FINAL REPORT

On the invitation-based international design competition for the design of a new bridge over the Danube

Budapest
11/04/2018

This final report has been prepared by the Evaluation Committee of the invitation-based international design competition announced by the Centre of Key Government Investments (KKBK) under Articles 31-32 of Government Decree 310/2015 (X.28.) on the rules governing design competition procedures (hereinafter: Government Decree), in accordance with Article 25 (3) of the Government Decree, containing a tender summary prepared by the Evaluation Committee for the contracting authority, as follows

1. EXACT TITLE, PURPOSE AND NATURE OF THE DESIGN COMPETITION:

1.1 Contracting authority in the design competition:

KKBK – Centre of Key Government Investments Nonprofit Private Limited Company (Zrt.)

1027 Budapest, Horvát utca 12–26.

1.2 Exact title of the design competition:

Invitation-based international design competition for the design of a new bridge over the Danube

1.3 Object and location of the design competition:

The Danube bridge to be designed during the tender procedure will connect the Újbuda and North-Csepel areas, at the level of Galvani street in District XI of Budapest. Boundaries of the design area:

- on the Buda side: 400 m from the bank edge, ending somewhere in the middle of the Galvani street section between Budafoki street and Szerémi street;

- on the Csepel side: 400 m from the bank edge.

1.4 Purpose of the design competition:

The purpose of the design contest is to ensure that, in line with Gov. Resolution 1372/2016 (VII. 20.) on the amount of funds required to make the preparations for certain transportation projects of key importance in Budapest, the negotiated public procurement procedure for drawing up the planning permission documentation, without prior publication of a Contract Notice as per Gov. Resolution 310/2015 (X. 28.) on Design Competition procedures, is carried out with the winning Applicant.

1.5 Form and nature of the design competition

The form of the design competition procedure is: invitation and pre-qualification-based, single-round international design competition.

Nature of the design competition: open in the pre-qualification phase and closed in the design phase.

The quota for potential applicants invited under this Design Competition procedure is 17, 12 of which will be directly invited. If a directly invited applicant submits an invalid pre-qualification application or fails to submit a pre-qualification application, other eligible applicants will be invited within the limits of the quota.

2. SCHEDULE OF CONDUCTING THE DESIGN COMPETITION

The Contracting Entity has conducted the design contest subject to the deadlines set out in the Brief, as follows:

2.1 Pre-qualification phase:

Commencement of registration for the competition	27/06/2017. 9.00 hrs
Deadline for arrival of questions	17/07/2017
Deadline to answer questions	21/07/2017
Submission of pre-qualification documentation	31/07/2017
Announcement of results for the pre-qualification phase	**22/08/2017**

2.2 Design phase:

Commencement of the design phase, invitation of applicants	23/08/2017
Site Visit:	19/09/2017
Deadline for arrival of questions	20/10/2017
Deadline to answer questions	13/11/2017
Deadline for submission of entries	**09/02/2018, 23.59**
Deadline for arrival of entries	**19/02/2018, 18.00**

2.3 Evaluation of entries

Plenary session of the Evaluation Committee, 1st day	26/03/2018
Plenary session of the Evaluation Committee, 2nd day	27/03/2018
Opening of envelopes	12/04/2018

The Contracting Entity will announce the results of the design competition on 20 April 2018, in contrast to the date of 19 April indicated in the Brief. The applicants and the Evaluation Committee have been notified accordingly.

3. SHORT DESCRIPTION OF THE DESIGN COMPETITION PROCEDURE

The design competition was conducted particularly under the following laws and conditions:

– Hungary's relevant legislation in force – Act CXLIII of 2015 on public procurement and Government Decree 310/2015 (X. 28.) on Design Competition procedures (available in English on the following link: http://www.kozbeszerzes.hu/nyelvi-verziok/hungarian-act-on-public-procurement/)

– IABSE Guidelines for Design Competitions for Bridges

– With regard to the ordering of the design competition, the relevant sections 1.9-1.10 of Govt. Resolution No. 1371/2016. (VII. 15.) on the harmonisation of the infrastructure capital investments related to Hungary's short and medium-term road development project and the implementation thereof by 2022, replacing Govt. Resolution No. 1372/2016. (VII. 20.).

– The design competition was announced on 27 June 2017, and the related brief and documentation was finalised on 13 November 2017 integrating the answers given to the questions.

3.1 Pre-qualification phase:

The design competition brief and the related documents became available in Hungarian and English on the website created for this purpose (www.ujdunahid.hu, www.newdanubebridge.com) by simple registration on 27 June 2017.

A total of 31 pre-qualification entries arrived during the design competition.

Although 12 applicants had been previously invited, only 11 of them submitted a pre-qualification documentation.

All of those applicants who were invited and also submitted an application fulfilled the eligibility requirements, and therefore 6 more vacancies remained.

The evaluation of the pre-qualification applications was carried out in cooperation with the Evaluation Committee, in compliance with the Brief and with the criteria set out therein.

Following an assessment of the ranking criteria (number of references, number of professional prizes, etc.), the final result was established.

The results were announced on 22 August 2017, which was followed, on the 23rd, by the invitation of those applicants who had passed to the design phase.

Invited parties:

1. Arhitektura d.o.o., JV Ponting d.o.o.
2. CÉH Tervező Beruházó és Fejlesztő Zrt.
3. Explorations Architecture, COWI UK Ltd., TRENECON Ltd.
4. Főmterv Mérnöki Tervező Zrt., AVANT-GARDE ÉPÍTÉSZ STÚDIÓ Kft.
5. Marc Mimram Architecture & Associes, T Engineering INTL SA, FUGRO Consult Kft.
6. NEY & Partners BXL S.A.
7. Pont-terv Mérnöki Tervező és Tanácsadó Zrt.
8. Speciálterv Építőmérnöki Kft., PIPENBAHER INŽENIRJI d.o.o.
9. Unitef-83 Műszaki Tervező és Fejlesztő Zrt.
10. Van Berkel en Bos U.N. Studio B.V. & Buro Happold Consulting Engineers P.C.
11. Uvaterv Út- Vasúttervező Zrt.

Applicants admitted based on ranking:

1. FHECOR Ingenieros Consultores, DISSING+WEITLING architecture
2. Knight Architects, Ove Arup & Partners
3. Lavigne & Chéron Architectes, Bureau d'Etude Greisch, Közlekedés Consulting Engineers, Geovil
4. Leonhardt, Andrä und Partner Beratende Ingenieure, Zaha Hadid Architects, WERNER Consult, Smoltzcyk & Partner

5. Mott MacDonald Hungary Kft., Brownlie Ernst & Marks Limited
6. setec tpi, Wilkinson Eyre, Terrasol

3.2 Design phase:

The Contracting Entity held a site visit combined with a full-day professional program in Budapest on 19 September 2017, which, in addition to the general overview, provided the applicants with an insight into the professional details and urban development context of the new Danube bridge to be built in Budapest.

In the questions related to the design competition, as well as during the site visit the applicants expressed their opinion that the question-answer deadlines should be postponed.

The Contracting Entity examined this possibility and decided to fulfil this request and to shift the deadlines concerned.

– New deadline for arrival of questions: 20/10/2017
– New deadline for providing answers: 13/11/2017

In order to ensure that the modified question/answer deadlines do not affect the actual length of the design phase in whatever manner, the Contracting Entity also examined the possibility of shifting the deadlines provided for the submission of the bridge designs, and decided to change the relevant dates accordingly, as follows:

– Deadline for submission of entries: 09/02/2018
– Deadline for arrival of entries: 19/02/2018

Prior to the submission of the entries, an address sheet provided with a submission number had to be requested on the website, a precondition of which was the completion of the data sheets and declaration forms relevant to the designers. The administrator of the website (hereinafter: “Trade Secret Manager”) handles this data confidentially.

3.3 Evaluation of entries

A total of 17 entries were submitted for the design competition; the Evaluation Committee accepted all entries as being submitted within deadline, and opened all of them on 20 February 2018. Prior to opening, the Trade Secret Manager covered the submission number on the package and replaced it with an evaluation code, then the members of the Evaluation Committee who took part in the opening procedure provided each document within individual entries with the relevant evaluation code. Only the Trade Secret Manager can identify a submission number behind the evaluation number.

The bid evaluation took place during the first and the second plenary sessions of the Evaluation Committee, on 26 March and on 27 March 2018.

At its first plenary session, the Evaluation Committee stated that all of the submitted entries were in compliance with the requirements in terms of content, form and confidentiality.

Following the expert presentations and a discussion, the Evaluation Committee decided by votes on the prized entries.

3.3.1 Evaluation criteria

The Evaluation Committee evaluated the entries based on the following criteria:

3.3.1.1 Aesthetics

The Evaluation Committee evaluated positively the following:

- The good overall architectonic effect, the good proportions and townscape appearance of the bridge and its related parts;
- The unique appearance and the character of the structure, as well as its similarity to other bridges in Budapest;
- The space experience provided to the people crossing the bridge, through a visual connection with the city;
- An urban space experience provided to pedestrians and bicyclists by integrating observation points or other community spaces in the design.
- The entry presents a bridge that appears as a landmark on the southern section of the line of the existing bridges of Budapest.

3.3.1.2 Innovation

The Evaluation Committee evaluated positively the following:

- Bridge structures never before applied in Budapest, which mesh well with the bridges of Budapest and also give an air of novelty, in terms of design principle;
- Innovative material usage, using construction materials with a low environmental impact, manufactured with low energy consumption;
- Use of an innovative construction technology.

3.3.1.3 Structural effectiveness

The Evaluation Committee evaluated positively the following:

- Structural slimness of the bridge superstructures, effective pairing of the material used and the statics conditions, as well as the clear structural system.

3.3.1.4 Feasibility

The Evaluation Committee evaluated positively the following:

- Any entry in which the plan as a whole and its architectural and technical standard vouch for feasibility and provide a possibility to choose the bridge designer, provided the Evaluation Committee with convincing guarantee for the preparation of a high-quality bridge plan package.

3.3.1.5 Maintainability, operation

The Evaluation Committee evaluated positively the following:

- Any entry the designer of which strived to achieve energy and resource efficiency in the course of the operation and maintenance of the bridge.
- The designer was able to find a careful solution for managing pedestrian, bicyclist, motor vehicle and tram traffic on the bridge and the off-ramps, and to design appropriate connections to the roads running along the river banks.

3.3.1.6 Costs, economic aspects

The Evaluation Committee evaluated positively the following:

- Beyond the innovative and imaginative construction, the planned bridge was designed with cost-efficient structural solutions in mind.

4. SUMMARY ASSESSMENT OF THE RESULTS OF THE DESIGN CONTENST

The Evaluation Committee, having requested the opinion of the experts who participated in the design competition, opened and reviewed the entries in detail, and, **based on appreciable solutions, now considers the design competition to be successful.** The different architectural perspectives and structural solutions resulted in highly varied designs.

4.1 Aesthetics - architectural appearance and cityscape compatibility

– The majority of the applicants either adhered to a particular structural system and endeavoured to find a matching form that could be integrated even in the line of the existing bridges of Budapest (e.g.: Entries NDB-10; NDB-14) or deliberately chose an appearance that differs from the usual systems (e.g.: Entries NDB-05, NDB-08, NDB-09).

– Some of the applicants adhered to the chosen structural system, but, for form-related reasons, proposed a solution that the chosen structural system does no longer justify (e.g.: Entries NDB-11, NDB-12, NDB-13).

– Other entries, on the other hand, have sacrificed structural harmony on the altar of an overemphasised form factor, and the composed visual effect eventually became unsolvable and uninterpretable (Entry NDB-07; NDB-17).

– Formal uniqueness was, however, sometimes able to meet with the structural system composed by the designers (Entry NDB-03).

– As early as when the Brief was published, the Evaluation Committee agreed that the beam bridge structure was not compatible with the objectives of the design competition. In evaluating the entries, they were of the opinion that – compared with other structures – the segmental arch bridge structure is also less suitable. They did, of course, evaluate in this structural category as well, those unconventional solutions that are innovative in terms of both structural design and visual effect (e.g. Entry NDB-09).

