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TECHNOLOGIES AND INNOVATIONS AT THE IBA AND IGS EXHIBITIONS – HAMBURG 2013

TECHNOLOGIE I INNOWACJE NA WYSTAWACH IBA I IGS – HAMBURG 2013

Abstract

Hamburg has become a world-class innovation centre indicating the direction of ecological transformations in the 21st century. Internationale Bauausstellung (International Building Exhibition) IBA Hamburg 2006–2013 is a rebuilding process unfolding over many years and being an answer to the question about the architectural future of cities; it is a place where the latest achievements of building technology and designs of the architecture of the future are presented. Internationale Gartenschau (International Garden Show) IGS Hamburg 2013 offers a new municipal park in Wilhelmsburg to its inhabitants, where they can find leisure, recreation and educational grounds. Modern residences, office buildings and shops were built on the edges of the park within the IBA. The whole creates a harmonious green space defining a new quality of living. These enterprises show how to transform a neglected urban space in a sustainable manner so that it is both attractive for people and environmentally-friendly.

Keywords: architecture, landscape architecture, building technologies, IBA Hamburg, IGS Hamburg, IGA, BUGA, LAGA

Streszczenie

Hamburg stał się światowej klasy centrum innowacji, wyznaczającym kierunek ekologicznych przemian w XXI wieku. Internationale Bauausstellung (Międzynarodowa Wystawa Budowlana) IBA Hamburg 2006–2013 to proces odbudowy rozłożony na lata, będący odpowiedzią na pytanie o architektoniczną przyszłość miast, to miejsce, gdzie prezentowane są najnowsze osiągnięcia technologii budowlanej i projekty architektury przyszłości. Internationale Gartenschau (Międzynarodowa Wystawa Ogrodowa) IGS Hamburg 2013 oferuje mieszkańcom Hamburga nowy park miejski w Wilhelmsburgu. W parku można znaleźć tereny do wypoczynku, rekreacji i edukacji. Na obrzeżach parku w ramach IBA powstały nowoczesne rezydencje mieszkalne, biurowce i sklepy. Całość tworzy harmonijną zieloną przestrzeń, wyznaczającą nową jakość życia. Przedsięwzięcia pokazują, jak można w sposób zrównoważony przekształcać zaniedbaną przestrzeń miejską tak, aby była atrakcyjna dla ludzi, a zarazem przyjazna środowisku.

Słowa kluczowe: architektura, architektura krajobrazu, technologie budowlane, IBA Hamburg, IGS Hamburg, IGA, BUGA, LAGA

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1. Introduction

New technologies and innovations connected with their application are currently being broadly discussed in both scientific and popular publishing. Presentation of their implementations in architecture frequently takes place in competitions, exhibitions, biennials etc.

The idea of presenting innovations and new technologies in international or regional exhibitions dates back to the mid-eighteenth century, although it was the Great Exhibition in London from 1851 which was recognized as the first truly global exhibition. Presentation of cultural, scientific and technical heritage lies at the basis of these cyclically organized international events. They also offered an opportunity for a competition in a given field among the participants. One can observe the striving to raise the level of presentation and the impetus of accompanying events every year. Regional exhibitions are governed by the same ideas, but the scope of the impact is smaller.

A perfect example of the above mentioned presentations are the German International Building Exhibition (Internationale Bauausstellung IBA) and the International Garden Exhibition (Internationale Gartenbauausstellung IGA) and also the National Garden Exhibition (Bundesgartenschau BUGA) or a smaller exhibition in a particular area (Landesgartenschau LAGA).

2. The IBA idea and history

The history of building exhibitions begins in the early twentieth century, when the first exhibitions in Darmstadt Malthildenhöhe (1901, 1908, 1914) and Leipzig (1913) presented the latest trends in architecture. Later, the implementations of architectural concepts on a global scale in Stuttgart (1927) and Brno (1929) and urban planning ideas in Vienna (1932) and West Berlin (1957) appeared in the history of shows. 1979 turned out to be a breakthrough year when Internationale Bauausstellung (IBA) Berlin GmbH programme including the works of Peter Eisenman, Zaha Hadid, Rem Koolhaas, Paul Josef Kleihues, Rob Krier, Aldo Rossi, Wolf Siedler, James Sterling and Elia Zanghelis were introduced. The IBA exhibition in Berlin was opened in 1987. It achieved a tremendous success by signing up permanently on the architectural map of Europe. The following exhibitions were IBA Emscher Park in 1989–1999, IBA Fürst-Pückler in 2000–2010 and IBA Stadtumbau Sachsen-Anhalt in 2002–2010. The latest being IBA 2006–2013 in Hamburg.

