New National Gallery and Ludwig Museum Architecture description

The author's vision

The New National Gallery and Ludwig Museum is envisaged to be a public attraction of international ranking. The museums shall complement the experience of the City Park Budapest especially through the southeastern metamorphosis area of the park.

The previously predominant parkland dedicated to recreational activities presents a cultural landscape that promotes new urban and spatial relationships.

The emerging buildings, located at the edge and middle of the park, are in their first perception of spatial installations formed through the interaction between location and area program.

The museum experience hence commences from entry into the park and cultural landscape.

The design for the New National Gallery and Ludwig Museum has been developed in reference to the City Park. It considers the Museum as an open and publicly accessible establishment as well as becoming a Temple of Museums. It shall serve as a place of study, education and pleasure experienced through spaces of minimalistic design language, culture and nature.

The ensemble is divided into four separate parts and is only connected by the basement volume. On ground level, the buildings seem independent from one another and hence creates a welcoming public space within the museum grounds, integrating landscape and architecture. The interlace of these two elements instills the feeling that one is neither in the park nor in the Museum. The park itself is framed by walkways and outlines of the building being exhibited.

Site relations

According to the four other programmed museums, the building complex of the New National Gallery and Ludwig Museum shall become another and probably the most important element in the transformation of the historic City Park into the museum site of "Liget Budapest".

The site is located on the historic axis, which functioned as the main access road to the park in east-west direction dating back to the beginning of the 19th century. For the Millennium Exhibition in 1896, an Exhibition Pavilion was built in coherence and alignment to this axis. From the Ötvenhatosock Square, the axial geometric orientation of the park has made way for an open scenic design approach in the course of the 20th century. Design and spatial solutions can therefore be realized while maintaining this historic axis as a significant element on the site.

The Masterplan for the museum site of "Liget Budapest" places importance on this axis through the museum buildings on both sides of the Ötvenhatosock Square and the park centre axis of the Music Museum.

The design of the New National Gallery and Ludwig Museum additionally refers to this axis, as the four parts of the ensemble are composed along and around it. A unique space is created and spans centrally between the building volumes, into which the atmospheric parkland is condensed into an urban space.

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The symbiosis between architecture and landscape functions in such that; the park sets the scene for the four pavilion-like structures while also the architecture being able to frame views in and out of the park landscape.

The existing routes and views of the park are naturally introduced in the ensemble and merged on the plateau into four inviting gate-like situations.

With the division of the new building into four individual volumes, an architectural moderated scale is created, allowing the positioning of the large volumes in the park to be successfully implemented.

By separating the main building into 'houses - New National Gallery, Ludwig Museum, Gaia – the individual establishments function separately while maintaining a correspondence to one another.

Landscape

A patterned Carpet of Pavement and Vegetation:
The Plateau works as a museum Garden and has a floating density of pavement and vegetal structures: Wider structures at the edges form a green diverse Carpet of Gardens, while dense pavement structures define the two axes, where most people will walk. The gardens will contain small trees with wild-grass and flowers.
Visitors are welcome to take a break in the Gardens and become temporarily part of this Museum-Parkscape-Painting.

The Park Axis and the Grove
Coming from north-east, the main axis contains already the idea of the mixed structures of vegetation and pavings as an Entree.

Bald Cypresses (Taxodium distichum) and fern planted near the axis display the exotic character. The surroundings are developed into a diverse logical patterned grove with a mixed range of local trees to enrich Ligets biodyversity.

Defining the Plateau on its south-west, a great perron builds the connection to the slightly shifting topography of the lawn. The plateaus altitude difference of 2 m initiates this stair-grandstand into the open landscape of Liget.

Architectural concept

The two museums, the New National Gallery and the Ludwig Museum face each other diagonally. They are further complemented by the two smaller volumes - the Office building for office space required for both museums and the Gaia-Lab building.

The ensemble can be accessed by two inviting flights of stairs that are positioned on the historic axis and leads to the main foyer at underground level. The Foyer extends transversely from the main axis and gives access to the two museums positioned diagonally of the foyer.

