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IRRATIONAL FORM
OR PRACTICAL PACKAGING –
TWO DIRECTIONS IN DESIGN
OF CONTEMPORARY SPORTS FACILITIES

IRRACJONALNA FORMA
CZY PRAKTYCZNE OPAKOWANIE –
DWA KIERUNKI W PROJEKTOWANIU WSPÓŁCZESNYCH
OBIEKTÓW SPORTOWYCH

A b s t r a c t

Modern sports facilities, especially large show facilities, are one of the most complex and complicated functional systems. Appropriate programming requires very rational thinking from designers. At the same time, we expect from this type of objects spectacular formal solutions, preferably naturally derived from the structure and construction. Designers wanting to reconcile these two requirements encounter many obstacles, from those connected with regulations to financial ones. One way to overcome them is to separate its function from the form, which may serve as an attractive packaging in this case.

Keywords: sports facility, stadium, form, packaging

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

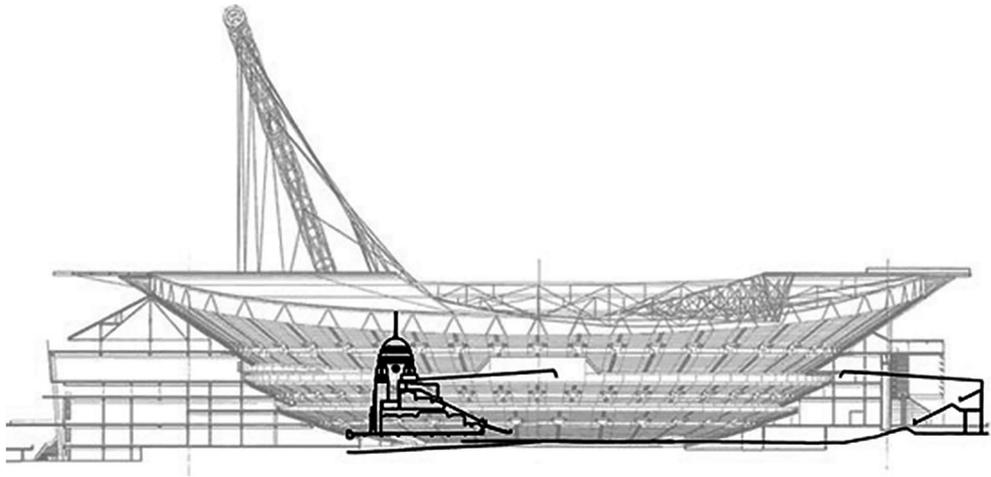
Współczesne obiekty sportowe, a w szczególności duże obiekty widowiskowe to jedne z najbardziej złożonych i skomplikowanych układów funkcjonalnych. Odpowiednie ich zaprogramowanie wymaga od projektantów bardzo racjonalistycznego myślenia. Jednocześnie oczekujemy od tego typu obiektów spektakularnych rozwiązań formalnych, najlepiej w naturalny sposób wywodzących się ze struktury i konstrukcji. Projektanci, chcąc pogodzić te dwa wymogi, natrafiają na wiele przeszkód – zaczynając od tych wynikających z przepisów, na finansowych kończąc. Jednym ze sposobów ich pokonania jest oderwanie funkcji od formy, za którą odpowiadać może w takim przypadku na przykład atrakcyjne opakowanie.

Słowa kluczowe: obiekt sportowy, stadion, forma, opakowanie

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In 1959, the architectural competition for the design of the Provincial Sports and Entertainment Hall in Katowice was settled. The winner was the concept of architects Maciej Gintowt and Maciej Krasieński, which was also influenced by the constructor Waclaw Zalewski. Construction began in 1964 and was completed in 1971, 47 years ago. “Katowicki Spodek” – [“Spodek” of Katowice – “Saucer of Katowice”], as under this name it has long been functioning in people’s minds, is the only spectacular sports facility developed in the times of the PRL [People’s Republic of Poland], which without any changes in form and structure has survived in commercial terms to our times, retaining all functional values. It has not only survived but also kept the top position. It hosts world-famous celebrities of the stage and is the arena of the most important sports events, it is here that the Polish volleyball players played the final match with Brazil winning the World Championship in 2014.

