STURCTURAL CONCEPT

The building with the overall dimensions of 295.50×58.00 m is a spaced structure with a height of 25.00 m bridging over the 1956's monument with an arched span and freeform finish

According to the above the proposed building consists basically of the mass marked by the external shell supported by the longitudinal steel structure arch-girders and the monolithic reinforced concrete part of the building formed by the stepwise shifted independent floor levels within the shell running down on both ends.

The supporting structure of the freeform finished external building mass, the substantial span, streamlined architecture, significant openings along the supporting line of the shell and loading with external and internal walking surfaces substantiate the use of steel structures, to which the freeform shell support is attached. The basic supporting structure consists of two three-girder braced main arch girders and one two-girder braced auxiliary arch girder. The braced girders are concentric in their layout arched in vertical direction as well. The walking surface of the pavement will be set up between the upper belts of the external main arches, while the inner walking surface floor connecting the masses of the building set up in the two extreme ends will be located between the lower girders of them.

The span of the outermost arch structure is 235 m, the middle one is 215 m, while the innermost auxiliary structure was a 135 m span. In order to reduce the span of the main arches they will be supported by four angular abutment pillars on each side starting from a single point within the area bordered by the shells running down to ground level.

Pillars directly supporting the arches are articulated on top and bottom. Arch girders are connected to each other at the supporting points. The hierarchic supporting structure described above was set up in order to reduce construction problems and costs. During further design feasibility of the purely freeform structural design can be investigated by architectural, technical and economic analysis.
The monolithic reinforced concrete box structure basement will be set up under the entire area covered by the building and it even overhangs in several directions. Accordingly, steel structures of the external building shell and the reinforced concrete uprising building parts impose a load on the walls and pillars of the basement.
The internal uprising parts of the building marked by the shell are monolithic reinforced concrete and pillar structures using monolithic reinforced concrete slabs. Stiffening of the building parts is ensured by the stiffening cores delineated by monolithic reinforced concrete walls.

Belts and bracings of the braced girders are large cross section tubular steel rods. During further design the necessity of divided section components is to be investigated. The main girders are set up of three belts, allowing stable assembly during lifting and mounting. In spite of this the erection of auxiliary scaffolding is necessary for the purposes of assembly. The upper and lower belts of the two main girders are connected to each other in transversal direction and stiffening is also installed on both the upper and lower plane. These elements ensure the joint stability of the arched elements both in layout and in cross section and the prevention of tilting due to the arch effect.
Connecting the lower girders in the middle section allows the abutment of the floor connecting the two inner cores at the fourth floor. This and the upper floor structure are supported by the arch structures, while the other floors of the inner building parts are independent, they are held by the stiffening cores, pillars of the inner building parts and the angular pillars supporting of the arches and crossing the floors.

Vertical structures of the basement consist of perimeter basement walls, inner stiffening cores and walls as well as pillars. Stiffening of the basement and the uprising parts of the building is ensured by the reinforced concrete walls of the stiffening cores and the reinforced concrete perimeter and internal walls.

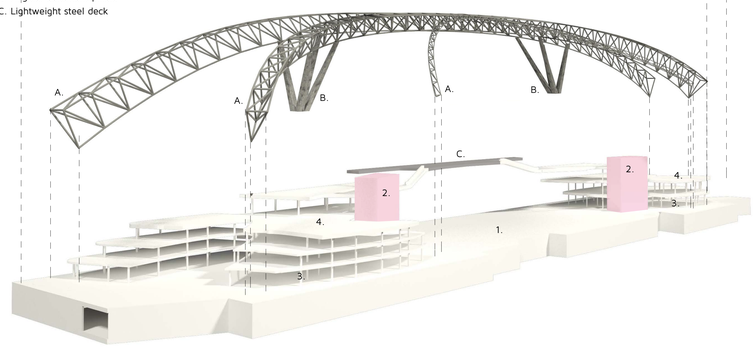
The middle walking surface between the main girders of the roofing structure is a steel structure roof, while the support of the turning profile and layout shell is provided by freeform steel structures broken down to triangular components attached to the main and auxiliary girders.

Freeform external shell

Steel space truss structure

The longitudinal steel structure

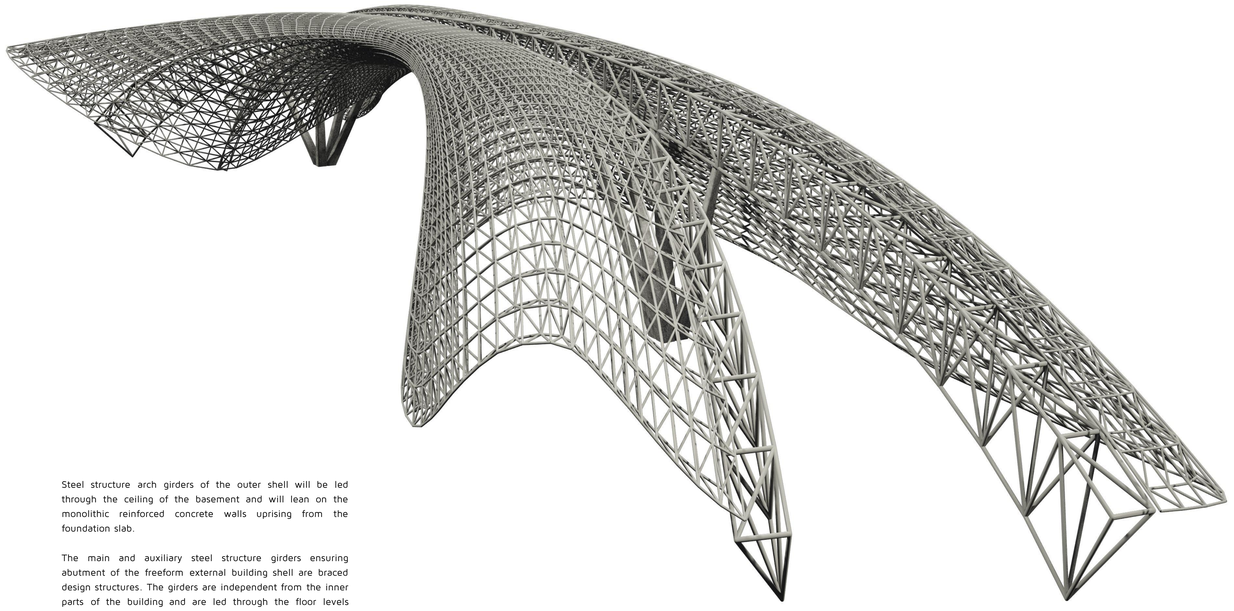
A. Two three-girder braced main arch girders and one two-girder braced auxiliary arch girder
B. Angular abutment pillars
C. Lightweight steel deck



Reinforced concrete base structure

1. Reinforced concrete box structure basement
2. Reinforced concrete structural cores
3. Reinforced concrete wall and pillar structures
4. Reinforced concrete slabs

The complete steel structure system



Steel structure arch girders of the outer shell will be led through the ceiling of the basement and will lean on the monolithic reinforced concrete walls uprising from the foundation slab.

The main and auxiliary steel structure girders ensuring abutment of the freeform external building shell are braced design structures. The girders are independent from the inner parts of the building and are led through the floor levels directly, without connections.
In order to reduce the span of the main girders (235 and 215 m, respectively) the girders are supported by angular columns. The supports are partly connected to the reinforced concrete structure of the inner building parts. They are made as reinforced concrete structures up to the top floor, and above it top and bottom articulated steel columns are installed.