Beneath the stairs, that lead to the museum tour and flank the foyer, are the ticketing offices and hire of audio devices. They are located directly at the entrances of the rooms for permanent exhibition. There are also Wardrobe facilities at opposite ends for visitors of the museum.

The areas of the temporary exhibition are present in angular spaces around the entrance hall of the permanent exhibition room or Foyer. They are orientated in the longitudinal direction of the Foyer.

The didactic museum spaces and the event areas are respectively organised in the last two levels of the museums (NNG 3rd and 4th floor and LM 2nd and 3rd floor). The event areas can also be optimally used in conjunction with the exhibition spaces. The Event Halls are in front of the foyer, allowing visitors to have a panoramic view of the Liget. Light penetrates through the 6m high halls and it receives sufficient daylight through the Skylight Garden.

The Sculpture Courtyard of the spacious roofed atrium of the office building is a binding element to the museum route from the NNG to LM.

The museum shops, the entrance to the museum cafe and the Brasserie are located respectively opposite each other and near the main entrance staircase. These 2 storey areas dedicated to gastronomy facilities opens itself to the public square at ground level where access is also possible.

The visitor toilets are located in the 2nd underground level and can be easily accessed through a central staircase and lift.

The delivery areas are organized in the ground floor of the Gaia Lab building as a closed external maintenance depot. This is available over the Zichy Mihály út. Two goods lifts carry deliverables from ground floor till 2nd Underground level. Workshops and warehouses are located here, northwest of the central axis. Work areas are exposed under the spacious atrium of the office building and the NNG.

Car parking areas for employees and visitors are available in the 2nd and 3rd Underground floors, southeast of the central axis. As requested, Visitor's parking is not located under museum areas. The underground parking can be reached using the circular ramp from the Zichy Mihály út. The staircase and the lifts can be reached from basement leading directly into the foyer.

The areas of the Gaia Lab can be access from the foyer as well as the square. It can also function as a separate volume.

The office areas are also connected through the foyer as well as a separate entrance from the square.

Facade – material and color

The facade design of the ensemble corresponds with its exceptional location of the scenic parkland of 'Liget'. Defined areas, such as the main staircases, take advantage of this view.

The opposing park views from the building are projected unto the facade of vertical aluminum-like swords with varying widths. Much like the formation of the park - dense with trees and bushes at ground level and views of the unobstructed sky on the upper horizon level - the ensemble and façade concept blends into the landscape and plays with this idea.

The vertical elements start with a wider surface and decrease in width as it grows in height. This delicate and diaphanous facade cladding binds all areas and volumes together while differing in visual permeability. Levels of the buildings that do not require daylight have no views through the building, whereas upper levels enable views in and out the building.

Visitor experience

The visitor experience begins with the approach to the four buildings with a large space between them offering two restaurants / Café. These are also important for the well-being of park visitors.

Two large stairways provide already an insight into the museum shop on one side and exhibitions on the other side. They make visitors curious and prepare them for the experience of art.

The spacious foyer welcomes visitors with a central Information Counter and offer comfortable seating for waiting and relaxing. It offers two cafeterias, museum shops and a few general shops. The foyer can accommodate a large number of visitors at major exhibitions, even if all three institutions offer large events simultaneously.

The entrances to the temporary exhibition areas are facing each other and allow visitors an easy orientation.

Both temporary exhibition spaces - National Gallery and Museum Ludwig - provide a direct connection to the permanent exhibition, if necessary. If required, this space may be included in a temporary exhibition concept - eg at an international art fair.
The entrance to the sculpture courtyard is positioned opposite the entrance to the exhibition levels of the National Gallery. This is a great day light gallery with ides ideal lighting for sculptures. A corridor connects the sculpture gallery with the permanent exhibition of the Ludwig Museum offering the possibility of a joint presentation of 19th and 20th century sculpture.

The two exhibition buildings have a sophisticated logistics concept that offers curators opportunities to different spatial and content based visitor tours.