Over the last thirty or forty years, the conditions that contemporary, spectacular sports facilities should meet have changed dramatically, mostly in terms of user requirements, as well as the needs related to broadly understood requirements in the area of ensuring the safety of users. The main factor generating these changes is the commercialization of sport, galloping at an alarming rate, which, in fact, does not seem to end, as initiated in the seventies by the development of television broadcasts. Sport has increasingly begun to be treated in business terms, which, at the same time, influenced the design of sports facilities. There are many new functions added, priorities have changed, new technologies have emerged. Requirements related to evacuation and fire protection have increased dramatically, which applies to all public utility facilities, but in a situation where there are several or tens of thousands of people in the stands, the problem becomes a real challenge for designers. Adapting existing facilities to new needs and requirements is very expensive and often just impossible. The costs of renovation, reconstruction and extension usually associated with complicated interference in structure and construction (in the case of stadiums, a typical case is the need to roof the stands) are generally so large that it is more rational and cost-effective to build a completely new facility in place of the demolished old one, or one in a new location, more beneficial for many reasons (the size of the plot of land, transport accessibility, the possibility of organizing parking lots, lack of conservation restrictions, etc.). The fate of being replaced by the new affected most of the facilities built at least thirty, forty years ago but also a lot of younger ones. It is estimated that the usable lifetime of a sports facility does not exceed thirty years. The best example illustrating this phenomenon is the complete demolition of the legendary Wembley stadium, symbolic for world football fans, and replacing it in the same location with a completely new facility. The explanation of the reason for such an extreme action may lie in comparison to the cross-sections of stadiums. In addition, it is necessary to point out that the old Wembley had a capacity of about 100,000 spectators, the new one only 90,000.



Ill. 1. Comparison of cross-sections of the old and new Wembley stadium. Black line presents the old facility, blue the new one. Source: World Stadium Team, *Wembley Stadium London*, Area 75, 2004, p. 111

How did it happen, then, that Katowice’s “Spodek” has survived in great condition? The decisive factor was its unusual form, irrational in reference to sport. The hall, designed in the sixties, was part of the worldwide fascination with the conquest of space by man. With its shape it represented the most popular futuristic vision of space vehicles belonging to alien civilizations to this day. Thanks to this, it has not aged with regard to its form, gaining the status of a very characteristic and very recognizable symbolic meaning, additionally well located in the heart of the city. It is one of the most well-known architectural facilities in Poland and not only in the category of sports infrastructure. Attempts to demolish it would probably meet with a huge social protest. In connection with the form, the second key factor ensuring its immortality are unique, pioneering construction solutions. Thanks to them, the outstanding designer, Waław Zalewski, gained world-wide fame. The tension rod system of covering the hall on the plan of the circle, as proposed by him in the competition design can be considered the progenitor of one of the most sophisticated contemporary construction systems, currently known as *tensegrity*¹. The system was so innovative that the scientists of the Gliwice University of Technology predicted a catastrophe, which stopped construction for a year and a half. Only research carried out at the Warsaw University of Technology confirmed the accuracy of the solutions. At the implementation stage some simplifications took place, but this did not change the fact that a construction facility was unique not only for those times but also nowadays. Matching the Spodek to

¹ Tensegrity, a tension rod construction system, the use of which in building systems is associated with the need to minimize the compressive forces in favour of tensile forces, translates significantly to weight reduction and construction speed. The most characteristic feature of the system is that all rigid, compressed elements do not connect (do not touch) directly with each other but only by means of extended ties.

the requirements of present-day performances did not require interference in the structure of the building, and functional reorganization was made only to a small extent, which undoubtedly testifies to the exceptional skills of the architects. Modernization, conducted in 2009 at a cost of seventy million zlotys, was limited to the installation of air conditioning, monitoring system, suspension of a cylindrical diode screen under the dome, replacement of external shell containing asbestos with an aluminium one as well as enlargement of the spectator stands area (it is unusual that it could be increased without structural interference) with replacement of seats. The capacity of approximately 11,000 seats is comparable to the capacity of newly built top halls in Poland such as Atlas Arena in Łódź (12,109 places), Tauron Arena Kraków (15,030 seats), Ergo Arena on the border between Gdańsk and Sopot (11,100 places).