– In a major part of the bids the off-ramp structures of the bridge ran over Budafoki street. The Brief did allow for a multi-level interchange at Budafoki street, but creating such a structure at the abutment inescapably resulted in an unfavourable urban environment, with the interchange and the local city area coming to be dominated by the public road structure, which also required substantial local area separation. The access of pedestrians and bicyclists to the Danube Bank has also become cumbersome. A good solution in this respect was the one that separated the pedestrian and bicycle paths from the deck roadway and first led them to the level of the quay (e.g.: Entries NDB-05, NDB-08, NDB-11, NDB-14).

– The solution in which all the exit ramps of the deck reach the level of Budafoki street certainly deserves recognition (e.g. Entry NDB-10; NDB-11).

– Due to the diversity of structural systems, the space and sight experience is different for the people crossing the bridge. Perhaps the most powerful experience is the gate image at the beginning and at the end of the passage (e.g.: Entry NDB-10), but a similarly calming experience is the reassuring image of the structure (e.g.: Entry NDB-03).

– An unfortunate solution in the entries was where the designer intended to attach a community space to the deck, or to design observation terraces by extending the edge of the carriageway (Entries NDB-11; NDB-13; NDB-02).

4.2 Innovation

– The concept of innovation was interpreted correctly by those applicants who were able to visualise a specific structural system by integrating solutions that are both up to date and forward-looking in terms of form, detail, traffic system, construction and sustainability.

– Although the Evaluation Committee did not consider the arch bridges to be novel, it did not rule out these solutions, but even appreciated their innovative construction and appearance. (Entries NDB-03; NDB-09)

4.3 Structural systems

– The applicants made the following suggestions for the main bridge:

  – Arch bridge: 6 EA (NDB-01; NDB-02; NDB-03; NDB-09; NDB-16; NDB-17)

  – Single-pylon stayed girder bridge: 2 EA (NDB-06; DDB-12)

  – Two-pylon stayed girder bridge: 5 EA (NDB-04; NDB-07; NDB-10; NDB-11; NDB-15)

  – Single-pylon suspension bridge: 2 EA (NDB-05; NDB-08)

  – Two-pylon suspension bridge: 1 EA (NDB-14)

  – Beam bridge: 1 EA (NDB-13)

– The proposals for bridge substructures and piers are also varied:

  – Bridge structures without a river pier: 3 EA (NDB-02; NDB-11; NDB-14)

  – Bridge structures with one river pier: 4 EA (NDB-03; NDB-05; NDB-08; NDB-12)

  – Bridge structures with two river piers: 10 EA (NDB-01; NDB-04; NDB-06; NDB-07; NDB-09; NDB-10; NDB-13; NDB-15; NDB-16; NDB-17)

– There were two types of proposals for the deck layout:

  – A straight-line route crossing the Danube in an angle: 14 EA (NDB-01; NDB-02; NDB-05; NDB-06; NDB-07; NDB-08; NDB-09; NDB-10; NDB-11; NDB-13; NDB-14; NDB-15; NDB-16; NDB-17)

  – S-shape crossing: 3 EA (NDB-03; NDB-04; NDB-12)

Experts considered most of the proposals in the entries to be structurally sound and well-developed at the level of the design competition, and, in agreement with the Evaluation Committee, considered the symmetric systems to rely on the same principles as the other Danube Bridges in Budapest to be the most appropriate (NDB-03; NDB-10; NDB-14), although they also accepted the single-pylon asymmetric (NDB-05; NDB-08) and the single-arch bridge options (NDB-05) as well.

4.4 Feasibility

With the involvement of Experts, the Evaluation Committee found that most of the bridge structures can be built applying construction methods that are traditional in Hungary. They disagreed with solutions that assumed a long-term restriction of river traffic during the construction process, and also disagreed with solutions offered for the integration of large-scale structures assembled in one piece.

4.5 Maintainability, operation

– The long-term sustainability of the bridge depends on the fulfilment of the maintenance and operation requirements. Although not all of the entries focused on these issues in sufficient extent, the plans allow us to identify those bridges in the case of which these criteria can be met if the plans are further elaborated.

– Structures that are too complicated in terms of form and system imply the potential for future maintenance and operation difficulties, so the experts did not support these solutions (NDB-07; NDB-13; NDB-17).

– Since the green vegetation and the green strips envisaged on deck surfaces are not recommended due to their physical characteristics, the Evaluation Committee disagreed with their integration in the plans (e.g.: NDB-01, NDB-06, NDB-09).

– The committee was also reluctant to appraise the community spaces being built together with the bridge structures, given that it is highly questionable whether the spaces below the deck can be serviced or even used. The creation of community spaces in the narrow (2 m clear width) pylon is also a rejectable solution (NDB-11, NDB-13, NDB-17).

– It is unfortunate to install light fixtures on the railing between cars, as the flying stones and dust rapidly reduces glare value, thereby increasing the accident hazard (e.g.: NDB-01; NDB-06).

4.6 Costs, economic aspects

The values provided for the material requirement of the project mainly refer to the main bridge. The differences between the estimated construction costs of the deck structure and of the related support structures vary within the range of 55%. The solutions focusing on exaggerated form factors were more costly. The investment costs of the exit ramps connected to the banks are considerably increased by the fact that the exit ramp reaches the level of the Buda side either at Budafoki street or by crossing it at a higher level and then connecting to Szerémi street.

5. DETAILED PROFESSIONAL EVALUATION OF INDIVIDUAL ENTRIES, IN THE ORDER OF THE EVALUATION CODES

Entry No. NDB 01

The main span of the bridge is a basket handle arch bridge with two river piers.

It has a clean structural behaviour and the straight axis is also favourable. This is a high-quality, aesthetically pleasing design. The specific density of steel is 28 t/m, which is appropriate for the 240 m maximum distance between supports. A statically balanced, symmetrical, clean design with clear structural behaviour, nothing new or unexpected.

The solution is not genuinely unique; in spite of the clear visual design, the arch appears undersized in comparison to the length of the bridge and the expected size of the surrounding city structures.

It is not worthy of the size of the Danube, and it is not decisive in terms of visual impact. The arc is disproportionately small compared to the entire bridge. It avoids unique shapes. It becomes schematic, and the linkage insignificant. The detail of the support is sketchy.

The biggest problem with this entry is that it does not lead pedestrians to the bridge at the Buda abutment, which is poorly elaborated compared to the other entries.

From a city planning point of view, the bridge's approach ramps are too long, splitting the explosively developing Albertfalva district in half.

Partially solid, closed abutments. No detailed information is available regarding the foundation. The total weight of the steel structure is 13,582 t, its strength grade is S355 and S460, the weight of the suspension cable is 697 t. The structural weight appears excessive. The insides of the two thinner box girders on the sides are difficult or impossible to access. The statics and deformations for the solution have not been determined. Connecting cables for supporting the structure's self-load is difficult.

The bottom anchoring is inaccessible. The bottom surface of the central box is level; the inspection car could be placed here, yet this is not included in the design. The surface between the main box and the side box (the cable anchor is covered with a mesh) is, unfortunately, useless from a transport point of view, yet the lane runs through the entire length of the bridge. Due to flying stones and raised dust, lighting built inside crash barriers soon becomes opalescent, which reduces its efficiency. That design should therefore be avoided in order to prevent the risk of accidents.

The river piers are raised to a level of 101 AMSL; however, due to flood prevention reasons, including in particular protection against the breakup of ice, they should be raised by another 2 to 3 metres, which will significantly deteriorate the bridge image and affect the structural behaviour as well.

The appearance of the bridge structure is not particularly unique; some of the visual impact of the segmental arch is lost due to its low structural height, and the bridge will probably not successfully impact the cityscape to the extent hoped for, especially when viewed from the deck level. The lower view of the deck structure is well designed. While the grass-covered tram track leading across the bridge is theoretically feasible, it is not a reasonable solution in this location. The pedestrian and bicyclist cantilevers are wide, 2.5 metres in width. The elevator solution used at the Buda-side abutment towards the banks of the Danube is undesirable for unobstructed bicycle traffic: ramps would be more functional and less sensitive to operational issues. The solution used by the entry for the Csepel abutment is more rational. This is the second widest structure among all entries. (46.7 m)

The cross-section of the superstructure varies all along, leaving a great deal of idle surface. The construction technology presented is known, although it requires the construction of a temporary trestle in the middle of the bed, which results in a long-term restriction of and interference with river traffic (the authorities must be consulted about the bottleneck). Due to the temporary trestle (complete foundation works in the riverbed) and the varying cross-section of the deck, it is not the most economical solution.

The Designer failed to examine the impact of any maintenance works performed on the public utility lines located in the bridge caisson, including the district heating line, on the traffic.

Entry No. NDB 02

This structure without river piers is unusual in terms of statics. It is high for a beam but low for an arch (its height is 29.5 m, l/h=15.7).

It uses a two-support, 465-metre span structure with an upper arch. The main girder is a box with four ridges, 6 metres in height and approx. 15 metres in width. Both sides have a cantilevered public road deck, a sunk bicycle track and a sidewalk, supported by inclined rods. The total width of the deck structure is 43 m.

The plan has multiple issues, including structural, functional, architectural, and cityscape deficiencies. The look-out terraces in the centre of the bridge look forced, unlike the terraces at the abutments, which seem to blend more organically with the shape of the bridge and the promenades on the banks. The bicycle ramp is both good and necessary, but the solution chosen is standard and mediocre. I would have also liked to see stairs and possibly some attractive lifts for pedestrian use. Although the large span reflects an ambitious idea, the proportions are restricted by a low arch height, furthermore, the solid material of the bow girder blocks out the view. There is no symbolism in it and there is no analogy among the bridges of Budapest.

The strive for an elegant look demanded too high a price. The distance between supports is extremely high, 465 m. This avoids the use of piers in the riverbed, but results in a low deck height, which means the support characteristics of the arch cannot prevail. The designers include this fact in their description, stating that the structure's support characteristics are somewhere between an arch and a beam. All this resulted in extremely high specific steel usage: 71 t/m. The deck acts as a towline on horizontal loads. The suspension beams appear weak. The foundation of the abutments is strange, it is planned to have 2.5 m diameter piles. No other bridge on the Danube has piles with a diameter of 2.5. Based on the metro line developments, this would be impossible to anchor into the Kiscell clay.

The main girder is a box with four ridges, 6 metres in height and approx. 15 metres in width. Both sides have a cantilevered public road deck, a sunk bicycle track and a sidewalk, supported by inclined rods. The total width of the deck structure is 43 m. A consequence of the size is that regardless of one's point of view, the wide and tall structures seen from an angle form an impenetrable wall almost 30 metres in height, obscuring the view of the city. The length of the main structure and the border between the transitional section and the approach ramp is unclear.

Sinking the sidewalk and bicycle path cantilevers by 1.2 metres make it impossible to see the other side (especially from the southern side of the bridge towards the city centre), the pedestrian view is significantly obstructed by the cars and possibly even trucks moving at head height. The Brief did allow for a multi-level interchange at Budafoki street, but creating such a structure at the abutment will inescapably result in an unfavourable urban environment, with the interchange and the local city area coming to be dominated by the public road structure. The spiral ramps of the Buda abutment are functionally adequate for bicyclists, but stairs should have also been provided for pedestrians. The areas located under the structure for the Buda-side bridge ramp are oppressive, the entry fails to provide a true, urban-friendly solution.

The recommended solution for assembly – a combination of lengthwise insertion and flotation – cannot be adequately evaluated without knowing the weight of the main structure (reaction forces, lead capacity of flotation unit). The material quality and plate thicknesses for the main structure are not included in the entry, making it impossible to evaluate the construction (manufacturing, assembly).