3. BUGA and IGA garden shows' idea and history

Presentations of the latest trends in landscape architecture are architectural, horticultural and landscape undertakings. Various examples of compositing plants, from simple gardens to large expansive parks, and related technical innovations in the field of technology, construction, installation and materials are presented depending on the event's profile. Among the presented objects, there appears, as defined by Amanda Marshall in the Venice Biennale's catalogue, „a beautiful landscape [...] congruent with the twenty-first century and

a)



b)



III. 1. IBA Hamburg 2013, CITIES AND CLIMATE CHANGE, IBA DOCK: a) IBA DOCK view from the waterfront, b) IBA DOCK interior with centrally located Hamburg map and marked IBA and IGS 2013 buildings (photo by S. Kuc)



III. 2. IBA Hamburg 2013, CITIES AND CLIMATE CHANGE, Georgswerder Energy Hill (photo by S. Kuc)

a)



b)



III. 3. IBA Hamburg 2013, METROZONES: a) Wilhelmsburg Urban Railway Station and Pedestrian Bridge, b) New Ministry of Urban Development and the Environment (photo by S. Kuc)

inhabited by the symbols of the twenty-first century". It's mostly about concepts beyond the old technical barriers and providing new insights on the formation of the contemporary landscape.

German landscape architects can confront their creative visions during multiple landscape architecture events. The most important and having the longest tradition at the same time is BUGA (Bundesgartenschau). The National Garden Exhibition is an event reflecting wide coverage in the environment of creators and supporters of landscape architecture. Organized every two years, BUGA was recently held in Magdeburg (1999), Potsdam (2001), Munich (2005), Gera and Ronneburg (2007), Schwerin (2009), Koblenz (2011) and international exhibition IGS in Rostock (2003) and Hamburg (2013). As in the case of building exhibitions they also have a high social impact. Every time, they leave behind a modern developed area: green space, municipal park or larger landscape design that will serve residents on a daily basis even after the exhibition's displays have disappeared [2].

4. Technologies and innovations

Between 2006–2013, aided by the IBA, Hamburg began the reconstruction process unfolding over the years, which is a response to the question about the architectural future of cities. Thus, it became a world-class innovation centre indicating the direction of ecological transformations in the construction industry, holistically treating urban, architectural, infrastructure and environmental science issues [3, 4, 6].

Simultaneously, IGS 2013 offered a new municipal park to Hamburg residents in Wilhelmsburg where they can find leisure, recreation and education grounds. Modern residences, office buildings and shops were built on the edges of the park within the IBA. The whole creates a harmonious green space defining a new quality of living. These enterprises show how to transform a neglected and degraded urban space in a sustainable manner so that it is both aesthetically and functionally attractive and environmentally-friendly.

The buildings of the IBA Hamburg are laboratory-like. The purpose of the project was to indicate the direction of future energy-efficient district development, where:

- the cost of construction could not to exceed the average cost of construction per square meter in the district (buildings after the IBA exhibition are to be sold on the primary market),
- protection against flooding will be ensured,
- high energy efficiency of the building and district (zero energy buildings, virtual power plant) will be guaranteed,
- the buildings will force residents to take action to protect the environment, such as reducing the amount of waste, reduction of car trips etc.

All the buildings are characterized by innovative architecture and construction solutions, and are zero-energy (total heat demand is less than 35 kWh/m²). The surplus energy produced by buildings shall be transmitted to the network and the so called virtual power plant: interconnected units. An essential element of this district structure is the heat reservoir in a converted bunker from the time of World War II (Energiebunker). It houses a buffer storage facility with a total capacity of 2000 m³ heated by surplus energy produced by prosumers including the one coming from its own renewable energy sources. The possibility of energy

a)



b)



III. 4. IBA Hamburg 2013, METROZONES: a) Water Houses, Living at the Wilhelmsburg Island Park, b) Natural, efficient and innovative: The Smart Material House (photo by S. Kuc)

a)



b)

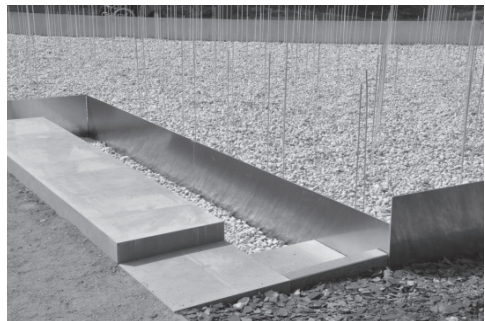


III. 5. IGS Hamburg 2013: a) Flags with exhibition advertisement, b) World of Ports (photo by S. Kuc)

a)



b)



III. 6. IGS Hamburg 2013: a) World of Water, b) World of Continents (photo by S. Kuc)

storage allows for the flexibility of reception, depending on the final consumer demand. A significant element of the district's energy supply is the Energy Hill (Energieberg), a producer of methane and wind energy in the former Deponie Georgswerder landfill. Solar panels and windmills on the former landfill provide electricity for 4 thousand flats. The district is not only self-sufficient in energy, but it also earns money from the introduction of electricity to the grid. With the profits it covers the cost of waste water treatment and local public transport [3].

