred and the profane to coexist largely depends on tradition and cultural conditions, as well as the legal, ethical and moral standards of the community. What may be considered inviolable and sacred in one community – may be unknown or culturally alien to another. Behavior that is considered sacred to some, may be neutral to others, or fall under completely secular behavior associated with the broadly understood profane. Sometimes, the sacred area itself, invokes an epitaph to characters, and on the strength of the direct or indirect action of God, is earmarked for the feature of transcendence and the sacramentality of places and people, thus revealing its holiness to the milieu [1][2]. Father Janusz Nowinski of the Institute of Art History at the University of Cardinal Stefan Wyszyński (UKSW) in Warsaw says: [...] it should be emphasized that the term ["sacred space"], operating today within different contexts in studies on the temple, on the liturgy celebrated in it and on the accompanying works of art did not exist in historical liturgical texts [3]. The issue of the border between the sacred and secular zones is not precisely defined, even by canon law. Pursuant to the records of the Code of Canon Law: the 'church' means a sacred building designed to worship God, where believers have the right of access in order to perform the cult, especially the public cult (Canon 1214); and 'holy places' have been made through consecration or dedication, according to the provisions contained in the approved liturgical books, and designed for religious performance or burying the faithfully departed" (Canon 1154) [4]. The sacral area is for performing the liturgy for God, which is understood as a public service in space, defined through the act of consecration, or sacrifice, and excluded from the realm of the profane. The sacred space is determined by the architectural framework of the temple, or by the act of sanctification. Therefore in the case of the Catholic church/temple these frames include the naves, sanctuary, chapels, vestry, porches and crypts. In praxis, the towers and attics of a church are not considered to be sacred areas. Church towers are often made available for both believers and tourists, either because of the significant touristic views and cognitive potential extending from the top of the tower, or the fact that tower clocks or the carillon have been placed there. Attics typically remain a private area, serving as a temporary storage, accessible only for the members of the convent. After the fire in 2006, the restoration of the attics in St. Catherine's Church did not make use of the new available space, which seemed to the church owners a serious mismanagement.

### *The History of St. Catherine's Church*

St. Catherine's is the oldest parish church in the Old Town of Gdansk. Built between 1227-1239, it was founded by the princes of Gdansk Pomerania. Originally small, it consisted of three low naves and

the semi-circular sanctuary. In the fifteenth century, it was extended by a tremendous tower on the west side of the church and two more naves of the sanctuary. The church was known for its rich interior decoration, a clock and a peal (1575), the carillon (1737), and the magnificent baroque helmet by Jacob van den Block located atop the 76m high tower. In the years 1555-1945, the church belonged to the Protestants. During the Napoleonic Wars, the military troops quartered in Gdansk had arranged inside the church a coach-house and cartwright workshop, which destroyed part of the interior decorations. In 1905, a great fire destroyed the church roof and cupola and melted the carillon. The greatest damage the church suffered was a result of the war in 1945. Part of the vaults collapsed, the helmet burned down again, and the carillon that was reconstructed in 1908 was dismantled and transported to Germany. The most valuable interior furnishings were dismantled and hidden outside Gdansk. In 1953 after the war, as a result of the lack of adequate protection, the south peak of the gable crashed. Yet reconstruction and conservation measures were then taken. Work on restoring the splendor of the temple lasted until 2006, when another fire broke out and destroyed the roof over the naves and sanctuary and violated the tower construction. As a result of the intensive rescue operation, the interior of the church underwent flooding, thereby destroying most of the previous renovation work. The crippled facility required immediate intervention and reconstruction of roofs over the naves and sanctuary. The project documentation for reconstruction of the church roofs was prepared in 2006. The new project assumed the shape of the restoration according to the plan before 1905, which included the pinnacle and dormer that were unreconstructed after the war. The roof over the naves of the church was made using the technology of laminated wood, while the three roofs over the sanctuary were formed by steel structure. Due to the reconstruction of the roofs, a new area of 1800m<sup>2</sup> was established just over the sacred zone of the church. To take advantage of the space that was formed, the Carmelites Convent who own the church, decided to give this surface to the Historical Museum of the City of Gdansk for public purposes.

