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COMBINED CABLE STAYED-STRESS RIBBON BRIDGES

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Stress ribbon bridges are a structural typology for bridges that combines slenderness and lightness. It is a very efficient solution for medium and large span structures that can be also combined with other structural typologies.

The combination of stress ribbons with other bridge typologies is a very interesting field which offers many possibilities to structural designers.

The different identified possibilities comprise the combination of several stress ribbons (fig 1 - A), stress ribbons and arches (fig 1 - B), or stress ribbons suspended by cables (fig 1 - C). The purpose of this paper is to go more in detail to the solution that combines cable stayed with the stress ribbon (C2 in Fig 1)

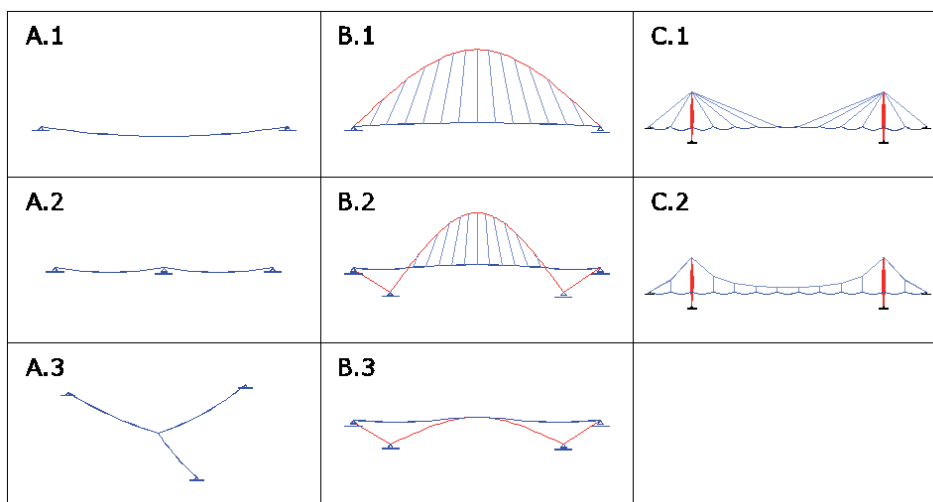


Fig. 1. Stress ribbons combined with different structural typologies.

As a result of the analysis, some relationships were obtained, as shown on the next figure:

$$f_i = \frac{L_i^2}{L_{i-1}^2} \rightarrow \frac{f_i}{f_{i-1}} = \left(\frac{L_i}{L_{i-1}} \right)^2$$

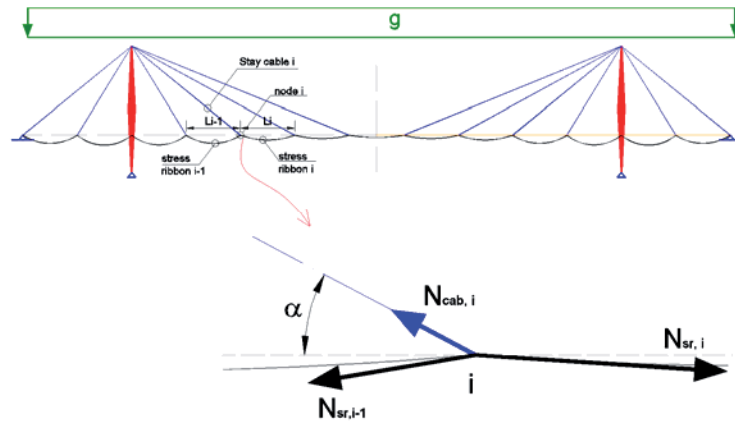


Fig. 2. Relationship between two consecutive stress ribbons

As a conclusion of this process, a virtual application of a stress ribbon suspended by cables is proposed for one of the locations (Brommy) that the committee of Footbridge 2017 offered.

The proposal consists on a cable stayed bridge where the deck is formed by three span stress ribbons. The mid span is supported over a pair of struts connected by stay cables to the pylons. The cable under this center span is arch shaped, getting, at the same time a stiffer shape and an evocative image that reminds to the former bridge, thus recovering a piece of memory of this part of the river.

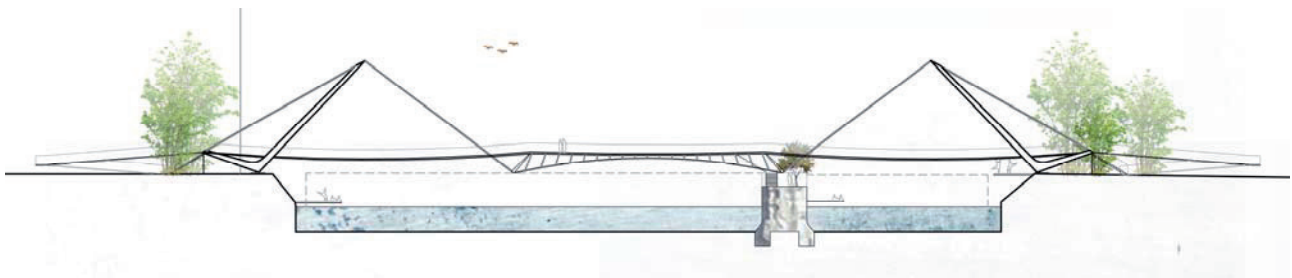


Fig. 3. GmasP proposed design © for Berlin location, Brommy

The result is a footbridge supported mainly by tension forces that saves 120m span and with a very slender and attractive shape. It also creates interesting spaces and an attracting spot respecting the history of the site.

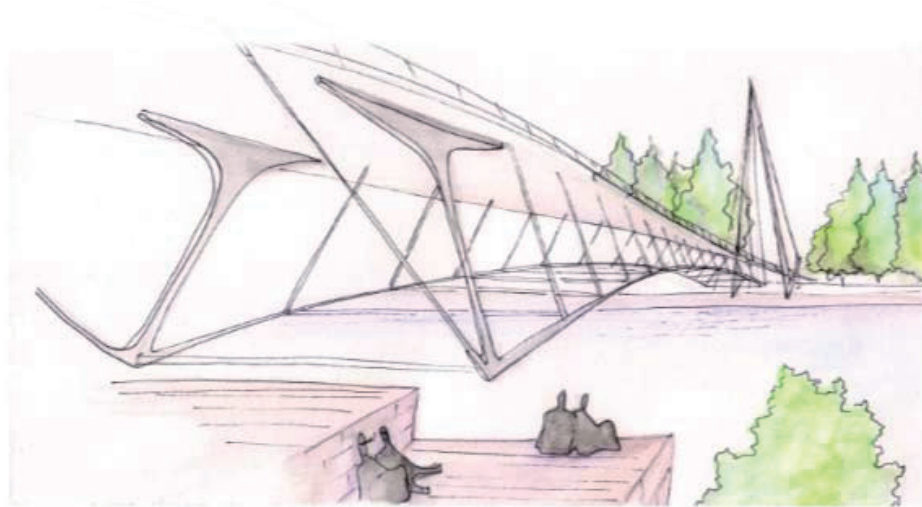


Fig. 4. Perspective from the existing pier © for Berlin location, Brommy