The TS barges available in Hungary are capable of bearing loads up to 1600 t. Including the temporary reinforcements, the floated weight of the entire bridge structure is expected to be no less than 30,000 t. Taking just half of this as a baseline would still require at least 10 efficiently connected barges, if using resources available in Hungary. Positioning that number of barges so close to the endpoint of the bridge (within 20-30 m at most) is impossible. However, moving them further away to distances of 100-120 m (as recommended in the proposal) would result in the entire structure acting as a beam instead of an arch, meaning that it would require significant reinforcements to make flotation possible. Just for information: the heaviest river floating ever carried out in Hungary weighted 8,600 t at the bridge built in Dunaújváros). This would further greatly increase the already significant construction costs to a wholly unrealistic extent. The solution is technically uncertain and expensive. Overall, the structure as proposed is expensive, and fails to achieve the desired visual effect.

The tram tracks are sunk into concrete, enabling access for replacement buses along the same lane. While the visual designs include posts for the overhead tram wires, they do not include street lighting poles. Pedestrian and bicycle traffic passes through the bridge at a lower height compared to motor traffic, which may substantially deteriorate the bridge usage experience of pedestrians and cyclists, as the noise of motor traffic is generated directly at ear height. Flying stones kicked up by motor traffic of a velocity of 70-80 km/h may also be dangerous to pedestrians walking at a lower height. On top of that, view from the sidewalk only opens into one direction, and is blocked in the other direction. It is recommended that the level of pedestrian and bicycle traffic should rather be raised above that of motor traffic. The riverside access bridges receive the tram load asymmetrically and, on top of that, in the least favourable range (at the end of the cantilever), this should be reconsidered. Due to their 6% gradient, the sidewalk ramps do not comply with the Hungarian disabled access standards. Routing bicycle-pedestrian traffic to the bridge at the abutment is over-emphasized and creates unnecessarily large structures in comparison with other entries that present much more subtle solutions.

Entry No. NDB 03

A support structure suspended from double-span, outwardly inclined asymmetric arches, with one single central river pier and an S-shaped deck structure.

The upper double arch scales nicely to the scenery, and meshes well with Budapest’s other bridges, despite being of a completely different character. This reinterprets and displays in a peculiar way the characteristic symmetry of our bridges: a symmetrical system mirrored from the inflection point. The support pier in the middle of the river is a little bulky, but blends nicely into the overall view. It is provocative for the Galvani út environment: it seems to enforce its opinion that the old, mismatching buildings should relinquish their place to a more modern and matching urban environment. Considering the form factor arising from the arches drawn with a solid sense of style, a spectacular structure and a surprising route management, this entry is one of the most promising ones in terms of the bridge’s role as an urban symbol; the resulting extremely striking appearance, however, overdominates the deck contour and the related structure. The form factor of the bicycle (and also pedestrian) ramps are exemplary, an organic part of the whole sculpture-like edifice.

If we accept that using a curved deck is important, as this designer does, then this is more-or-less the “structural form” for the structure in question. It is a properly designed solution, while also being interesting and unique. The tilted arches are a statically favorable solution for the curved deck. The question is whether this S-shaped deck is necessary? Is it worth the extra weight? The distance between supports is 244m, the specific steel usage is 45t/m. The S-shaped deck routing bent to such an extent is not necessitated by the route itself. The straight-line bridge that spans between the roads reaching the Danube bank crosses the river in a 72 degree angle. Although the curved route may be justified, it appears that the arc was increased deliberately to create the double tilted arch – for valid statics reasons, once the arc had been increased – which does indeed create an interesting visual effect.

The design of the centre pier is novel, and would require further analysis regarding boating and flood protection. The navigation path can be secured on both sides.

The ortho-composite superstructure and the flotation of the half bridge with the closed box cross-section are novel solutions. The construction places higher than normal technical requirements on the rigid supporting poles and the arch. Due to the larger cross-beam distances, larger trapezoidal wales are needed than usual. The manufactured components are no larger than what can normally be transported on public roads, and can therefore be transported to the pre-assembly site. The pre-assembly site can be located on the banks of the Danube, directly in the vicinity of the construction site. The flotation would require a detailed nautical inspection. The materials used are general bridge-building materials. Under the domestic weather conditions, apart from the listed benefits of the ortho-composite deck slabs (reducing the likelihood of the deck freezing through) several disadvantages (major temperature fluctuations, salting during the winter) are also possible. Except for the design of the head of the central river pier and the floating technology, the construction technology is familiar in Hungary.

The structural materials are primarily made of steel, which is advantageous in terms of environmental impact. Few moving parts are built in, which reduces the amount of maintenance works to be performed without disturbing traffic, and thus reduces costs, too. The design makes it possible for pedestrians and cyclists to reach green areas, riverbank promenades and public spaces that can be created at the river bank.
It is truly an innovative, novel, unprecedented form in this size, which also follows the tradition of the double-stress bridges in Budapest. The S-shape and the double-curved design makes the crossing of the Danube an experience. The form is playful yet serious, and the single middle river pier may be beneficial. It is not too fancy, yet special. Of all the entries, this is perhaps the one that offers a true “spatial experience” when passing through the bridge by providing a view of the structure itself not only from the side but also from the axis of the bridge. This is a novel form that is unique in Budapest, something unseen so far, so it has the chance that if this entry is selected, it receives positive international feedback.

The Evaluation Committee awarded a second prize to this entry, without ranking.

Entry no. NDB 04

The main structure is a three-span stayed girder bridge with two pylons and two river piers. Spans: 95+240+95=440 m. The deck structure is 33 m wide, and is a traditional closed box girder. The axis of the pylons is curved: their height is 120 and 100 metres. Its unique feature is the slightly S-shaped routing, the arched pylons, and the resultant hyperbolic cabling. If the curved deck is necessary, then the cabling is a good idea; if not, then it is merely an unnecessary complication. Instead of the ballet dancers mentioned by the designers, the appearance is more reminiscent of chaos and confusion. As described, the structure is feasible, but the curve of the deck is statically unfavourable, the bent pylons and the spatial cabling gives a disorderly impression.

This bridge design was intended to be an architectural symbol, a core part of the cityscape, but the end result is an excessively emphatic, over-designed form factor. The design’s visual appearance is unappealing, giving a sense of uncertainty to those crossing the bridge, and heavily obstructing the view in some places. The S-shaped layout of the bridge is functionally unjustified. It is hard to interpret the contradictions reflected by the 110m high, self-serving pylons curving every which way and the cables with confused alignments. It does not belong among the bridges of Budapest, despite its symmetrically placed but asymmetrically formed pylons! Its design is very far from Hungarian and European traditions and is quite self-serving. There is no pedestrian experience, no observation platform is provided. It does not provide a separate pedestrian path, yet it may offer a particular experience to people who cross it.

The proposed construction technology is well understood and feasible, but would require special attention due to its unique structural design. Using silica dust or furnace dross for the concrete structures as per the proposal would be advantageous in terms of reducing environmental impact. The main structure brace and the box girder for the access ramps are traditionally designed, their manufacturing process is well understood. They can be transported from the factory to the pre-assembly site, while the pre-assembled units are transported via water routes to the assembly site. The special design of the piers and the suspension cables and the arched components of the deck, which has a uniform cross section, make pre-fabrication more difficult and add to the construction costs. Oblique truncated cone shaped units are made in the factory. Both the construction and the assembly will require highly precise work. The pylon arms are connected by hinges at the bottom. Stability is provided by cables, which must be taken into consideration, by anchoring them individually. Therefore, the 'climbing crane supported by the structure' as specified in the construction technology is not a real alternative in the technical specifications.

The abutment connection is not elaborate enough, it does not solve the problem of routing pedestrian-bicycle traffic to the bank of the Danube. The one-way bicycle paths on either side, and the sidewalk in parallel are adequate solutions, but the sidewalk is more narrow than for other entries (1.5 metres), making the spatial effect problematic, even from a purely functional point of view (two pedestrians meeting at a point where there are already other pedestrians looking around will find it uncomfortable to pass each other.) Considering the length of the bridge, design speeds of 50 km/h are insufficient for the tram in the long term (many other entries do not even mention this parameter.) The bicyclist-pedestrian ramps of the Csepel abutment force pedestrians to make especially large circuits. No promenades or direct (stairway) connections to the sidewalks were provided on either shore. The overly large pedestrian abutment spaces lack any attractive features, and are generally not sufficiently detailed. The tram stop planned for the Csepel abutment is unnecessary, because there are no functions generating pedestrian traffic there.

Shape and size of areas required for operation is appropriate for performing bridge inspection and maintenance. Part of the district heating line that runs along the bridge is located outside the caisson, which makes it easier to deal with malfunctions. Few maintenance works can be performed on the bridge without disturbing traffic.

Entry No. NDB 05

A single-pylon suspension cable bridge with one river pier. Spans 360+115 m. Deck width: 44.9 m. Massive box cross-girders, box deck girders, with a reinforced concrete slab being prepared for the tram tracks. The bridge deck is split in its full length. The supports for the bicycle route and the sidewalk will be sunken, relative to the deck surface. The pylon is a variable-height, 120 m high steel structure with a complex cross-section.

Because of the bend in the Danube, a single-pylon solution also seems feasible here, among the bridges of Budapest. Even if the pylon itself may look attractive with its diverging legs, the structure presented in the entry is too static, while attempting to represent an unearned dynamism in its form factor. The structural pedestrian arch below the main deck, as well as the split main deck itself, are both solutions to give one pause.

A more rigid arched bridge would perhaps be more appropriate for the large tram load, but the designer compensates by using a strong stanchion. The structure is correctly designed. The asymmetry is less than preferable, but it is a logical solution for this distance between supports. A double-pylon, symmetrical suspension bridge would have a more efficient superstructure, and would also allow for a larger distance between supports, thereby not requiring the use of a river pier. The steel pylon is aesthetically pleasing, but the statics do not justify its height; its top section only became the designer's intention for form-related reasons. Anchoring the main cables into the lower deck structure on the Buda side is favourable for the foundation, with a cable box to be established on the Pest side. The cable reaction forces would be transferred to an anchoring block. Globally, it is an interesting solution that the structures of the roadway, the tram tracks and the pedestrian sidewalk differ and, what's worse, the sidewalk structure now also bears the load of the roadway.

Manufacture and assembly is feasible using Hungarian resources and know-how, the construction technology requires, however, the suspension of navigation until the completion of the deck structure, which would be followed by the cable suspension. The entire deck structure would first be welded together, prior to the cable suspension and hang-out. It would be an extremely slow and uneconomical solution.

Transport between the manufacture, pre-assembly and assembly sites is available using a combination of public roads and water routes. No innovative solutions or materials are apparent in the structure.

The sidewalk and bicycle track, sunken below the level of the main deck, provides a highly functional and well-designed connection to the Buda-side bank. The abutment area is well conceptualised, but its size and design are excessive. The lion and griffon abutment statues, intended to reference Budapest, are offputtingly mock-archaic, and do not mesh well. The Brief did allow for a multi-level interchange at Budafoki street, but creating such a structure at the abutment will inescapably result in an unfavourable urban environment, with the interchange and the local city area coming to be dominated by the public road structure. The partial cloverleaf interchange at the Buda abutment meets traffic requirements, but takes up too much space, and tears into the urban fabric. The positioning of the tram stop is appropriate. With its long benches and lack of separation, the surface of the bicyclist and pedestrian tracks on the bridge do not meet the requirements for safe use. Its lack of space (only 4 metres, including the benches and the legroom for those sitting on them!) is completely disproportionate to the large-scale, expansive Buda-side ramp, appearing as an entire structural element of its own.

The separation of the various deck elements by traffic function (tram track, public road decks, pedestrian and bicycle tracks) and the independent height and longitudinal routing of the sidewalk as presented in the entry is a good idea, promising a wealth of positive effects on the economics, operations and maintenance of the structure.

From a navigation point of view, in the case of a single pier, a river pier on the Buda side would have been a better option, as it would have been less of an obstacle to the maneouvring of large barges due to the access to the ‘Csepel free port’. Similarly, consideration should have been given to the fact that, due to the curve in the river, the current line of the Danube is closer to the Csepel side, i.e. it steers boats toward the Csepel bank, which is made dangerous by the pier being on that side. The pylon’s ‘A’ pedestals penetrate the deck, producing an idle surface along the entire length of the bridge, despite the fact that the bottom anchorages of the oblique cables have been positioned at the edge of the cross-section.