#### *Design Task and Assumed Solutions*

The idea to create a Museum of Science in Gdansk had come from the new initiative of a local group of dynamically operating scientific associations who wish to collect and showcase the greatest scientific achievements and history of Gdansk. Owing to its rich history as a vibrant Baltic Sea harbour and hanseatic city, the city had been a place of residence and research for many internationally recognized scientists, researchers and thinkers like: Johannes Hevelius (1611-1687), Daniel Gabriel Fahrenheit (1686-1736), Arthur Schopenhauer (1788-1860), Daniel Gralath (1708-1767) and Günther Grass (1927-2015). Unfortunately, preserved memorabilia illustrating the scientific achievements of scientists associated with Gdansk are now scattered. Since the beginning of the twenty-first century, the search had been carried out for a building to house the new science museum. At the same time, the city and museum authorities had analyzed the idea of erecting a new seat for a new museum. Now, having found the location for the realization of the new museum seat, the task of architectural design began to take form.

The scheme of functionality relevant to the architectural design for the New Museum of Science was developed by the Historical Museum of the City of Gdansk. It consisted of the following areas: entrance area for ticket sales and info point, a small museum shop and cloakroom, a zone for permanent and temporary exhibitions, conference hall and educational zone, areas for preparing exhibitions, toilets for visitors, museum offices and social facilities for the museum staff (figure 1).

#### *Entrance Area*

As the level of the attics reached a height over 11 meters above the ground around the church, the main problem was to develop a solution for getting museum visitors to the entrance, regardless of their age or potential disability. There was an obvious necessity to design a new staircase with a minimum of one lift. The staircase would have to meet the parameters required for evacuation regulations; clearly the existing tall, narrow, spiral stone staircase leading to the level above the arches of the naves could not provide an escape route during fire. The first variant analyzed assumed the assignment of a new vertical communication within the body of the church. It was assumed that in order to guarantee the independent function of the museum, separate from the

open hours of the church, the entrance area of the museum would need access directly from one of the streets surrounding St. Catherine's Church.

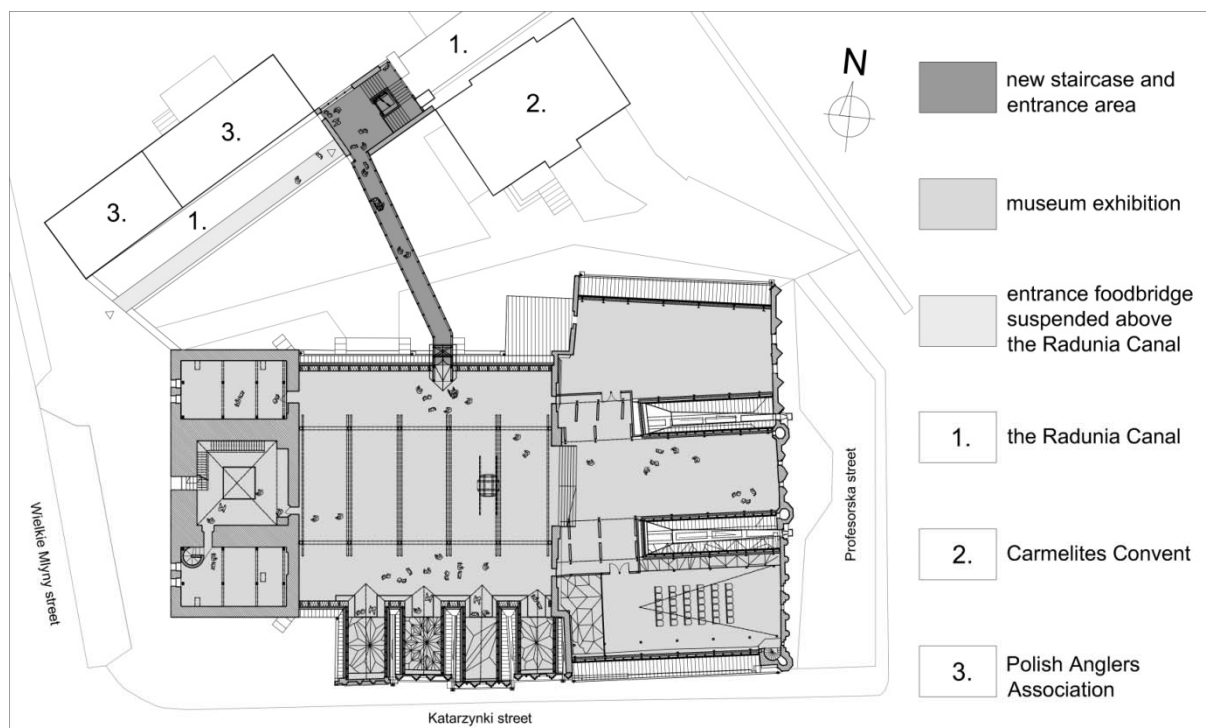


Figure 1. The museum exhibition and the new staircase building with the entrance area - plan on the level +11.70 m.

