Hochschule Neubrandenburg
University of Applied Sciences

Fachbereich *Landschaftswissenschaften und Geomatik*
Fachgebiet *Baudokumentation / Historische Bauforschung / Vermessungskunde*

Prof. Dr. Philip S. C. Caston
Raum 229, Laborgebäude (Haus 2) **Telefon** (0395) 5693 4501 **E-Mail** caston@hs-nb.de
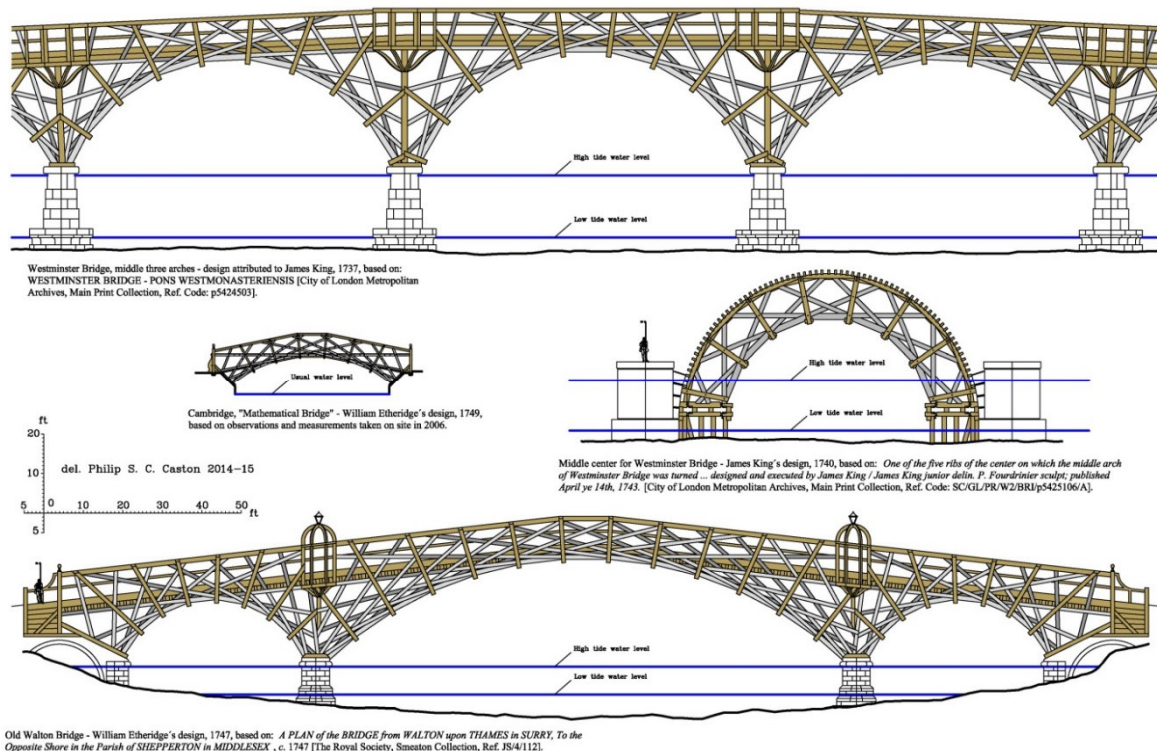
Mathematical Bridges

"*Mathematical Bridge*" over the river Cam at Queens' College, Cambridge University, England (Image Copyright: Caston).

The construction of mathematical bridges is based on an underlying geometrical pattern. The term is generally applied to wooden bridges with criss-crossing structural elements in their main supporting frames as can be seen in the small foot bridge at Queens' College, Cambridge. This principle was also applied to some centring in the 18th C. The geometry of these structures is based upon a circle, which is divided up radially from the centre point into sectors. Beams laid out along the edges of the sectors are called "*radials*" as they radiate out from the centre. The other defining element of this construction is the remaining beams which all touch theoretical circles based on the same single radial centre point and match their slopes (i.e. are tangents). These are called "*tangents*" and are aligned to sector centre

lines. The resultant intertwining mass of beams are thus geometrically ordered and repeat the same junctions/connections around the circle.

There are limits to this web of radials and tangents which form an inner circular boundary and an outer boundary where the tangents cannot cross each other anymore. Mathematical bridge frames use the inner boundary, where the beams are closest together, as the underside to form a solid arch. James King (d. 1744) and William Etheridge (b. 1709 – d. 1776) used the idea of weaving the tangents in their mathematical bridge designs.

Design for the *Westminster Bridge*, London; *Mathematical Bridge*, Cambridge and the Old Walton Bridge, Surrey/Middlesex all used woven tangents (Image Copyright: Caston).

Articles related to mathematical bridges

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