The shape and size of the areas required for operation are not sufficient for performing bridge inspection and maintenance. Maintenance is made more difficult by the complexity of the superstructure, the size of the pylons, the glass railings, the wooden material of the benches and the situation of the market place. Operation of public utility lines running along the bridge, including any malfunction of the district heating line is not allowed for. Many maintenance works require disturbing traffic. The fact that the pedestrian and bike traffic, which is separated from vehicular traffic, is led to the bank of the Danube makes possible to access any future green areas and public places to be created by the city unhindered.

The Evaluation Committee offered to purchase the entry

Entry no. NDB 06

A single-pylon cable stayed river bridge with two river piers. The pylon is arched from a side view, looking from the centre line, approx. 60% of its height is curved and 40% is straight, meaning that the lower section is spatially curved, while the upper part is only curved in the top plane. A well-elaborated design. The deck structure and the steel structure of the support girder is well structured and properly thought-out. Budafoki street ramp: open, continuous composite bridge with I-girders. 4 spans, total length: 90.2 m. Buda and Csepel approach: composite box, closed over its entire cross-section, variable width (min. 35.91 m). The Buda approach has 4 spans, 167.35 m. The Csepel approach has 2spans, 80.9 m. The total river span of the bridge: 95+230+140=465 m. The girder support is a box construction, with a two main girder cross-section. The width of the box is 35.91 m, its height is 3.6 m. There are longitudinal girders underneath the tram track. The distance between the cross-girders is 4m. The piers are at an angle with the main bridge axis. The pylon and the elements of the steel structure are perpendicular or parallel to it. The height of the pylon is 117.3 m, as calculated from the structural beam of the pier.

The curved pylon is unique in itself, it has a fine line, but not quite spectacular, as its mirror image would be highly desired on the opposite side, above the river pier. There is no balance. It would be practical if it descended to ground level by Budafoki street at the Buda-side abutment. The plan does allow for this. In general, this a well-thought-out plan, both from a functional and a traffic engineering point of view, but the form factor would require improvement.

The entry presents a properly designed solution. The structural behaviour is transparent and clear, but the pylon appears too overpowering. The steel closed box girder deck structure, concave from below, is an interesting solution.

The foundation and construction methods for the bridge are traditional and feasible, with no novel features. The proposal suggests reducing the bridge’s environmental impact through moderate lighting, a noise-abating cladding, and dilation. The manufacture and assembly of the steel structure is feasible, using the technology and know-how already demonstrated on a number of bridges over the Danube. The spatial curve of the pylon requires an increased level of technical know-how, both for manufacturing and assembly. Spreading the pylon legs will allow for a reduction in the width of the bridge. By using installed pre-assembly, it should be possible to reduce the environmental impact using existing practices.

The one-way bicycle paths on either side of the bridge, and the sidewalk in parallel are adequate solutions. The terraces expanding from the sidewalks feel dynamic, and provide attractive views onto the city. The observation terrace below the deck, connecting the two sidewalks is a good idea, although experience shows that it is hard to supervise. The grass-covered plant bed, however, does not mesh well with the bridge structure. The Budafoki interchange at the Buda abutment requires too much space and is not well integrated into the urban fabric, but is an adequate solution, traffic-wise. The Brief did allow for a multi-level interchange at Budafoki street, but creating such a structure at the abutment will inescapably result in an unfavourable urban environment, with the interchange and the local city area coming to be dominated by the public road structure. The P+R parking lot makes good use of the area below the structure, and the entry also provides a useful suggestion for the placement of the operational functions. Establishing a port on the Danube that can allow for transfers to the circular tram line is a good idea. However, the connection with the bicycle path on the Buda side feels inadequate, and the upwards slope includes too many steep turns. The reception area under the Csepel abutment is elegant and provides sufficient connection, but feels too urban in comparison to its unused, out-of-the-way environment. There is no good reason to establish a tram stop or a P+R at this location.

An asymmetrical pylon, a symmetrical substructure, two piers in the water. The plan fails to exploit the potential of a second pier in the river by using a symmetrical pair of pylons, even though that solution would not only have achieved symmetry, but also made it possible to significantly reduce the height of the pylons and create a more favourable ratio of span size to pylon height. That said, the way the pylon is formed would appear to require the height proposed in the design.

From a navigation point of view, in the case of a single pier, a river pier on the Buda side would have been a better option, as it would have been less of an obstacle to the maneouvring of large barges due to the access to the ‘Csepel free port’. Due to the curve in the river, the current line of the Danube is closer to the Csepel side, i.e. it steers boats toward the Csepel bank, which is made dangerous by the pier being on that side. It would have been a better solution if the Applicant had presented a mirror image of the proposed structure. The pedestrian walkway running below the pylon, as good an idea as it may seem, is unacceptable in terms of both hygiene and public safety. A two-directional bicycle path would have been a much more appropriate solution instead of a 3.75 m wide one-way path. The operation of green vegetation boxes next to the pedestrian stairs on the bridge is not feasible as their surface is too small.

There are no street lighting poles. The street lighting fixtures are installed along the crash barriers (difficulties may arise from dust, cracks and snow ploughing). The only way to illuminate the arched pylon structure is by designing an external light source at places covered up by the arch, which would, however, spoil the daylight view of the bridge. Therefore, the pylon illumination as depicted in the visual design cannot be realistic at certain sections. On the other hand, the floodlit section between the touching pylon legs is a very nice and graceful idea.

Entry no. NDB 07

A two-pylon, cable-stayed bridge. One of the pylons is a steel box forming four crescent shapes, while the other is two crescents facing each other. The crescents standing on end curve into each other above the bridge axis. The crescents are box cross-sections, with heights of 1-8.3 m and widths of 2.7 m. The standing crescents are 90-100 m tall. The support girder is a orthotropic box, 5.5 metres in height. The curvature of the lower belt varies, with two V-shaped grooves under the inner ridges.

This entry is equally questionable whether looking at it from a form factor, structural or cityscape point of view. In addition, it is functionally incomplete. The unique, statue-like pylons are intriguing in themselves, but as a bridge it is dissonant. The form does not meet the function, it lives a separate life. There is no harmony between the pylons and the feet. The designer has made an attempt at avoiding allusions to a specific symbol, a rather unsuccessful attempt though as it is a very powerful structural element.

From a statics point of view, the entire structure is ill-advised, with a poorly conceived form factor, and is a mere formalism. It is no wonder that this design requires the most steel among all cable stayed girder constructions, with 50 t/m.
A symmetrical, cable stayed girder solution with a straight pylon would be a logical response to the partitioning of spans presented, the designers chose to overturn symmetry along both axes, the bent pylon is given an unnecessarily severe curve, and there are no inclined cables on one side, directly bending the pylon is directly as well, and supporting it with an "eyebrow". The structure grossly deviated from the “structural form”. In this construction, the “form”, that is, the horn or flower or crescent moon overwrites the statics system.

Its foundation and construction methods are standard, its environmental impact is high, due to the large material requirements. There is not even a perfunctory description of the on-site assembly. In general, the weight of the bridge is hugely excessive. The proposal does not provide any details on how the ‘special’ pylons would be constructed. In other respects, the draft contains sound and sufficiently matured engineering details (substructures, deck girder), which are in contrast with the technical information concerning the proposed pylon solution.

It would give a crushing, depressing impression for pedestrians and bicyclists crossing the bridge. The walkway and terrace system on the Buda side is a lifeless concrete desert, with a piecemeal form factor that clashes with the bridge’s organic appearance. On a positive functional note, the pedestrian and bicyclist connections of the Buda abutment have both ramps and elevators. The Budafoki interchange at the Buda abutment requires too much space and is not well integrated into the urban fabric, but is an adequate solution, traffic-wise. The Brief did allow for a multi-level interchange at Budafoki street, but creating such a structure at the abutment will inescapably result in an unfavourable urban environment, with the interchange and the local city area coming to be dominated by the public road structure. The ramps of the Csepel abutment are appropriately restrained for the out-of-the-way environment. The design and internal cohesion of this entry do not meet expectations.

Another innovation is use of indirect, upward shining and reflected street lighting. Unfortunately, a similar design was tested for the street lighting of Rákóczi Bridge, and has since been replaced. For cyclists, the way the railing is formed and the lanterns of the deck lighting behind the railing, and the wiring of the support structure are dangerous. The wood-imitation paint applied on the pylons is both unnecessary and costly.

Entry No. NDB 08

A single-pylon suspension bridge with a single support leg. Spans: 48+162+306+48=564 m. There are reinforced concrete superstructures on both sides of the bridge, slotted into the steel openings (acting as a counterbalance). Together with these, the length of the steel superstructure is 446 m. The reinforcing deck consists of two orthotropic boxes, connected by open cross-girders in line with the pylon. The support girder is 4.45 metres in height. A boxed sidewalk and a bicycle track is suspended from cantilevers on the outside. The pylon is an approx. 90 m high structure with a variable cross-section. A structural steel saddle is placed at the top of the pylon, used to lead the main cable and change its direction.

It offers the best solution from among the asymmetrical bridges in the tender. It separates pedestrians and cyclists from the roadway and routes them elegantly and gently to the bicycle route on the bank of the Danube. The abutment spaces are elaborate and humane. The bottom view of the bridge offers a real experience, it is playful, structured, not overwhelming. Separation of the north and south side roads and tram routes creates lightness to the already large-scale structure, lending it an airy appearance. With its horizontal and vertical openings, the deck structure is extremely good-looking. These openings allow for a wealth of functional solutions. However, the pylon is significantly less well thought-out and designed than the other parts of the bridge. While such asymmetry does not harmonise with the design of Budapest bridges, this is not so confusing with this solution, perhaps because it is on the Buda (hilly) side. It would improve navigation conditions if the pylon were moved 20 to 25 m to the Buda side, an option to be considered during the development of the design.

The separately anchored cable design is mainly advantageous due to the foundation. The simple, needle-shaped reinforced concrete pylon, with no extraneous decorative elements is functional. The vertical anchoring of the pier column below the pylon and the use of a reinforced concrete deck structure in the side spans are good designs. Its foundation and construction methods are standard.

During the further elaboration of the design, consideration should be given to replacing the solid design with a wall structure and a reinforcing floor structure at each level, which may reduce the material requirement and the dead load and may involve operational and technological advantages. The proposal for the corrosion protection of the enclosed interior spaces of the deck structure and the main cable (internal ventilation) is a feasible solution. The vibration absorption of long (L=78 m) and thin (R=4.4 cm) suspension cables must be taken into consideration when elaborating the designs. The looping of the main cable around the Buda abutment makes for a very advantageous structural behaviour. The structure balances its loads almost by itself, without a cable anchorage at the Buda end. In the strip of the pylon, the drawn-apart cross-section results in a waste of materials, with the cross-beams functioning solely as spacers, and leaving an uneconomical strip that is unutilised for traffic.

Due to the height of the girder support ridge, transport on public roads will require a permit, or alternately, horizontal on-site assembly into the ridge will be needed (this latter should be avoided because of the potential risk of deformation.) The sidewalk box is inaccessible from the inside, even when crawling, and there is no internal surface protection planned for it. Forced ventilation with sub-40% humidity warm air is planned for the insides of the boxes (including the accessible, walk-in ones.) The pre-assembly of the support girder would be done on-site, in line with the bridge on the Csepel side, and it would be emplaced using lengthwise insertion. 3 trestles and a heavy scaffolding supported by the substructure of the pylon will be necessary for insertion. The largest cantilever will be 100m long during insertion, therefore a temporary truss-frame and rostrum will be needed to provide stability for the cantilever. A tower crane will be used for constructing the pylon. The weight of the steel saddle to be lifted onto the top should also be considered when taking the maximum load bearing capacity of the crane into account. Pre-assembly can only be done on-site, which will increase the bridge's environmental impact.