Regardless of the currently adequate functional values, the support of the thesis that this unusual form saved the hall of Katowice may be an example of the fate of the Olivia hall in Gdańsk. Designed at a similar time and by the same team of architects as Spodek, i.e. Maciej Gintowt and Maciej Krasiński with construction solutions by Stanisław Kuś, it was opened a year later, in 1972. Its form, equally impressive, maybe even more expressive and dynamic, but rational on a rectangular plan and typical (many similar designs were created) did not ensure similar sympathy on the part of recipients or such recognition. For many years, deprived of necessary repairs, it fell into ruin. At the end of the nineties, there were some ideas for its demolition and in 2007 it was closed due to the risk of the roof collapsing. If it were not for the legend of Solidarity, as it was here, where in 1981 the First National Congress of Delegates of NSZZ Solidarność took place, today a new shopping centre could be located in the place of a spectacular, historic sports facility.

We can observe similar trends all around the world. With the passage of several decades, the facilities most interesting in terms of their form have been handled best, no matter the fact that their solutions were not necessarily associated with the ones typical or characteristic for sport. Their irrational shapes in relation to their function and costs have influenced the fact that today we treat them as timeless icons of world architecture. In the front rank, you can include two halls in the Olympic complex in Yoyogi in Tokyo designed by Kenzo Tange in 1964. They constitute one indivisible whole of the organic composition resembling underwater life forms. Although their design seems to be hanging in the air, in order to get the desired shape it was necessary to use rigid elements that pretend to be hanging, but the effect is still amazing today. The second, perhaps most impressive and most irrational example is the Olympic complex from 1972 in Munich. The German architects Frei Otto and Günther Behnisch, using research on the forces occurring in the surface tension of a drop of water, created an unreal landscape of biomorphic forms without having the appropriate technologies for this purpose yet. Suspended on poles, soft rope netting forming only double-curved surfaces covered with rigid polyurethane panels, which are not resistant to ever-changing stresses, keep breaking regularly to this day. After the Bayern Munich football team moved to a new stadium adapted to modern requirements, the complex has largely lost its commercial and functional sense, but it is constantly preserved and no one thinks of demolishing it as an architecture of unique value on an international scale. The sports halls of Pier Luigi Nervi (Pallazzo dello Sport, and above all Pallazzetto dello Sport) or the Olympic Stadium in Berlin, which are modelled on ancient temples captivating classic elegance have a chance to survive for hundreds of years and have a similar iconic importance in a global and timeless sense.

Contemporary, modern sports and entertainment facilities such as large stadiums and halls adapted to the organization of the most prestigious spectacles are the most functionally and structurally complex structures that design teams can meet, in the scale of difficulty comparable only to large airports or extremely tall buildings. The development of optimal solutions took place, we can say, on the living organism by trial and error approach. This means that errors that were evident during the lifetime of one facility were corrected on the occasion of the next implementation. The first basic problem of contemporary spectacles was the independence from changing weather conditions (e.g. the costs of cancelling shows due to extreme weather conditions or the discomfort of participants connected with the weather). The solution was to use a sliding roof that would allow the stadium to be turned into a hall at any time. After the construction of such facilities, it turned out that the required natural turf, meaning grass for playing football does not want to grow due to the significant limitation of access of sun and wind. It was still necessary to exchange the whole grass surface (several or even dozen times a year) and its quality degraded quickly. Therefore, the entire pitch should slide out from the stadium into the place where the grass in the open space has ideal conditions for vegetation was invented. An additional advantage was that during the concerts, when the audience is on the pitch, there is no need to secure the grass. It required, however, atypical, innovative construction solutions. How to slide out a pitch from under the stands? A patent was invented with temporally hiding supporting columns supporting the audience. The pitch comes out when the tribune is empty, the loads are then much smaller; it can be moved to the extreme supports by a powerful binding joist. After finishing the whole process of sliding out or sliding in, the intermediate supports come out providing adequate support for the maximum loads generated by the audience-filled grandstands. The biggest challenge for the designers was, however, meeting different needs, most often mutually exclusive, of different groups of users of large arenas. The most numerous one, ordinary viewers, are a group of a few to tens of thousands of people, who, above all need to be smoothly and safely led to stands, from which they should have optimal visibility for the whole arena. In addition, it is necessary to provide them with catering and sanitary services, a very fast evacuation in the event of an emergency and a convenient way to leave the facility after the event. It is also necessary to check them before entering, which is not completely solved today. The second group, in turn, the least numerous but the most important in the context of the spectacle, from several to several dozen people, of athletes or performing artists, should have their own entrance, preferably discreet with an independent driveway so as not to meet, among others, their fans. Their way of moving around the facility, for example in order to reach the locker room or the pitch, should not cross any roads of other users. Imagine Cristiano Ronaldo breaking into the locker room before the match through the crowd of fans. The next group are officials and so-called VIPs. In numbers from several dozen to several thousand, they play a very important role in the organization of events, due to their prestige and, above all, a huge impact on the commercial aspect which drives the profitability of the operation of the facility. For them the luxury boxes are designed at the level of the best visibility, often on the perimeter of entire grandstands in one, two, and in the largest buildings, even three storeys. Private individuals or companies and organizations lease them for a minimum period of one year (or much longer). They are of various sizes and have the character of lounges with kitchen and sanitary facilities as well as their own seats in the stands available only from a given box. Income from luxury boxes is usually the most important item in the budgets of many stadiums and, to a lesser extent, of halls. The lease of a basic box at the Arsenal stadium

