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)

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**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:

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

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