The ramp/elevator/stair connections to the Buda abutment are highly functional; the abutment area is well detailed, although its size is excessive compared to the expected volume of its use. The Budafoki interchange on the Buda abutment requires too much space, and is poorly integrated into the urban fabric. The Brief did allow for a multi-level interchange at Budafoki street, but creating such a structure at the abutment will inescapably result in an unfavourable urban environment, with the interchange and the local city area coming to be dominated by the public road structure. Although the designer does provide a suggestion for using the enclosed areas as parking buildings, approaching them would prove to be problematic from a traffic technology point of view. No connection is provided between the parking building and the tram stop; the stop is located appropriately, above Budafoki street. Establishing a port on the Danube that can allow for transfers to the circular tram line is a good idea. The off-ramps at the Csepel abutment are functional and restrained.

The ascending structures have a simple shape and maximum functionality. The classical geometry elements of the deck can be pre-fabricated well, but, compared to the building materials used, a significant proportion of reinforced concrete structures, including the pylon, can be manufactured on site. Operation and maintenance of the public utilities in the superstructure is ensured with sufficient access. A small part of the maintenance needs can be done without traffic diversions.

The Evaluation Committee offered to purchase the entry

Entry No. NDB 09

Two intersecting hanging arch bridges with a network suspension.

Spans: 57.5+75+320+75+57.5=585 m. The axial distance between the main boxes of the support girder is 14 m. Structural height is 3.2 m. Deck width on the river bridge: 41.2 m. Arch height is 50 m, the axial distance of the supports is 14 m, and the axial distance of the apex is 23.9 m. The fixed-length support cables are affixed with pins. It is unclear whether the side spans are continuous with the river spans or not.

An expansive, aesthetically pleasing solution, whether looking at it up close or from far away.

From a close view, the concept is rich in detail, although its appearance in the cityscape does not have the same effect. It does not fit into the urban structure, the circular exit ramps take away valuable urban space, and this industrial, motorway-like solution does not fit into the cityscape. There are no observation platforms. The crossing arches in smaller size are not unknown for pedestrian bridges, but they look new in this size. It does not give a prominent experience to pedestrians, and certain smaller details are insufficiently described.

The location of the columns holding the top cables feel arbitrary. Care was given to the bottom view of the deck, which is an advantage. However, it does not pay particular attention to the pedestrian experience. The creation of the urban space is made completely impossible by the two huge spirals to be created on the Buda side.

The network of cables suspending the deck structure from crossing arches results in a statically favourable bridge structure, strong in every direction. The height of the arch (50 m, l/h=6.3) appears excessive, and the "wings" opening from the top plane of the arch seem forced. It is questionable how much they really improve the aerodynamic characteristics of the bridge. The steel deck structure with the straight, closed box cross-section is an aerodynamically favourable design. The number of piles used for the foundation was estimated based on the foundations of other Danube bridges. Although the crossing point of the arches is a weak point in the structure, this is not a critical issue and can be worked with. According to the submitted documentation, they investigated the issue. The weight of the bridge is appropriate for its size, its linear weight is 43 t/m.

The structural materials are primarily made of high-strength steel, which is advantageous in terms of environmental impact, but the green separation strip to be created under the arches with the intention to increase green area gives no significant advantages but its maintenance would increase costs and energy consumption, and would require disturbing the bridge traffic. There is room for public utility lines in the enclosed box of the bridge. The impact of any malfunction of the district heating line on the traffic is not studied. The internal areas required for operation are passable but too tight for performing bridge inspection and maintenance, including maintenance on public utility lines. A direct road connection is established with Budafoki út through spiral ramps; the ramps, however, also lead cyclists and pedestrians off the bridge on a compulsory basis, without an option to walk or ride on. It is difficult to maintain the green belt along the tram track. It is not a good solution to create a green belt along bridges.

The spiral public road ramps on the legs of the Buda abutment are not taking up much space. There is a cost, however: the solution provided for bicyclist access is very awkward. The park surrounding the ramps has no discernible function. The platforms of the tramp stations above Budafoki street are too short. Establishing P+R parking lot under the structure and a port on the Danube that can allow for transfers to the circular tram line are good ideas. The Brief did allow for a multi-level interchange at Budafoki street, but creating such a structure at the abutment will inescapably result in an unfavourable urban environment, with the interchange and the local city area coming to be dominated by the public road structure. The fact that the Csepel abutment would only have a stairway leading off it is a deficiency, as bicyclists would only be able to get on and off by making a detour.

Manufacture can be performed as standard, using panels. Transport to the pre-assembly site (Csepel, bridge axis) can be done via public roads, or by water routes if the manufacturing site is located on the banks of the Danube, by establishing a port on-site. Assembly would be done using lengthwise insertion, with trestles along the watercourse. The distance between trestles would be approx. 100 m to maintain the availability of the water route for boats. The repositioning of the cantilever is currently unsolved. The arch construction should be done using the cranes on the deck structure, on the heavy scaffolding above the trestles. Due to the 100-metre distance between trestles, both the arch and the support girder will bend downwards. The assembly of the suspension cables requires little to no downward bending. Due to the problematic assembly, a more detailed statics analysis would be necessary. The number of piles used for the foundation was estimated based on the foundations of other Danube bridges.

The Evaluation Committee offered to purchase the entry

Entry No. NDB 10

A two-pylon, back-anchored, cable-stayed bridge. The cross section is a simple parallel-belt box, with a width of 38.9 m, and a structural height of 2.0 m. The length of the main span is 220 m(?), the side spans are 60-80m (estimated). To reinforce the side span (and act as a leg for the pylon), a box 5 m in height is connected to both sides of the deck. The pylon is 70 m in height, the box is 10 m below and 4 m above.

Simple yet unique, elegant, graceful, harmonious concept. It is connected to the bank with building-like feet, creating an organic effect favourable in terms of cityscape, and the observation points on the feet are simple but witty. The two piers represent acceptance and release: their gate-like design has a symbolic meaning. It organically connects to the urban structure by finely complementing it. It is directly connected to the road network and does not pass through it as a foreign body. It blends into the urban silhouette and forms a harmonious image. Good contrast between the heavy start and the floating middle part. Majestic, marks its space within the space. Conveys strength and dynamism, its design is clear and timeless. Some entries offer more in terms of pedestrian experience, yet functionality, form and experience are in unison in this bridge.

It connects to Budafoki street on ground-level. Thus, the intersection created at Budafoki street is far less prone to splitting the traffic and development of South Buda in half. This is exactly the sort of solution needed for supporting the development of the city sub-center, and for extending the core of Budapest southwards! In its current state, the plan does not provide an adequate solution for pedestrian and bicycle connections. The structures connecting to the banks are somewhat oversized. Nonetheless, the thought and care that went into their design clearly shows that the designers are fully capable of following up on the main thrust of their idea with the necessary details.
From an urban design point of view, this is the most well thought-out entry. The bridge would be both an architectural and cityscape symbol, but is simultaneously a traditional and functional bridge structure that does not impinge on its environment. The coherent design and lighting of the gates and piers make for an elegant evening view, worthy of a Budapest bridge. The form factor of the abutments meshes well with the structure. Their form and size on the Buda side is well suited to the expected volume and nature of use, although the one on the Csepel side would require the actual realisation of the office district envisioned on the visual design plans to really bring it to life. The structure between the river piers and the banks is a unique solution, with an observation terrace.

With its deck structure suspended from pylons inclined towards the end spans and bent backwards along the top, this bridge is statically one of the best-designed proposals. The slender watercourse section, suspended by cables, as well as the strong, stable deck structure integrated with the rear-anchored pylons in the end spans and requiring no suspension are a well-designed solution, both aesthetically and with regards to the support structure. The reaction forces of the rear-anchored cables are transferred to piles driven in the abutments. It is a clear, straightforward structural form. The connection between the two masts of the pylon does not look adequate, but this can also be corrected in the final plans. The 220 m main span (the shortest one of all designs) is accompanied by a slim deck structure, practically positioned oblique cables, carefully thought-out horizontal and vertical lines. As a counterpoint, however, a vaulting pair of pylons are added at a distance of 230 m from each other and reaching at a height of 185 m. The nearly 20 m wide pylon abutment (front view) poses a serious risk of the piling up of scum and ice. Should the design be further elaborated, the solution must be reviewed taking into account the significant variations in the Danube water level.

Assembly would begin with the construction of the bridges on the banks. The pair of pylon legs transported on the barge is affixed to the lower corner with a joint, then raised with the help of a lifting bar installed on the bank. The drawing does not include any support for resisting impact. Once the pylon is in place, it would be back-anchored. The units for the main span would be transported on a barge. They would be lifted into place with a hydraulic crane, and affixed using inclined cables. A closing unit would be lifted into place in the centre. Construction technology: instead of parallel construction (which blocks navigation for the duration of the construction of the main river span), it is recommended to build the central river span sections from the two riverbanks one after the other. The use of ‘weather-resistant steel’ instead of ‘carbon steel’ is remarkable.

Their urban system of connections is well designed. Establishing a port is a good idea, but – due to the large distances involved, that would have to be made on foot – in its current form, it is not appropriate for public transport. The one-way bicycle paths on either side of the bridge, and the sidewalk in parallel are adequate solutions. A ramp would be established at the Buda abutment for bicyclists, but no stairs are available for pedestrians leaving the abutment. One positive feature is that no expensive overpass structures are used for the off-ramp, enabling it to connect to the ground-level road network at Budafoki street. This makes the area around the Budafoki interchange much more human, usable and urban-friendly than the solutions used by most other entries. Unfortunately, the tram station is located too far from the interchange. The Eurovelo bicycle track connections would also need to be redesigned. The bridge traffic, including tram traffic, is conducted to Budafoki út, where the proposed tram tracks intersect at 90°. Due to the phase designs of intersecting tracks, motor traffic on the bridge may also be synchronised with the Budafoki út traffic lights. Due to the at-grade Budafoki út junction, the inclination of the bridge is 4.1% (conforming to the Brief), which represents the maximum gradient of tram tracks in Budapest. The bottom anchoring points of the suspension cables can only be examined from under the bridge. It may be worth designing internal anchoring points in order to enable the examination of the bridge from inside the box girder.

The robust pylons are supporting an airy deck over the river. The bridge provides unobstructed access for pedestrians and cyclists with resting bays. Building materials include lightweight concrete and reinforced earth ramps to reduce environmental stress. The design of the ascending structural elements is unique. The simple box girder can be pre-fabricated well. Pylons, however, need more on-site assembly. Operation and maintenance is average. This entry does not provide any solution for managing public utilities within the box. The drainage of the deck a properly designed solution rarely used in Hungary. Pylon inspections, which can be completed without traffic shutdown, are facilitated with a structure built into the structure. It takes only the amount of space required to perform the function. It leaves the banks accessible and free for development.

The Evaluation Committee awarded the 1st Prize to the entry and unanimously decided to propose the designer of the entry to participate in the public procurement procedure following the design contest.

Entry No. NDB 11

A two-pylon suspension bridge with a combined stayed girder suspension. Spans: 46+500+46=592 m. (The axial distance of the pylon supports is 500 m in the technical description, but the distance between the apexes of the backwards-leaning pylons in the drawings is also 500 m!? The support girder box is an orthotropic structure with several ridges. The cross-section of the pylon is basket handle or ellipse-shaped, with four double-level saddles on top of each, which hold a total of 16 main cables. The section of the pylon below the support girder is a reinforced concrete structure. The pylon legs are stand-alone columns, they are not connected by gates. The near side of the support girder pylon uses cable-stayed suspension, while the next section uses a combination of cable-stayed and main cable suspension. In the middle of the bridge – where the main cable ducks under the deck level – a secondary steel box (“Lens”) is affixed to the main cable. On this section, the support girder is supported by columns. The space between the two box girders (the support girder and the secondary box girder) can be used as a multi-purpose community space. The support girder and the pylon are not directly connected.