Within the IBA project, many interesting in terms of engineering, intelligent and green public and residential buildings were constructed. Residential buildings are hybrid, in which the function of the rooms can vary depending on the needs, as the installations and technical equipment are distributed in a way that allows for flexible modifications.

The most important examples include [4, 6]:

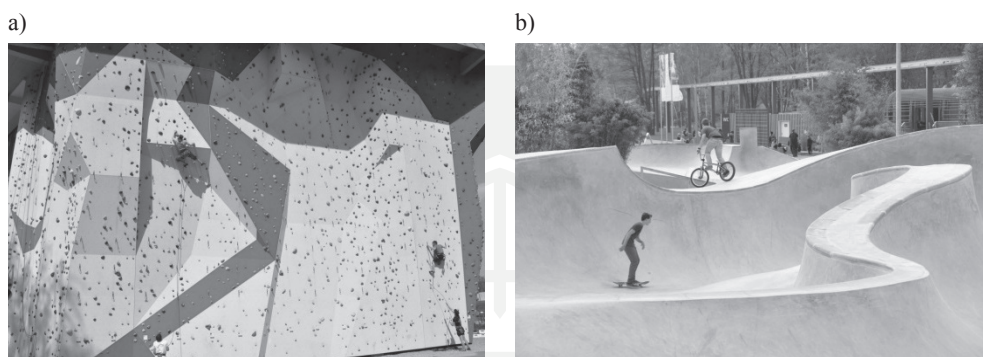
- a building complex of the Ministry of Urban Development and the Environment, in which below its green areas, there is a reservoir storing geothermal heat and heat from the solar panels of the building,
- Smart It's Ground, a five-storey residential building with phase-change (PCM) materials on the facade which significantly affect thermal comfort by storing heat during the day and giving it off at night,
- SOFT Mouse residential building, characterized by a mobile (dynamic) facade, built of modules containing photovoltaic cells and membranes which react to sunlight (the intelligent, possible to be controlled by the inhabitants, façade provides heat loss reduction and deep solar radiation penetration to the inside of the building depending on the needs of the shading of the building), minimizing heat loss and allowing deep penetration inside by solar radiation,
- BIQ Wilhelmsburg Mitte, a prototype residential building, the glass facades of which produce energy with bioreactors.

The latter is the most spectacular example of the modern concept of the building using renewable energy sources. The budget of 4,500,000 EUR resulted in the project designed to demonstrate the viability of bio and eco-friendly building construction. It is the first inhabited building in the world to have a bioreactor façade. The glass facade panels were inoculated with cultures of unicellular algae (phytoplankton). Constant nutrients are supplied in the form of diluted waste water and carbon dioxide by a separate water circuit. The algae flourish and multiply in a regular cycle until they can be harvested. They are then separated from the rest of the algae and transferred as a thick pulp to the technical room of the BIQ. Afterwards they can be fermented in an external biogas plant and thus re-used for the generation of biogas. Algae are especially well-suited to this process because, compared with soil-grown plants, they produce up to five times as much biomass per hectare. Apart from the production of energy, wall panels can control the natural lighting and isolate the interior of the building. Moreover, the façade collects energy by absorbing the light that is not used by the algae and generating heat, which is then either used directly for hot water and heating, or can be cached in the ground using borehole heat exchangers: 80 metre-deep holes filled with brine.

From an architectural point of view, it is also interesting that the BIQ not only draws all the energy needed for the production of electricity and heat from renewable sources, but also the inhabitants of the fifteen flats located in the building can configure the internal space of the apartment adjusting functional layout to suit their needs.



III. 7. IGS Hamburg 2013, World of Cultural Diversity (photo by S. Kuc)



III. 8. IGS Hamburg 2013, World of Activity: a) Climbing Hall, b) Skate Park (photo by S. Kuc)

5. Conclusions

The relationship between energy and modern construction and architecture is an issue more and more often discussed with regard to the economic and environmental aspects, current technical knowledge and the requirements relating to the design of energy-efficient buildings.

Both IBA and IGA exhibitions in Hamburg, which embraced most of the city, confirmed the desirability of a multisite architectural, urban planning and engineering action. After analysing the overall problems of the city, the recovery program was presented and later implemented in between 2007 and 2013. An architectural and landscape “organism”, was created, which due to the latest technologies and innovative solutions, is to create a friendly, sustainable living environment for the residents. Thus, Hamburg has been recognized as a world-class innovation centre and has become a world-class innovation centre indicating the direction of urban ecological solutions in the 21st century.

Building and garden exhibitions are not only a form of presenting the latest developments in the field of architecture, urban planning and landscape design but also the instrument of urban planning and urban design in a specific location, closely associated with that place, which may become a model and an inspiration for other works.

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