To comply with conservational regulation, the entrance to the new staircase could only be located only in the existing openings of the circumferential walls surrounding the church. This included openings that had been walled up in the past. Another problem was the need for the new vertical communication to break through some of the church vaults. The iconographic and conservation research had shown that some of the church vaults were not original, since they had been reconstructed after the devastation caused by the Second World War. The reconstructed parts proved to be those vaults located above the first and the fourth chapel, adjacent to the southern nave of the church. The location of stairs and lifts in the two chapels was analyzed, but after a detailed inventory numerous problems were encountered. This included: fragmentation of the preserved arm pits of historical vaults; too small difference in height between the roof ridge above the chapels and the assumed floor level of the new museum; and no openings in the outer wall within the analyzed chapels, which could be used for the new entrance. This all disqualified the planning of a staircase within the outline of the church.

Architects started to investigate places for locating the communication section outside the church. The conservation guidelines indicated rigorous protection of the so-called "shell exposition" of St. Catherine's Church: it disabled the location of any new large-size element in the immediate vicinity of the walls of the building, and excluded the violation of the geometry of the reconstructed roofs. The city council guidelines did not allow the placement of any new volume in the belt zone of the road adjacent to the church (on Wielkie Młyny and Katarzynki streets) and in the area of the current parking lot in front of St. Bridget's Church. Even worse, the Carmelites Convent, owners of the area adjacent to the northern façade of the church, reserved the right to maintain absolute privacy in this zone, thus excluding the potential for locating the vertical communication for visitors there. The left bank of the Radunia Canal, running along the northern boundary of the area occupied by the church was also analyzed as a place available for the investment. The final location selected for the vertical communication was in a gap between the existing seat of the Polish Anglers Association and a



building of the monumental Small Mill. The new construction was designed over the Radunia Canal, based on both sides of its structural walls (figure 2). This made it possible to ensure a representative approach to the entrance of the museum, while preserving the privacy of the site belonging to the Carmelites Convent.

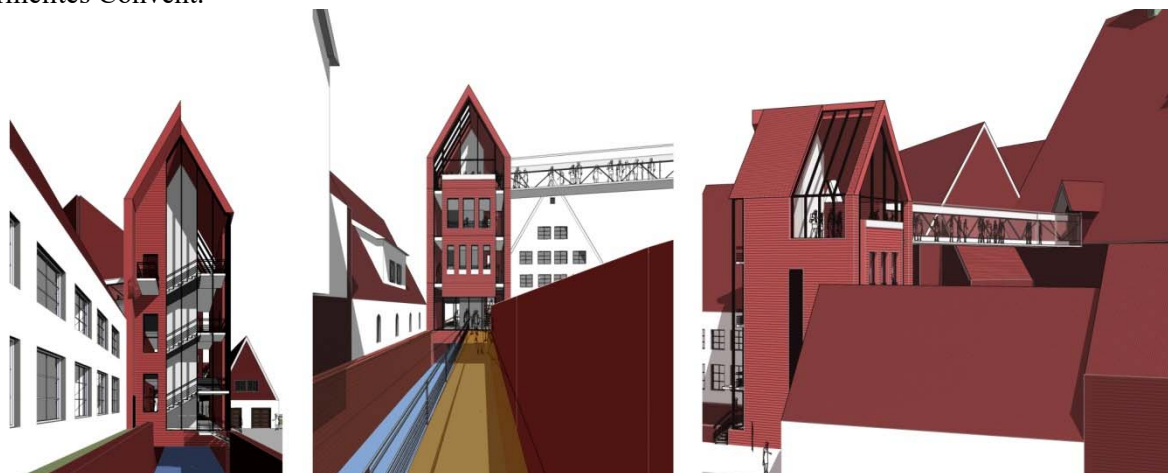


Figure 2. The new staircase building with the entrance area viewed from different perspectives.