The large public area located in the middle of the bridge is an exciting idea, but its long-term maintenance – not just at present, but 10 years from now – is highly questionable. The lens that determines the nature of the entry is spectacular, but functionally unsuitable for any kind of event. It is far from everything, there is no green space, it is unusable and unfeasible to operate due to vibration and noise under the road and tram line. Using angled pylons is an interesting solution, in particular the 500 m span, which eliminates the need to construct river piers. The arc of the bridge is basically determined by the fact that it starts almost on the surface level. On the Csepel side this is basically favourable, but the at-grade crossing of the Budafoki út does not correspond to the planned traffic. The pedestrian connection to the quay and the development of a community space under the abutments, however, is a very good solution and is well-developed.

A suspension bridge combined with cable-stayed girders and without a river pier is a favourable solution for the support structure, primarily because of its increased strength. That said, this type of combined-suspension structure is generally used for larger spans.

A unique feature of this suggestion is that the centre section of the river span is supported by the cables. This creates the central “lens”, which is to be used as a community space. This central area seems to be a poor fit for the entire structure. In addition, it necessitates raising the deck level to ensure appropriate clearance. 40-50 m piles are planned at the pylons, and dehumidified cable boxes at the abutments. The construction methods are not described in much detail. The proposal suggests reducing the bridge’s environmental impact through the use of green areas, photoelectric cells in the surface, water purification facilities, noise abating cladding, an insulated tram track, and upper handrails, among others. The cross-section of the pylon is basket handle or ellipse-shaped, with four double-level saddles on top of each, which hold a total of 16 main cables. The section of the pylon below the support girder is a reinforced concrete structure. The pylon legs are stand-alone columns, they are not connected by gates. The near side of the support girder pylon uses cable-stayed suspension, while the next section uses a combination of cable-stayed and main cable suspension. In the middle of the bridge – where the main cable ducks under the deck level – a secondary steel box is affixed to the main cable. On this section, the support girder is supported by columns. The space between the two box girders (the support girder and the secondary box girder) can be used as a multi-purpose community space. The support girder and the pylon are not directly connected. The quality of the steel used is weather-proofed steel (in which case the internal surfaces could remain as-is), or standard structural steel (in which case the internal surfaces would be coated, and the closed areas would require forced ventilation.)

It must be examined, how stable the pylons are during assembly without support. Assembly of the support girder section suspended from the side spans and the watercourse next to the pylon can be done via pre-assembly on-site, but the cross-sections must be lifted using powerful mobile cranes. The “lens” section can be assembled using two floating cranes. It is critically important to connect the cable-stayed section and the two levels of “lenses” on the main cable. The main cable will assume a certain shape in response to the weight of the lens. Once connected, the increased weight will significantly alter the shape of the main cable (in addition, these changes will be asymmetrical on the two sides of the lens.) An additional factor that should be noted is that during construction, the stability and temperature of the stayed-cable section will differ from that of the structure on the main cable. All of the above factors will require careful inspection to avoid unwanted deformation. The pre-assembly done on-site on the banks will increase the bridge’s environmental impact.

Suspending a community space from the deck is a good idea in itself, but without a justifiable function it can easily become underutilised – something like this would be more appropriate for an intense city centre environment, not the area currently being designed, at least not for the next few decades. While the grass-covered tram track leading across the bridge is theoretically feasible, it is not a reasonable solution. The station in the middle of the bridge is poorly conceived. The fact that the design essentially ignores bicycle infrastructure is a serious flaw. While its sidewalks are extremely spacious, because of the Lens (assuming it would be in actual use), the separation of pedestrian traffic would be vital. One positive feature is that no expensive overpass structures are used for the off-ramp, connecting it to the ground-level road network at Budafoki street. This makes the area around the Budafoki interchange much more human, usable and urban-friendly than the solutions used by most other entries. There is a significant abutment area around the interchange, although it is questionable whether the functions located there would be used by anyone. Some of them appear rather arbitrary (the playground, the theatre next to the busy roads).

While the inclination of the deck is not revealed by the tableaux, due to the structural design (the hanging-down lens), through traffic must be raised to a higher-than-minimum level. According to the visual design, the height of the lens may be ~9 metres, which must be negotiated by all bridge users, including wheelchair users and trams, which are the most sensitive to slopes. Because of the hanging-down lens, the navigation clearance should probably also be divided into a pair of 100 m sections. In order to prevent boats from colliding into the ‘lens’, it may be practical to install a directing dam/set of piles in the river. Obviously, signs should be placed on the bridge in order to warn of the split river traffic. The logistics servicing of the (3000 m^2) structure at the middle of the bridge is not properly resolved and is extremely disadvantageous. Would there be a parking lot for vans or a single-bay underground garage for the day-to-day delivery of goods? In the absence of the above, goods could only be transported by a handcart or on a bicycle trailer. According to the description, the ‘lens’ are designed with a sound-absorbing internal casing and vibration-free fastening. If a sound-dampened glass case is envisaged, its air engineering must be resolved by separate mechanical installations. The operation of the green strip along the tram tracks is too complicated and is therefore not recommended.

Entry No. NDB 12

This is a single-pylon stayed girder bridge. Spans: 50+330+124+52=556 m The girder on the 311.6 m long main span is made of steel, while the side spans – reaching across the supports of the main span – are reinforced concrete structures. The steel structure of the support girder is a 42 m wide orthotropic box with four ridges. The lower belt is parallel with the deck slab along a 14-metre width. The box height is 4 m. The height is lowered towards the sides. The pylon is a reinforced concrete structure, rising 160 m in height above the deck level. The upper 2x7 pairs of cables are connected to a steel structure. The layout of the deck is an elongated S-shape.

The shift in focus of the sight is not justified. Yet the design of the pylon is unique and witty. It is not connected to the transport network organically, the exit ramp has been poorly solved.

The deck has a slight bend in it, which is not necessary for any traffic-related reason. The designers do, however, properly compensate for this with the cable, taking statics into account, making this a correct structural form. My comment would be similar to the one given for the arch bridge in Entry No. 1, or the cable stayed girder bridge in Entry No. 3, but here, the bend in the deck is much smaller, and there is no significant quantitative increase in the steel used for the main girder. The reinforced concrete “crystal” pylon for the bridge is a high-quality design. However, the pylon is too high. At 160 metres, its height competes with the top of Gellért Hill.

The steel support girder assembly unit is 16 metres in length and weighs 300 t. It is lifted into place using Derrick cranes. The environmental impact of construction is high, due to the large amount of on-site work required. The steel structure is a relatively small quantity, but a large amount of cabling is required. Due to the curved layout of the freely assembled cantilever, deformation can potentially pose a problem. The reaction of the 300-metre-long free cantilever to wind stresses would need to undergo detailed kinetic analysis. The pylon foundation behaving as a group of piles must be reconsidered; a larger-sized pile-work base under the bed bottom and a larger pile axis distance may be advantageous for anchoring the pylon. The proposed deck structure has a well thought-out design in terms of both its longitudinal and cross sections, whereas the alternating use of steel and reinforced concrete box girders provides an optimum design solution.

The infrastructure for bicycles is incomplete and insufficiently connected to the public areas. The pedestrian and bicycle infrastructure on the bridge is spacious. The environment of the Buda abutment and the Budafoki street is only partially established; the suggestion for landscaping lacks detail. The market beneath the bridge is unlikely to be utilised, due to the low number of residents in the area. The exits are functional, including stairs, ramps and elevators alike. (The only possible criticism would be the narrow bends of the multi-lane ramps.) The tram station is appropriately positioned, but the platform is too narrow, and the stairways with the irregular handrails are not easy to use. The Brief did allow for a multi-level interchange at Budafoki street, but creating such a structure at the abutment will inescapably result in an unfavourable urban environment, with the interchange and the local city area coming to be dominated by the public road structure. On the other hand, the partial cloverleaf interchange at Budafoki street uses relatively little space, and is one of the more attractive multi-level solutions.

From a navigation point of view, in the case of a single pier, a river pier on the Buda side would have been a better option, as it would have been less of an obstacle to the maneouvring of large barges due to the access to the 'Csepel free port'. Similarly, consideration should have been given to the fact that, due to the curve in the river, the current line of the Danube is closer to the Csepel side, i.e. it steers boats toward the Csepel bank, which is made dangerous by the pier being on that side. It would have been a better solution if the Applicant had presented a mirror image of the proposed structure. The pylon's 'A' pedestals penetrate the deck, producing an idle surface along the entire length of the bridge. It would have been reasonable to consider the possibility of positioning the pylon's 'A' pedestals so that they reach outside the deck. There are too many large cross-beam sections that are redundant in the structure, functioning solely as spacers, which is uneconomical. On each side, the anchoring strips take 3 metres away from the 42 m width of the bridge. While the pylon dimensions would allow, no service ladder has been included in the designs. The visual design does not include the support poles of the overhead tram wires and the overhead wire itself. The street lighting poles lean inward, illuminating the road lanes, the tram tracks and the pedestrian/bicycle lanes at the same time. A noise barrier of acrylic material has been designed to separate the roadway and the bicycle lane. If that wall gets soiled, however, it will mar the view for motorists and tram passengers.
In case of the box, the shape and size of the areas required for operation are appropriate for performing bridge inspection and maintenance. The fact that cable replacement works will not disturb the traffic is economical. The plan does not deal with the operability of public utility lines along the bridge and the drainage of water that would escape from the district heating line in case of a malfunction from the box.

Entry No. NDB 13

Cantilevered beam bridge with a suspended centre section and double-arch reinforcement. Spans: 109.2(80.8)+218.4+109.2(80.8)=436.8 m. The length of the 3 suspended mesh trusses is 70 m. The main girders are boxed girders with trapezoidal sections and variable cross-sections (width 2-4 m, height 1.6-5.5 m). The length of the double arch is 80.8+74.2=155 m. Its longitudinal and cross-girders have box cross-sections (0.4-0.7 m wide and 0.5-0.9 m long). Among the main girders, a boxed longitudinal girder and a grid structure created by cross-girders positioned every 3.9 (or 4.3) metres works together with the reinforced concrete slab. In the section between the two pylons, the structure of suspended girders and the support grid comprises a second level, which can be used as a multi-purpose community space.

An adventurous form factor, with a light, airy quality to its self-formed structures. An exciting and unique design, the details are, however, difficult to justify, either statically or architecturally. The community space and the observation terrace under the deck are very out of place. Many of the buildings on both shores are better suited to such structures. Provides a clever solution to the problem of integrating the road loops created at the Buda abutment exit ramp, but stubbornly insists on keeping the industrial hall between the Danube and Budafoki street.

A purposelessly unique and astonishing design for a support structure. The statics and efficiency of the system can be called into question. Due to the height of the section suspended in the centre of the river span, the deck level had to be elevated to provide adequate clearance. The abutments would be anchored with trusses to ensure that they do not rise. The river piers would have pile foundations and double elevating walls.

Invokes the Liberty Bridge (Szabadság-híd) as an inspiration, but its statics are significantly different. The former is a steel cantilever truss beam bridge, with the truss located extremely high up. This proposal, on the other hand, is a beam bridge, with an arched single-layer lattice on top, providing (inclined) support at the main span of the beam bridge. The single-layer lattice (containing no diagonal elements) is not efficient: it will flatten when supporting a load, and its elements will be subject to significant bending. In addition, unlike suspension or arched bridges, the lattice only connects to the beam bridge in a few spots, making it inefficient at transferring the load from the beam. The structure is fundamentally unlike what one would expect from the “structural form”. The steel material usage is high, yet still does not seem realistic. The bridge is indeed shaped like wings, but it is a mistake to overemphasize this element, which is inefficient from a statics point of view.

The manufactured structures are transported via public roads to the pre-assembly area, located on both banks. In the pre-assembly areas, which are approximately 200 metres in length and 40 metres wide, the main support girders, the support grid for the reinforced concrete slab and the double arch are assembled and surface treated. Next, the structure, which weighs approx. 5-5.5 t, is pushed into position lengthwise. A temporary pushing deck has to be established on the banks and in the side spans. Planing and foundation work is done along a 160-metre stretch on the banks for this purpose, while piled trestles are used along with steel beams in the side spans. The trestles and the pushing decks all have to support loads of approx. 2500-3000 t. The establishment of the assembly area and the pushing deck system is extremely costly, and public road transport, manufacturing temporary tools, pre-assembly, on-site surface treatment, removing the trestles and pushing decks, and finally restoring the area to its previous condition are all activities involving extremely high environmental impacts. Foundation work cannot begin for the access ramps on the banks until the pre-assembly area is removed.