Visitor Tour

For the permanent exhibition, the multi-storey building with two staircases offers a special feature: Two different possibilities for curatorial concept: (1) One way up and a different route down. Way up the northern half of the exhibition area is visited, when going down the southern half. This logistic concept distinguishes the building from many other multi-storey museums where the exhibition tour ends on the top floor with a "dead end". This project, in contrast provides a continuous tour, which begins in the foyer and also ends there. (2) Each floor can also be used as a separate unit. Each can be dedicated to a specific topic.
The stair-case offers panoramic views to the park and the city allowing visitors orientation while visiting the galleries.

Learning and Event Area

The Learning and Event Area is located on the top two levels. This is unusual, since these functions are often located in the basement. The position on the upper levels offers a unique view of Budapest for children and young possibility also to use the transport lift – and a staircase which can be separated from the exhibition galleries, meet the logistical needs. The galleries can be closed while events take place on the upper level.

Logistics of the art transportation

On the ground floor a huge delivery hall enables to accommodate two huge trucks at the same time. Crates will be directly transported into the second basement by huge elevators. A large handling and preparation area serves as a place for distribution of the objects in all directions. Corridors connect this area with (un)packing, crate storage, art storage, exhibition workshop, etc. Each museum has its own transport lift that serves all floors.

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Energy Concept

The main focus of the MEP design is to reduce the energy consumption of the buildings. Equally important in the design is the assurance of a maximum degree of flexibility in the energy demand, thus enabling the implementation of a demand side management without interfering with the strict requirements of the exhibition and art storage climate. For the competition stage, a district heating system with a CHP (primary energy factor of 0,75) is assumed.
In order to accommodate the district heating system, an interface via a heat exchanger is foreseen. The heat requirements of the building have been determined at 3,2 MW heating and the cooling demand at 1,3 MW. On the secondary part of the heat exchanger the heating system for the buildings is supplied as well as an absorption chiller. The absorption chiller is complemented by a conventional compression chiller. This is done in order to allow maximum flexibility on the production side (district heating). If there is a surplus of heat in the system during the summer time because the CHP is generating electricity the absorption chiller can use this heat energy in order to generate cooling energy. If this is not the case the conventional compression chiller will be able to cover the cooling needs for the museums.
Another feature that will greatly reduce the energy consumption and add to the demand side management capabilities of the buildings is an ice storage. The ice storage uses the latent heat of freezing water in order to extract low temperature heat through a heat pump. The use of the latent heat even allows for a seasonal storage effect depending on the size of the ice storage and the needs of the district heating system, thus substantially adding to the flexibility of the concept.
This will also allow taking in heat when it is the most convenient for the generation infrastructure (district heating system) in order to load the ice storage. When the ice storage is charged, the heating of the buildings can be realised with a heat pump. For an optimal conditioning of the exhibition rooms according to the museum best practices a surface heating system is recommended. Because the wall surface heating would not be compatible with the curatorial concept a floor heating system was chosen. The floor heating also works ideally in combination with the ice storage and heat pump because of its low temperature demand. For the heating of the supply air a higher temperature is needed, this will be drawn from the district heating system.

Indoor Climate

The main focus of the indoor climate is the conservation of the artwork. In order to achieve this, the lead parameter will be the relative humidity and the temperature will be the secondary parameter. The humidity will be allowed to vary between 45% and 60% and the temperature between 20° C in the winter and 24°C in the summer. Due to the considerable volume of the exhibition rooms the disturbing effect of the visitors towards the humidity is negligible. As a consequence the ventilation system will allow a change of at most +/- 5% in 24 hours. In order to minimize the energy consumption but still be able to achieve this performance, a contact humidifier will be used in the air handling units.
During the winter a base tempering of the rooms will be realised with the floor heating while the ventilation will compensate for the rest and achieve a minimum temperature of 20°C while strictly maintaining the humidity bounds. During the summer the ventilation will maintain a maximum air temperature of 24°C while strictly controlling the humidity.
The ventilation will take the fresh air from the roof of the national gallery and bring it to the 2nd level basement where the air handling units will be placed. The supply air will be distributed throughout the building, starting from the second level basement. Underneath the Ludwig museum the exhaust air systems will be placed. These will collect the exit air from the buildings and exhaust it on top of the Ludwig museum.
In the exhibition rooms the ventilation will be realised from the ceiling. The ventilation seams will be parallel to the lighting stripes. At the end of the lighting stripes spots will be installed in order to properly illuminate the artwork.

