

Creative Use of Structural Concepts: Quantum Leap -

The Charles Darwin Memorial

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Concept: Equilibrium

Structure: Quantum Leap - The Charles Darwin Memorial, Shropshire (Shrewsbury)

Description: The Quantum Leap is the 2nd largest sculpture in the UK, standing 12m high and 17.5m long, and was constructed in 2009 to mark the bicentenary of Charles Darwin's birth. The sculpture may be interpreted to represent some of Darwin's and subsequent scientific theories and developments such as invertebrate and DNA.

The structure consists of 31 ribs, each rotated relative to and spaced off its neighbour to form a free standing arch, supported at different levels resulting in local bending in the arch. Each rib weighs approximately 35kN, with the whole sculpture weighing around 1400kN.



Figure 1 – Quantum Leap, Mardol Quay Gardens

The dead load consists of the self-weight of each rib, each spacer and the two pile caps. The piles provide the vertical reaction and inclined ties between pile caps negate the horizontal reaction.

The asymmetry of the structure results in greater vertical load in the lower pile cap and less vertical load in the upper pile cap, as shown in Figure 2.

If the dead load is the only force acting, the structure is said to be in **static equilibrium**, as the resultant of all forces acting is zero.

An imposed load can consist of a varying point load or distributed load. Similarly the piles and ties take the vertical and horizontal reactions, respectively.

A wind load may act in the longitudinal direction or lateral direction. The horizontal reaction from longitudinal loads can be resolved into a vertical reaction and minor horizontal bending in the piles. The stability of the arch in the lateral direction by full fixity in the longitudinal direction of the pile cap resulting in tension and compression forces in the pile group at each end of the pile cap.

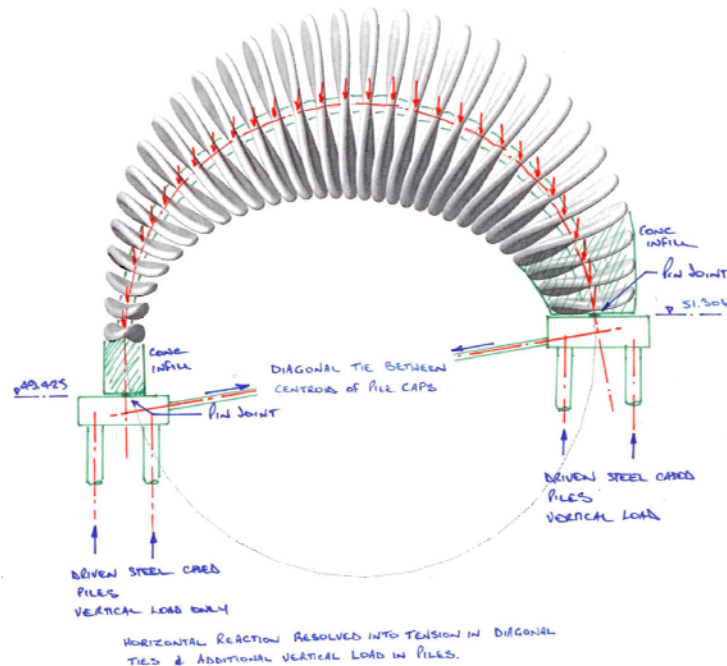


Figure 2 – Load distribution diagram

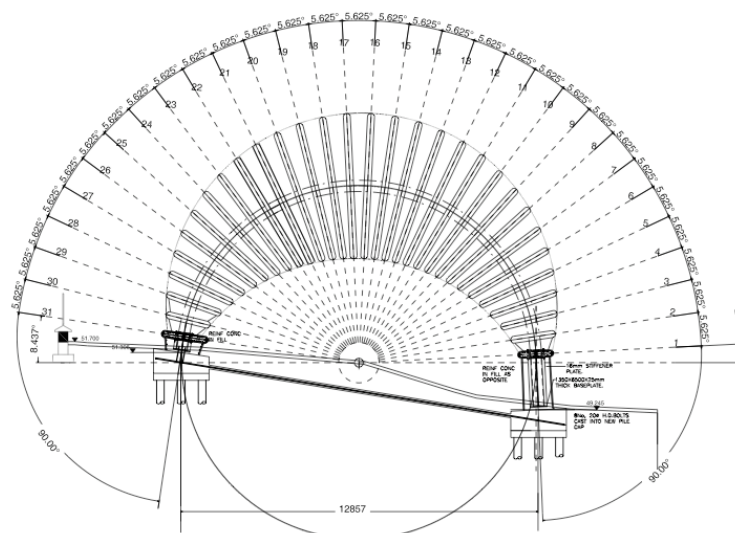


Figure 3 – Arrangement of ribs

References:

- http://www.rodriquesassociates.com/selected_works/cult_quant1.html
<http://www.britishprecast.org/documents/QuantumLeapCaseStudyOct09.pdf>
http://www.concretecentre.com/PDF/CQ_Spring%202010.pdf

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