The arched sidewalks envelop a community space in the centre of the bridge, above the watercourse. In itself, this is a good idea, but without a justifiable function it can easily become underutilised – something like this would be more appropriate for an intense city centre environment. As the neighbourhood currently hardly has any pedestrian traffic, the catchment area of the building appears to be negligible. It is referred to by the Author as a ‘spacious and open living space’, which will thus also be exposed to noise and vibrations. The utility of the two separate sidewalks is questionable, especially considering that pedestrians and bicyclists are both mixed in together in the bottom section. The environment of the bridge abutments are insufficiently detailed, making it difficult to evaluate the quality and functionality of the pedestrian and bicyclist connections. The Brief did allow for a multi-level interchange at Budafoki street, but creating such a structure at the abutment will inescapably result in an unfavourable urban environment, with the interchange and the local city area coming to be dominated by the public road structure. On the other hand, the partial cloverleaf interchange at Budafoki street uses relatively little space, and is one of the more attractive multi-level solutions.

Entry No. NDB 14

A two-pylon suspension bridge, reinforced with side boxes (vaulted arch, direct connection to cable anchorage. Spans. 80+440+80= 600 m (estimated value, precise data is not available). The legs of the pylons are spread, the legs are 2/3 of their height, the total height is 56 m above deck level. The leg section is a composite section with variable cross-sections (2x3-5m), while the upper part has cross-sections of 4-4.9 m x 5-8.3 m. The pylon is located at the halfway angle between the main cables, and leans towards the shore. The support girder is an orthotropic box with a width of 31 m, and a height of 2 m along the axis, and 1.1 m on the side. An internal ridge is located along the line of the suspension cable connection, and there is a longitudinal girder under the tram tracks. In addition to the sidewalk connected to the deck, there is an external sidewalk supported by sidewalk holding boxes (1.4x1.2 m) that do not follow the deck’s curve. The primary role of these boxes, however, is to assist with the horizontal – axial – support of the main cable anchorage, and to further reinforce the support girder both vertically and horizontally.

This is the only entry where pedestrians are positioned above road traffic so they get a "footbridge" experience almost free of the disturbing effects of motor vehicles, and because of its height, this solution offers the best view of all the entries to the city, to Kopaszi gát in the north, to MÜPA, and the new athletic stadium in Budapest as well as the Statue of Liberty. It leads pedestrian and bicycle traffic to the river bank at the abutment in a sensitive and beautiful manner, thereby creating a livable city space there, although the designer failed to elaborate this in sufficient detail. The structure is elegant, lightweight and transparent, while the positions of the pylons are perfectly suited to behave as a cityscape shaping factor.

Some parts of the bridge have been developed to a high standard. The unique arch of the pylon and pedestrian surface create an interesting atmosphere, although the form solution of the pylons requires further consideration. Journalists would obviously recall a bottle opener when looking at the pylons, but the really distinctive shapes always resemble something.

The “self-balancing” suspension bridge using no river piers is a statically favourable structure for the span length used. The steel pylons inclined towards the side spans are a functional and aesthetically pleasing design. The steel box support girder puts one in mind of the wing of a plane, and is aerodynamically favourable. Having the reaction forces of the main cables be transferred to the support structure of the arched sidewalk through support rods is an innovative solution. The suspension cables are perpendicular to the main cable, increase the strength of the bridge, and enable the use of identical cable connections throughout its entire length.

The pedestrian approach route is creative and elegant. This is a statically well-designed structure. Suspension bridges allow for a larger distance between supports, making it possible to omit the river pier.

The cross-sections for the support girder can be manufactured in approx. 10-metre lengths at a pre-assembly site on the banks of the Danube. The side spans can be assembled on-site via scaffoldings. The pylon will be assembled in a horizontal position at a pre-assembly site on the banks of the Danube. The pylon and the main span units will be transported to the site via a water route. The construction will proceed as follows: - Construction of the substructures and the anchoring box. - Installation on the horizontal steel support rods between the pier and the anchoring box. - Installation of the deck element above the anchoring box. - Floating the pylon into position, then installing it via a jack. Temporary supports will be placed to hold the pylon in the direction in which it leans. - Assembly and anchoring of the main cable. - Installing temporary crosswise connections and temporary suspensions to the side support boxes. - Lifting the support girders into position from the barge, using a hydraulic pulley system. Installation will begin from the centre, adhering to the balance principle. The connections can only be established once all of the units have been lifted into position. - The bridges on the banks are assembled from scaffolds, followed by the assembly of sidewalks and other fittings. The steel structure is primarily transported via a water route, to reduce its environmental impact.

Maintenance costs are increased by the installation of the pedestrian paths, the woodwork used on an extremely large surface and the use of wooden rails. The amount of maintenance work that can be carried out without restrictions on traffic is limited. It leaves room for diversified development of the river banks. As there are no river piers, it is an advantageous design out of navigation, bridge and bed operation considerations. The pedestrian sidewalk has connections at both the deck level and at the quays, offering a very advantageous and attractive solution. Pedestrian sidewalks are excellently connected. It is a disadvantage that the pedestrian rails are several times longer than twice the bridge length. An idle strip appears due to the pylon pedestals, which increases the width dimensions of the deck. Similar idle sections appear in front of and beyond the pedestrian sidewalk links. The pedestrian sidewalk is raised above deck level, offering a great vantage point for pedestrians while locally blocking the view from tram passengers and motorists. It is an innovation that the box girder of the sidewalk is raised above the walking level of the sidewalk, thus offering a sitting surface for pedestrians. The foot walking surface is made of corrugated wood panels, whose gaps are filled with synthetic resin blended with quartz to prevent slipperiness. While it is a choice of human scale to provide attractive wooden walking surface along pedestrian bridges, here, due to the proximity of the roadway and the use of salt in winter (or at least the mist of salty water carried/whipped up to the bridge by high-speed vehicles) the wooden walking surfaces will require special protection.

The off-ramps for the bridge abutments are optimal for pedestrian and bicyclist use. The separation is a very unique and good idea, the shape of the sidewalks is attractive, forming arcs similar to that of a manta ray's fins, and the observation terrace formed in the centre is also aesthetically pleasing. One positive feature is that no expensive overpass structures are used for the off-ramp, connecting it to the ground-level road network at Budafoki street. The partially covered abutment space comprising a part of the promenade on the shore provides an appropriate opening onto the Danube, but its functions are insufficiently detailed. Its pair is visible on the Csepel shore – unfortunately, no thought was given to matching the two abutment spaces to the different urban environments on the two sides.

The Evaluation Committee awarded a second prize to this entry, without ranking.

Entry No. NDB 15

This is a two-pylon stayed girder bridge with inclined pylons. Spans: 93.75+312.5+93.75=500 m The support girder is a parallel-belt orthotropic box, 34.5 m in width (36 m with the lower cable connection), and 1.8 m in height. The pylon rises 66 m in height above the deck level. From a side view, it is L-shaped, its horizontal length running along the entire length of the side span next to the support girder, while its standing length inclines towards the centre span and the centre axis of the bridge.

The way the pylons lean inwards give the observer a sense of doubt and uncertainty at first, but after taking a little time to understand just how this structure is held up, they do give a much more pleasant impression. The golden color scheme presents difficulties regarding maintenance, and – along with the detailing – are indicative of architectural weaknesses. The Buda-side abutment includes a number of good ideas, but the implementation is less than adequate. The transport network is not connected at grade, which is a drawback of the design. The ideas of the 'musical' pavement and the roadway illumination system are interesting and can be appreciated independently of the competitive design, although the gilding adds a popular, sensationalistic air to it. Its weakness is that it does not provide any unique experience for pedestrians and cyclists, and does not provide a good solution for abutment connection.

The inwardly-inclined piers are slightly inefficient statically, and look odd, but are functional. The vector sum of the forces arising in the river section cables, arranged in a lyre shape, and the rear-anchored cables is along the axis of the pylon, which allows for the construction of slim steel pylons. The pylons are built into the stronger beams of the side spans, but are not connected to the base in a load-bearing manner. Similarly to Entry No. 10, it features a slender (1.8-m tall) deck structure. Its cross-section is triangular, twisting along the axis of the pylon. The thickness of the slab is 50-80 mm. The cables are attached with pins. The support girders are made of S355 graded steel, while the pylons are S460. The approach ramps for the deck are not detailed. The "plan" is merely a draft, with little data and few structural solutions. 2x4250 t counterweights are planned for the ends of the bridge, but their position is not given. If using concrete counterweights, approx. 30 metres of the support girders on both sides would have to be entirely filled with concrete, creating an obstacle in the route of public utilities. It would have been better to use reinforced concrete for the ramp bridges. The pylon is closed and inaccessible, making it impossible to inspect the top cable connections. While the height (66 m) of the pylons tilting toward the span of riverbed would be acceptable, the direction of their tilt is contrary to the direction required by the structural behaviour. The 'narrowing' main span thus only measures 250 m between the suspension points. The lower mass of the two bed piers ends below the high-water mark; in the case of floods, scum and ice are expected to be deposited between the two elevated head-blocks. Anchoring the main cable at the bridge ends would generate statically undesirable forces along the final 15-20 m section of the slim load-bearing structure. The transverse truss system of the river bridge follows the crossing angle (74 degrees), which also appears at the lower connection points of the cables used for the suspension of the deck, which results in a 'Babel of cables' in the alignment of cables. Such consistency in obliquity across the entire structural system is superfluous. The transverse framing of the deck structure could be resolved without much difficulty using a rectangular (conventional) method, thus preventing lots of welding technology issues while also restoring the symmetrical rhythm of cable attachments. The deck structure (stiffening support?) is of an extremely low height (1.5 m); despite the thick cabling, given the width (34.5 m), the design of the deck girder structure of such low level of torsional rigidity is not reassuring.

The construction process is elaborated poorly, with deficiencies: there is no data on the dimensions of the mesh reinforcement structure. No data is available on how the structure will be lifted. Problems: To place the ramp bridge and the pylon onto a barge would require a purpose-built porn in the section of Danube between the Rákóczi Bridge and the M0 South Bridge. - The floating support girder would have to be supported by the barges at all times until the suspension cables are capable of taking its weight. - Between the installation of the mesh reinforcement and the cables, the structural behaviour of the cables and the shape of the bridge will shift and deform. - The length of the pin cables and the reaction forces thereof must be controlled! The bridge is spectacular, but the technical solution is insufficiently developed.

The deck and the connecting ramps feel incomplete: from below, their appearance is completely standard, and their structural height is surprisingly low. The infrastructure for bicycles is incomplete and insufficiently connected to the public areas. The separation of the pedestrian and bicycle infrastructure on the bridge is insufficient. The cross-section widths are not properly shown. The Brief did allow for a multi-level interchange at Budafoki street, but the design does not include any connections to public roads. The area below the abutment on the Buda side is clearly biased towards pedestrians. The movie theatre and coffee shop are unlikely to be practical and functional. The tram station is appropriately positioned. Only minimal information is available regarding the design of the Csepel abutment.

For the sake of slim appearance, the entry makes use of the opportunities offered by the selected ascending mechanism, but using the required 80 mm thick sheet makes it difficult to pre-fabricate the piers. The limited space in the low main girder hampers the maintenance and operation of the large public utilities passing through the structure. In case of emergency, this may lead to traffic restrictions. The 'musical carriageway' can only be maintained by stopping traffic. Because of the ambition to maximize space utilisation, the design of rooms with remote functionalities to the bridge's original function also increases the cost of construction and maintenance, their very raison d'etre under the bridge is also questionable. The inspection called "basic inspections available from a ship" does not interfere with the traffic of the bridge, but is unlikely to satisfy any of the required bridge inspections. It is, however, a question whether there is in fact a need for a 60-year-old reapplication of the gold-colored paint coatings exposed to the outdoor weather.