Hydrological Balance

The rain water shall be collected from the roof of the buildings as well as from the ground floor plate. This water shall be stored in a grey water tank. The grey water shall be used for the flushing of toilets as well as for irrigation, if necessary. In this manner the rainwater discharge of the site will be kept to a minimum.

Sustainability

The competition design views the sustainability issue globally, meaning that it takes into account the energy consumption of the museum buildings as well as the optimal integration of the buildings in the overriding infrastructure, thus enabling this infrastructure to function at optimal parameters as well. This design goal is reached by incorporating storage systems like the ice storage that can act as a seasonal storage if desired or it can be charged whenever the overriding infrastructure demands it. Another avenue to reach the sustainability design goal is the redundancy in generating systems. Thus the necessary cooling energy can be generated by conventional compression chillers using electrical energy as well as by an absorption chiller using thermal energy. This enables the consumer to adapt to the optimal functionality of the overriding system. Additionally to these features on the roof of the buildings solar panels are installed that can generate heat (solar thermal energy) as well as electrical energy (photovoltaic systems). These panels will additionally lower the dependency on the overriding systems and even allow for the integration of distributed generation capabilities if necessary and desired. The energy consumption is greatly reduced by using high quality isolation for the building and low temperature heating systems.
An important aspect of sustainable design is the water consumption. This issue is addressed by incorporating grey water usage for irrigation and toilet flushing. The secondary effect of this system is a great reduction in rain water discharge.

Description of Structural Concept

The building complex of the New National Gallery is formed by 4 square cube shaped single building bodies, each of which has different size and edge lengths. They are arranged with a considerable gap between each other, however resting on the same large scale basement level.
Foundation will therefore be carefully designed taking care on differential soil stresses and therefore avoiding differential settlement of singe building bodies.

As main structural material reinforced concrete will be used. At spots where high tension stresses are to be expected, optionally pre-stressed or posttensioned members may be applied. Steel composite action will be used for members and girders within mega-large-span slabs, where deflection limitations are governing the bending design or concentrated high load introduction is transferred to concrete supports (e.g. core corners).

The structural concept is anticipating a maximum of flexibility for the room spaces by providing large span slabs with a minimum of intermediate columns, wherever possible and economically justifiable.
Therefore the main structural system for the cube bodies is mainly reduced to and formed by just the outer r/c facade walls, the slabs and the inner central stiffening core, which provides elevator and MEP shafts and shear walls.

A special slab system is developed to bridge the distance between inner core/shearwalls and the outer façade wall totally column-free with spans up to 25m for the largest cube body, the National Gallery Building.

At first view the plan view seems to reveal that the inner core with its width of 4m will divide the slab system in 2 unfavorable single span systems with spans 21m respectively 25m which normally will require a large slab thickness creating heavy loads and high material consumption.

However the special idea for the National Gallery is the installation of a highly stiff steel composite "collar" along and "wrapping" the inner core walls, which is cantilevering out from the core walls for 4m at slab level, and serving the regular slab as a support at the most favorable location of the theoretical bending moment hinge point of a continuous beam. Therefore the regular slab span can be significantly reduced down to 17m respectively 21m providing thinner members dimensions.
The both collar structures sides along the longitudinal walls of the core are interconnected and rigidly coupled stiff girds placed within each of the transverse shear walls, therefore gaining full continuous beam actions (rather than pure cantilevering action) without disturbing any shaft clearance. The activation of continuous beam action is reducing thicknesses even further.

The collar structure, "wrapping" the inner core, together with the additional transverse beam extensions towards the façade walls perpendicular to the transverse shear walls, form a perfect backbone slab structure, where the regular slab system, which is formed by steel composite girders under a prefabricated r/c slab system only 20cm thick may be joined and supported.

The structure is highly fire resistant and the potential and high degree of prefabrication will guarantee high preciseness and maximum speed of installation and construction.