



# Model Testing of Caisson Foundations for Offshore Wind Farms

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## THE PROBLEM

The cost effective construction of large offshore wind turbines is a topical civil engineering problem. It is estimated that about 5000 turbines could supply 10% of the UK electricity requirements.



The Crown Estates have released 13 sites around the UK for offshore wind farms. These will allow 540 turbines to be installed.



## RESEARCH PROGRAMME

A research programme is being carried out with sponsorship by the DTI, EPSRC and a consortium of companies (Shell Renewables, Fugro, Garrad Hassan, Enron Wind Overseas Development, SLP Engineering, HR Wallingford). The programme is to develop design methods for caisson foundations for offshore wind turbines. The work at Oxford has three themes:

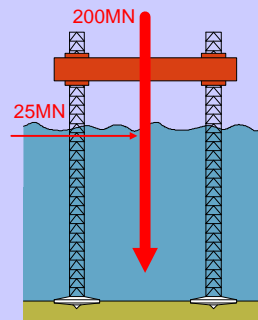
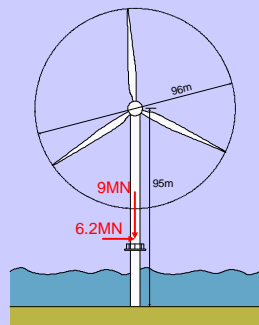
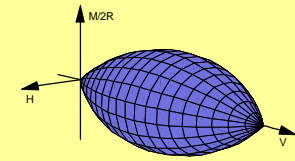
### Laboratory Model Testing



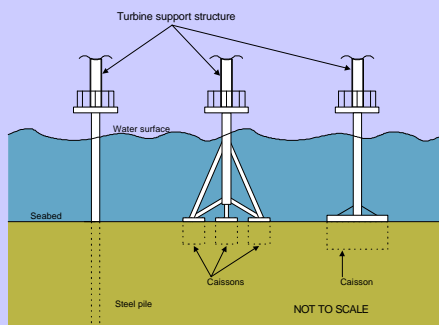
### Field Scale Tests



### Theoretical Developments

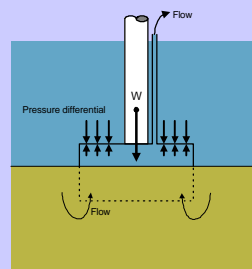


The loading on a wind turbine structure is different from offshore structures used in the oil and gas sector. The vertical load is very low whilst the horizontal and moment loads are very large in comparison.



Different Structural Configurations

Either a monopod, or multiple footings could be used for a wind turbine foundation. Current designs would use piles or gravity bases. A more cost effective solution might be a suction installed caisson.

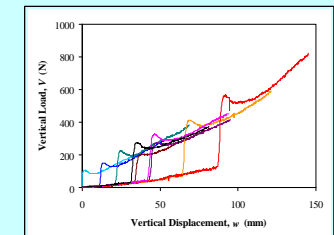
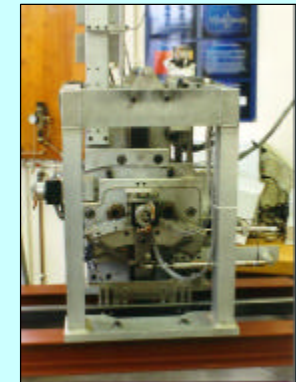
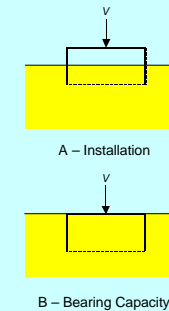
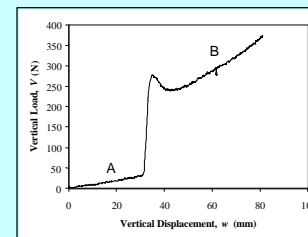


Suction Caisson Foundation

## LABORATORY MODEL TESTING



Laboratory scale testing is being carried out at Oxford University to investigate the response of shallow skirted foundations to a variety of loadings. Results presented here are for installation calculations.



Experiments have been carried out investigating the vertical load during initial penetration. A typical response is shown above for a caisson with a skirt depth of 38mm. The initial part of the curve is for the skirt penetrating the soil, whilst the second part is the bearing capacity failure for the foundation as a whole. The results shown on the right are for a number of caissons with different skirt lengths. The diameter is constant at 50mm.