Entry No. NDB 16

A bridge with four main girders and two basket handles. Spans: Ramp bridges on both banks, a continuous series of reinforced concrete bridges along a length of 42 metres. The central bridge is an arch bridge with a span of 300 metres and an arch height of 30 m. Beam bridges with two supports, 70 m in length, connect to the central bridge on both sides. The bridges have four steel box main girders; the main girders are connected with cantilevered steel cross-girders, and the deck is made of reinforced concrete. The arches and the main girders of the central bridge are connected with a network of suspension cables. The arches are connected in pairs by S-shaped beams. The beams in close vicinity to each other, the dense network of suspension cables, the arches, inclined towards each other, and the S-shaped beams between them also create a tunnel-like visual effect.

A classical, clean engineering solution, presumably with a good benefit-to-cost ratio. That said, the form factor is a little flat and uninspired, much like the segmental arch itself. It is not quite unique and does not have any element that would make it special. Its appearance in the cityscape is, therefore, not valuable enough. This proposed structure would never gain symbolic significance, either in part or as a whole. It uses very proper solutions for traffic, and therefore covers Galvani street in a wide area. However, this would also result in an area that is difficult to visually oversee. The designer also didn't consider the connection between the promenade on the bank and the bicycle path.

This would be the largest network arch bridge in Europe. Clean structural behaviour, elegant design, classic structural form. At first, one is surprised to find that the design includes 2 pairs of arches, but the description clearly outlines the advantages.

The network arch bridge with a deck structure suspended from double basket handle arches is a statically clean, strong, balanced and aesthetically pleasing proposal with low material requirements. The arch height (l/10) indicates a well-proportioned structure. From certain vantage points, the densely criss-crossing cables create a distracting, tunnel-like effect. Between the distinct stiffening girders, it would be practical to design the deck girder structure at the same height; there is no reason for narrowing the structure toward the exterior side, considering that the two stiffening girders are (rightly) of the same height. The quantity of steel material specified in the quantity calculations is slightly underestimated. The arch-climbing sidewalk, supported by slender arches, is an attractive proposition. Its foundation is traditional, with double ascending piers installed on a pile-supported substructure. The structural design contains no remarkable and novel elements whose further designing could be recommended.

The applicant failed to adequately separate the sidewalk from the bicycle tracks. It is impossible to precisely determine the widths of the cross-sections, based on the documentation. The "adventure trail" on the main girder is an amusing idea. The benches placed along the sidewalk are sufficient for use as observation platforms. Exits from the abutments are small staircases and large but poorly routed ramps. The tram station above Budafoki street is well positioned and designed. The P+R parking lot below the structure and the are under the tram station are rational designs. However, the stairs with the irregular handrails leading upwards from the latter are poorly conceived. One of the deficiencies of the plan is that it largely ignores the promenades on the shores and the bridge abutments, and fails to provide public areas of sufficient width on the two sides of the abutments. The Brief did allow for a multi-level interchange at Budafoki street, but creating such a structure at the abutment will inescapably result in an unfavourable urban environment, with the interchange and the local city area coming to be dominated by the public road structure. The environment of the Csepel abutment is appropriately simpler.

The high number of main girders creates a vast idle surface that cannot be utilised for transport. According to the Proposal, the bottom cable fastenings should be covered by aluminium bars, which is probably not the best choice of material (they can be stolen). There is no separately marked bicycle path along the sidewalk; the Designer proposed an undivided surface. At the linkages of box girders and cross girders, this Entry prefers screw fastenings over welded connections. The proposal requires further investigation. The arrangement of saddles could be more economical in the Technical Specifications if the #2 saddle instead of #1 was made the fixed saddle. As a result, the movement, perpendicular to the axis, of each saddle would be reduced and smaller saddles would thus be sufficient. The idea to paint the sidewalk green is questionable, as patch-paint repairs will appear contrasted against the faded parts, creating a spotted effect. The design also includes monitoring of the structure, the accessories needed for bridge inspections and the equipment facilitating maintenance. It allows for any maintenance work including those on public utility pipes to be carried out without interfering with traffic and thereby facilitating operation and maintenance.

The proposed construction technology is not mature, the proposals require a lot of auxiliary structures, stiffening or river trestles. Four drafts have been drawn up for construction. All versions use the elements as manufactured and transported to the site via public roads. No pre-assembly is used. This means that the construction of the steel structure and the reinforced concrete deck slab fully impacts the environment of the site.

Entry No. NDB 17

An arch bridge consisting of three undulating arched girders. Spans: 75+125+240+105=545 m. The two arch planes are slightly inclined towards one another, and a third is located between them along the bridge center axis, with a different undulation. The arches have variable cross-sections, with steel box girders of variable height, 2.1 m in width. The apex of the highest arch is 55 metres above the maximum navigation water level (LNHV). Independent steel box girders are located between the arch planes, suspended from the outer and inner arches, and supported in some places. The heights traced by the two decks are independent of each other. The distance of the outer arches from each other are 55 m on the Buda side, gradually narrowing towards the Csepel side, where the distance closes to approx. 36 m.

The church-like superstructure symbolizes the flying buttresses of the vault, which can be beautiful in itself, but it is difficult to imagine as a superstructure of a bridge. The eyes resembling Gaudi are unjustified because there is no limiting wall where they will have to look through. Organic architecture is a real value in Hungary (Imre Makovecz) but its application here seems forced. It does not fit into the urban silhouette. The designers failed to understand the timeless elegance of the built environment of Budapest, which would have been their task to enhance further. The reference to Art Noveau is unjust to the style.

It seems that the designers wanted to create something very special and surprising. They certainly did succeed in surprising me with their entry. This “Art Nouveau” style “undulating” four-span deck, suspended from three also undulating arches, with incomplete detailing, totally ignores all rational design principles. It is statically incoherent, it material usage is incredibly large, and no information is available regarding the technology of its construction. Resting on pile foundations, the ascending piers follow the lines of the arches. The structure’s environmental impact is significant due to its large material requirements. This is only partly mitigated by the energy-efficient lighting, the noise-abating cladding, and the flexible rail reinforcement. It’s a shame that the extravagant architectural design does not go hand in hand with technical content and merit.

No information is available regarding the method of construction. The specific weight of the steel structure along the length of the bridge is almost double that of the other entries. Pre-assembly is only possible for the half-length support girders, most of the work would have to be performed on-site. Positioning and lifting the support girders into position between the arches would be difficult. The structure’s environmental impact is significant due to its large material requirements. This is only partly mitigated by the energy-efficient lighting, the noise-abating cladding, and the flexible rail reinforcement. The asymmetry is irrational, and the statics of the support structure makes no logical sense.

The Brief did allow for a multi-level interchange at Budafoki street, but creating such a structure at the abutment will inescapably result in an unfavourable urban environment, with the interchange and the local city area coming to be dominated by the public road structure – assuming that the public road connection is indeed established with the Budafoki street, which is not quite clear from the design. The three-lane design without any tram line evident on some visual design drawings does not meet the stated requirements. Based on these drawings, the plan fails to provide the necessary physical separation for public transport. That said, some of the attached design drawings are different and do include tram lines. The bridge only allows for 75 centimetres for pedestrians in each direction, which is not sufficient. The observation terraces placed in the sides of the arched girders feel forced, the landscape design concept of the abutments shows a similar confusion to the design of the bridge itself. The functional, pedestrian and bicycle connections appear haphazard.

Its maximum gradient of the deck is 6%, which is unfavourable for tram traffic and does not comply with the Hungarian disabled access standards. The superfluous rippling of the deck is sensitive and disadvantageous for all vehicles, trams in particular. The pedestrian rail is uniquely made of a perforated steel plate. Due to its design, however, it does not conform to the requirements of the OTÉK. The rooms behind the circular ‘fish eyes’ or ‘bull’s eyes’ in the pylons lack imagination and their operation is unfeasible. Access has not been resolved in the 2-metre-wide pylons narrowed by stiffeners either. The road lane next to the tram tracks, i.e. the inside lane is designated as the road link to Budafoki út. That solution differs from the normal outside lane turning manoeuvres in Budapest (Highway Code), and is therefore unusual, confusing and unnecessary, which further increases the risk of accidents.

6. RANKING OF THE PRIZED ENTRIES

Based on the evaluations presented in Section 5, the Evaluation Committee has established the following ranking of entries:

The 1st prize is awarded to:	**Entry No. NDB 10**
The 2nd prize is shared, without ranking, and awarded to:	**Entry No. NDB 03**
The 2nd prize is shared, without ranking, and awarded to:	**Entry No. NDB 14**

The Evaluation Committee also decided to purchase the following entries, without ranking:

Entry No. NDB 05

Entry No. NDB 08

Entry No. NDB 09

7. DISTRIBUTION OF PRIZES AND PURCHASE OFFERS

The Evaluation Committee determined the amounts to be paid to the prize winners as follows:

First prize:	**EUR 90,000 gross**
Second prize:	**EUR 50,000 gross**

The Evaluation Committee determined the purchase price amounts to be paid to the winners of the purchased entries as follows:

Sum total of purchase price amounts: EUR 20,000 gross

The Evaluation Committee declares the design competition valid and successful, and therefore agrees to pay the reward for invitation to all 17 designers.

Total budget for rewards for invitation: EUR 40,000 gross

8. PROPOSALS FOR THE METHOD AND POSSIBILITY OF UITLISATION OF THE DESIGN COMPETITION ENTRIES

The Evaluation Committee declares the design competition valid and successful, and states that the design winning the first prize in the design competition renders its designer eligible for submitting an offer in the negotiated public procurement procedure for drawing up the planning permission documentation, without prior publication of a Contract Notice. The public procurement procedure can be launched as per the rules of the negotiated procedure without prior publication of a notice and the contract for designer services can be concluded under the contract terms defined in the documentation, in line with the Evaluation Committee's recommendation set out below:

The Evaluation Committee – in compliance with the provisions of Gov. Resolution 1371/2016. (VII.15.) in which the task is ordered – proposes the designer of the design to which the 1st Prize was awarded to participate in the public procurement procedure following the design competition. The concept, as well as the proposed functional, structural and technical solutions of the entry to which the 1st Prize was awarded are well suited to serve as the basis for further planning. The entry provides complex answers to all the questions set out in the tender conditions, all of which are clear, feasible and efficient in terms of both costs and time required for implementation, and therefore the Evaluation Committee proposes it for further elaboration.

The Evaluation Committee suggests to the Designer to reconsider the appearance of the structures connected with the river bank, to check the pylon leg junctions, to take into account the significant changes in the Danube's water level in finalising the pylon abutment, and recommends the method of successive construction from the two sides instead of parallel construction.

The Evaluation Committee confirms that its suggestions can be implemented based on information contained in the entry, without any changes to the main structure or the visual appearance, and without wording any recommendations that are similar to, or stricter or more difficult to implement than the recommendations made in relation to other entries above.

Finally, the Evaluation Committee calls the Contracting Authority's attention to the fact that at the time of compiling this final report – as a document containing professional evaluations – the data of the creators of the submitted entries had not yet been disclosed by the Trade Secret Manager. Should any grounds for exclusion under the Government Decree arise after the identity of the creator of the design winning the 1st prize is disclosed, or if the contract cannot be concluded during the public procurement procedure for any other reason, the Contracting Authority is to begin the negotiation with non-ranked second-prize designers.

Budapest, 11 April 2018

Signatures:

dr. Balázs Fürjes chairman of the Evaluation Committee	dr. Dénes Dalmy co-chairman of the Evaluation Committee	László Benczúr member

dr. István Schneller member	Ernő Biczók member	Judit Z. Halmágyi member
Erika Miklósa member	György Fekete member	Enikő Eszenyi member
Michel Virlogeux member	dr. Yozo Fujino member	dr. Aarne Jutila member
Sándor Finta member	Alexandra Szalay-Bobrovniczky member	Beatrix Frankfurt member
Iván Janitsáry member	dr. Róbert Homolya member	dr. Kálmán Dabóczi member
dr. János Józsa member	dr. László Dunai member	dr. József Lapos member