in London is approximately one million pounds. The target group of luxury boxes has high requirements. They also, like the players, want to get to the facility discreetly, preferably by car directly to the entrance, and then to the boxes and all privileged zones by an independent route without contact with ordinary spectators. The last, fourth group, perhaps the most difficult for an optimal solution of the functional system are journalists. They need similar facilities as the previous two groups but also much more, i.e. a separate entrance with an accreditation space, an independent route to the media centre, out of which they can get to specially adapted seats in the stands, conference rooms, television and commentator cabins with the arena view. They also have such a need resulting from the nature of work, which requires free access to other groups of users, in particular the athletes. The VIP group has similar requirements. Such situation causes conflicting interests which gives rise to conflicts about the time and scope of possible contacts. A good design aims to reduce them to a minimum, for example by the appropriate solution of the so-called mix zone – a special zone for contact with players. Finding the optimal solution for all of the above aspects was a long process that was conducted on “the living organism” of the functioning stadium.

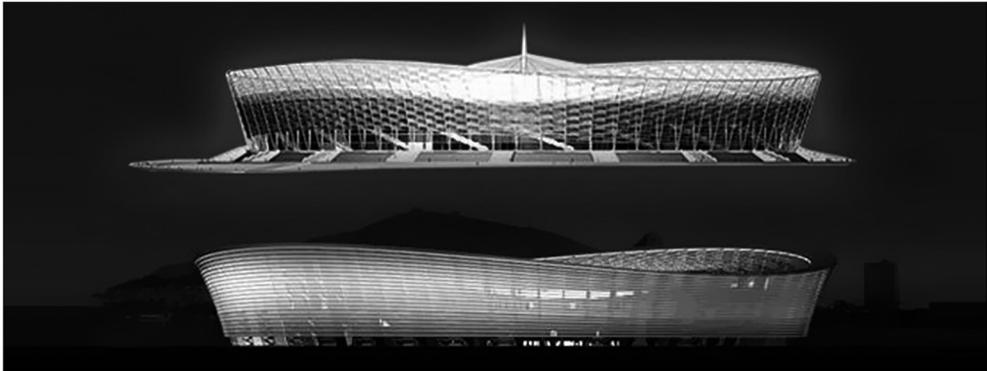
The first large sports and entertainment facility designed according to the new standards and setting the trend at the same time was Arena A in Amsterdam, built in 1996. The stadium was intended primarily for the local Ajax, then the leading club football team in the world. It was the first large-scale facility (50,000 seats in the stands) with a retractable roof. In this case, a solution based on a heavy, rigid structure was applied. The process of sliding was long and energy-consuming, a major problem was setting such huge mass into motion and then slowing it down. Hence, the facilities that were constructed afterwards had already used light-weight systems with a textile fibreglass membrane covered with Teflon, much more practical to use and faster in construction (the sliding roof over the National Stadium in Warsaw can be considered as the extremely light and simple structure)³. It was at this stadium when investors realised that the grass that did not have the right conditions for growing – did not want to grow, and to this day the only way to deal with the problem is to have a continuous, total exchange for a new pitch. It was there that the stadium luxury boxes started to be regarded as a commercial business assumption. Already during the construction stage, the demand for them was so great that it was necessary to implement design changes, which significantly increased their number. Reportedly, the income from the first rental of luxury boxes covered the construction costs in one-third². For many years that stadium became a reference point for subsequent investments of this type. Its form, however, is not very well regarded. The architectural structure of the building is massive, rationally resulting from functional decisions, it can evoke associations with pragmatic, technologically complex industrial facilities. It is difficult to believe that when it gets old anyone will fight for its preservation.