#### *Sanitary Facilities*

According to the functional program of the museum, the architects were obliged to design a museum that would accommodate up to 100 visitors (including conferences, seminars and workshops), and at the same time up to 15 employees (technical staff, curators of exhibitions, administration, and maintenance). In accordance with current Polish Construction Law [5], to handle that amount of visitors, the museum must have a service zone not less than 100m<sup>2</sup> (incl. entrance hall, safe, info point, cloakroom in the form of lockers, and a min. of three toilets). Since the sanitary and social services are related to the network system to guarantee water supply and sewage disposal, a serious problem arises when the floor of a designed area is considered a sacred area of the church, where the condition of holiness should not be violated. Because it was obvious that the downpipes could not be guided through the middle of any naves or choir sections, the architects focused their search for the right place to bring the sewage along the circumferential walls of the church. The concept assumed breakthroughs of existing ceilings or - if the vaults were original - making furrows in the circumferential walls of the church in order to avoid a collision with the monumental tissue of the vaults. However, wherever the location of sanitary functions at the attic level seemed appropriate to principles of the logical, modern museum functions, the area underneath was inappropriate as it would involve the sacred zone and interfere with the valuable interior of the sacral, open-space naves and sanctuary. Also, the idea of performing deep furrows in the preserved historic walls in order to conduct the sewer pipes did not meet with the approval of the Municipal Conservatory Service and was thus withdrawn by the design team. Therefore, due to the above-mentioned difficulties, the author decided to place all the sanitary facilities in the newly designed building with the vertical communication.

#### *Technical Rooms and Installations*

For a modern museum to operate, especially the Museum of Science, the architectural project should guarantee technical areas for the specific technology, including multimedia, which is required by contemporary exhibitions. Of considerable value for the museum function, is the breathtaking open-space area of the attics, now distinctively created by the reconstruction of the historical roof form of St. Catherine's. Therefore, it was the intention of the author to save the value in the interior design of the new museum by dividing this unique space into smaller rooms, including technical rooms. It is extremely complicated to locate technical facilities in a functioning church: attics intended to host

additional secular and cultural function are quite different from standard examples of adaptation for new purposes in historic buildings. Usually little representative technical rooms are placed in the basements or attics of historical buildings that are adapted. In the case of St. Catherine's Church, invaluable crypts and tombs of famous Gdansk citizens remain in the basements, while a modern space with a public function is being created in the attics. Therefore, the design team decided to place most of the technical equipment required for operating the museum between the newly designed museum floor and the historical vaults of the church, as well as in the so-called 'armpits' of gothic vaults. These 'armpit' spaces reach up to 3.5 meters in depth, but they have a funnel shape, which made it more difficult to locate in place the standard equipment having a rectangular shape. An additional challenge posed by this solution arose from the necessity of supporting each device by fixing the grid to the construction of the museum floor, or to the reinforced concrete wreath crown of the historic brick walls; the challenge was to not overload the preserved Gothic vaults. Some of the technical equipment produced a vibration that threatened the safety of the historic church structure and lowered the comfort of rooms. Therefore, it was necessary to use passive vibration eliminators (spacers, joints) and a flexible structure. Components of the mechanical ventilation and the dense network of designed ventilation channels necessary to ensure optimum conditions for museum exposition and use produce significant noise. Therefore, the ventilation substations and central data support rooms were located in the immediate vicinity of the feeding rollers to minimize the length of the ducts, and thereby minimize their crossing and the noise of the air flow. Additionally, to ensure comfort while celebrating Liturgy, and to create a museum space with unique acoustics, the design team proposed a system of multi-layered acoustic insulation, separating the technical spaces, including the space under the floor in the interior of the church and museum. Also, the issue of where to locate the fresh air intake and exhaust air launchers constituted a puzzle. The conservation guidelines make it impossible to locate new elements on the facade of the church, or on visible surfaces of the roofs. Therefore, the design team used the internal roof surfaces of the three-nave roof covering the sanctuary to accommodate the openings that would ensure proper air circulation inside the attics; at the same time making sure not to expose these changes on the visible parts of St. Catherine's roofs.

