

One of the largest projects ever to be undertaken in London was the construction of the British Airways London Eye. A primary passenger access route to the wheel embarkation area is from the River Thames via a purpose built London Eye Pier, which also acts as a collision protection structure for the wheel.

On behalf of the pier design engineers, Beckett Rankine Partnership, BPP-TECH completed a Quantitative Risk Analysis (QRA) assessing the occurrence frequency of possible impacts on the London Eye Pier structure caused by vessels travelling on the River Thames. The analysis carried out was necessary to:

- determine the magnitude of the risk from vessel impact in comparison to general risks that members of the public are exposed to,
- determine the resulting effect on associated structures as a result of an initial impact, and
- establish an acceptable collision criteria for the pier design using a combination of the above.

To satisfy each of the above requirements the model used was able to predict:

- the maximum perceived impact energy from river traffic,
- the direction from which the impact is expected, and
- the expected location of impact on the structure.

In order to complete this work it was necessary for BPP-TECH to extend a model that predicts vessel movements in a restricted region, developed previously for an MOD contract. The model has been developed to account for:

- complicated geometric shape of the vessel bow, of the pier structure under scrutiny, and predicted impact energy and impact occurrence frequencies on any required component of the structure profile,
- an accurate representation of traffic flow patterns and specific types of traffic, and



- environmental conditions and failure modes of a vessel that would cause it to deviate from its expected route and impact with the structure.

The results of the risk analysis painted a representative picture of the regions of the structure which are of particular concern and indicate regions of relative impact 'hot-spots' which required closer scrutiny within the design.

Using an ABAQUS FEA based approach a detailed appraisal of the design was carried out, enabling a consequence analysis to be developed.

This analysis needed to incorporate the development of a potential chain of events as a result of an initial impact on a specific component of the structure. Engineering solutions were then devised and included within the design to prevent the progression of the chain to the next step.

A second project with Beckett Rankine Partnership addressed the possible impact occurrence frequencies on the O2 in Greenwich, London.