Further development of the optimal scheme for large sports and entertainment facilities took many years and was executed following a trial and error approach. Currently developed facilities to a large extent use it and will probably continue to use it until new needs arise or new technologies allow to solve current problems in a better, more efficient or more economical way. The result of such occurrences, however, is that most of the new facilities, in particular stadiums, are very similar in structure and function. Why should

² The solution modelled on a retractable roof spread over the 18th century Arena in Saragosa in Spain from 1988 designed by Schlaich Bergermann and Partners.

³ Based on a conversation with Professor Wojciech Zabłocki.

anyone risk considering such large and expensive investments when existing, developed solutions are efficient and safe? However, how does it happen, that the new stadiums and halls do not look the same? One may venture to say that they are very different. This is determined by the outer shell defining the façade and roofing of the stands, which can commonly be called packaging. It can be freely shaped in order to give the facility its individual characteristics, but its content, that is, the arena, stands and accompanying functions are in each case very similar. I would even dare to say that an average football fan placed in the middle of the grass pitch, without being aware of where s/he is located, would have significant problems with recognizing the surrounding facility. S/he could find out by analysing the characteristics of, for example, the roof, but it is still a component of the packaging. A good example illustrating this phenomenon is the comparison of football stadiums in Cape Town and Warsaw. The first was the main arena of the World Championships in 2010, the second one was built for the European Championships in 2012. The same architects of the German architectural company GMP Architekten **worked on both** of them. We may even say that it's almost.



III. 2. Comparison of shape of football stadiums in Cape Town and Warsaw. Source: Materials from the lecture of Zbigniew Pszczulny architectural engineer, at the Faculty of Civil Engineering, Architecture and Environmental Engineering of the Łódź University of Technology in April 2007

the same facility adapted only to different climatic and social conditions (the African stadium does not have a sliding roof and an underground car park, but it has 14,000 larger grandstands). With the use of the Cape Town solution, tested in the construction and use process, the designers were sure that they would fit in time (time limits for investments related to EURO 2012 were extremely tight), and the completed facility would meet the highest global standards for many years. The problem of ensuring the originality of architectural structure, which in the case of the stadium later named National was of extraordinary importance, was solved very practically on the outer shell, i.e. through the packaging. The most spectacular and at the same time difficult to capture an example of such approach is the famous stadium built for the Olympic Games in Beijing in 2008, popularly referred to as the “Bird’s Nest” of the design studio Herzog & de Meuron, and the most iconic is the stadium in Düsseldorf, Esprit Arena. In the first example, the construction visible from the outside

is a sophisticated, extremely original packaging⁴, whilst the rest contained inside is typical, based on the scheme developed with previous implementations of this type. In the second, through a rectangular, transparent box, one may see a familiar architectural structure of oval, reinforced concrete stands.

Modern sports facilities, especially large entertainment facilities, are one of the most complex and complicated functional systems. Appropriate programming of such structures requires very rationalistic thinking from designers based on practical experience from previous implementations. At the same time, we expect spectacular solutions with regard to form from this type of facilities, preferably in a natural way derived from the structure and construction. Designers willing to satisfy these two requirements encounter many obstacles, with those resulting from regulations up to the financial ones at the end. One way to overcome such difficulties is to separate the function from the form, which becomes more and more fulfilled by attractive packaging. The word packaging, however, is related to the concept of temporariness, which may raise doubts regarding spectacular public utility facilities.

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⁴ The effect of an irregular structure resembling a nest woven by birds is an illusion. The structure is a regular grid of intersecting frames, additionally added elements of which distort the optical reception.