#### *Fire protection and safety*

The tragic experience of the many fires that plagued St. Catherine's Church had made the owners of the church more sensitive to issues of protection for the church occupants and the safety of the sacred works of art gathered in the church. Introducing new, usable space to the highest part of the church, intending to accommodate more use by a greater number of people, had placed before the project team another challenge: this time it was the most important issue of securing the safety and lives of future visitors. The space in the attics of a church does not readily provide common circumstances for protection against fire or for the evacuation of people in case of fire. Due to the function of the newly designed museum space, in the case of fire, typical firefighting water devices could not be used (water sprinkler systems when applied could seriously damage the museum collection). The possible destruction of exhibits and the historical structure of the church vaults necessitated an alternative solution. The innovative fire-extinguishing systems using HI-Mist and carbon dioxide were proposed, although neither of these options were guaranteed to be 100% efficient due to the significant height of the attic space. Nevertheless, it appeared the large cubic capacity and height of exhibition space relative to the new arrangement of the church attic would offer support in the case of evacuation: because various simulations of fire all showed that smoke and other toxic substances would be gathered in the highest, capacious parts of the interior, thereby making it easier to evacuate people from the level of the museum. Furthermore, smoke dampers placed in the mouth of the reconstructed pinnacle and internal surfaces of roof over the three-nave sanctuary would also serve to accumulate smoke. The museum's evacuation routes would then include the newly designed staircase connected by glass to the body of the church, and - conditionally - the two existing spiral, stone staircases, after undergoing partial reconstruction, remodelling, renovation and being properly equipped with evacuation signage.

### 3. Conclusions

As it turns out, the impossibility of using conventional technologies and universal solutions in the architectural design of areas where both sacred and secular function coexist forces the application of unique solutions. The case in which a functioning Catholic church coexists with additional secular function is atypical, and the architectural and technical solutions will necessarily be unusual, too. Regarding such cases, this research indicates the circumstances in which the highest probability of collision and technical problems might occur as a result of undertaking the difficult task of optimally combining areas of the sacred and profane. These related circumstances and their possible solutions include:

- 1) the inviolability of the sacred areas – solutions require the creation of a separate entrance, effective acoustic separation of the secular area with technical zone, and avoiding any installation inside the nave and sanctuary;
- 2) the lawful preservation of historical value of the monumental object (e.g. church) through the protection of the external exposure of its shell in the urban context – solutions require the alteration of wall structure by creating furrows, corridors, installation breaks, or perforations;
- 3) proper operation of the secular function according to mission and profitability – solutions require consistent compliance with contemporary standards of public safety and current requirements of the market economy.

The non-standard solutions indicated are conceptually and technologically complex, and as a result are several times higher than the financial resources typically required for the implementation of a modern museum. Other factors will equally affect the cost of such solutions. Introducing modern technology in order to facilitate the implementation of difficult, often unique technical solutions further requires the use of costly, innovative materials that minimize the negative impact on the existing historic structure of the church. Not to mention the fact that conservation works will also need to be planned as an introduction to any construction work on the monument.

### References

- [1] J. Harpur, *"Święte Miejsca" (Sacred places)*, Warszawa 1995, p. 7;
- [2] Encyklopedia Katolicka, vol. 6, Lublin 1993, column 848, *Religia*, p. 22
- [3] J. Nowinski, *"Sakralna przestrzeń: charakterystyka oraz wybrane treści ideowe i symboliczne"*, (*Sacral space: Characteristics and selected ideological and symbolic content*) *Seminare: Poszukiwania naukowe* 29, pp. 269-283, 2011, in: [http://bazhum.muzhp.pl/media/files/Seminare\\_Poszukiwania\\_naukowe/Seminare\\_Poszukiwania\\_naukowe-r2011-t29/Seminare\\_Poszukiwania\\_naukowe-r2011-t29-s269-283/Seminare\\_Poszukiwania\\_naukowe-r2011-t29-s269-283.pdf](http://bazhum.muzhp.pl/media/files/Seminare_Poszukiwania_naukowe/Seminare_Poszukiwania_naukowe-r2011-t29/Seminare_Poszukiwania_naukowe-r2011-t29-s269-283/Seminare_Poszukiwania_naukowe-r2011-t29-s269-283.pdf), (2017.01.10)
- [4] Kodeks Prawa Kanonicznego (Code of Canon Law). Przekład polski zatwierdzony przez Konferencję Episkopatu Polski, (*Polish translation approved by the Polish Episcopal Conference*), Pallottinum, Poznan, 1984.
- [5] Dziennik Ustaw Rzeczypospolitej Polskiej, Obwieszczenie Ministra Infrastruktury i Rozwoju z dnia 17 lipca 2015 r. w sprawie ogłoszenia jednolitego tekstu rozporządzenia Ministra Infrastruktury w sprawie warunków technicznych, jakim powinny odpowiadać budynki i ich usytuowanie (*Announcement of the Minister of Infrastructure and Development of 17 July 2015 on the announcement of the uniform text of the Regulation of the Minister of Infrastructure on technical conditions to be met by buildings and their location*) (Dz. U.2015 poz. 1422, §236, pkt 6) in: <http://isap.sejm.gov.pl/DetailsServlet?id=WDU20150001422>