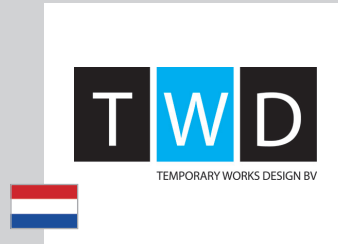


## TWD BV

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**Temporary Works Design.** TWD, is a Dutch engineering firm specialized in design of temporary structures for the civil and marine construction industry.

Temporary Works is the term which is often used for structures that facilitate the construction of Permanent Works.

Although these structures are of a temporary nature they all have to be safe, practical and economical.

We at TWD understand the requirements of temporary works and their design. Over the

past years we have designed many temporary structures varying from sea fastenings for off-shore projects to a repair frame for a jetty in Libya.

TWD has its main office in Schiedam where we work with experienced marine, civil and mechanical engineers and draftsmen.

Together with our partners we realize projects of various sizes, from a complete stinger design for a pipe lay vessel to a single sea fastening for a mono pile.



Software: Scia Engineer

## Piling Template for Ormonde Wind Farm - Irish Sea, United Kingdom

Temporary Works is the term which is often used for structures that facilitate the construction of Permanent Works. For example “piling templates” which are needed for the construction of a pumphouse or “upending frames” required to drive foundation piles for an offshore wind farm.

This project regards the design of a piling template, used by offshore contractor GeoSea to drive the foundation piles for the Ormonde Wind farm, in the Irish Sea, 10 km of Barrow-In-Furness. The Ormonde wind farm project comprises the installation of 30 wind turbines and 1 substation on quadripole jackets (four-legged towers), resulting in a total of 124 piles that have to be driven into the seabed. Each pile has a diameter of 1.8 m, a maximal length of 48 m, weighing over 96 metric ton.

The template hangs underneath a jack-up barge and is lowered onto the seabed at the desired wind turbine location. The template contains two guiding constructions which slide along the legs of the jack-up barge.

After the template has landed on the seabed, four piles can be lowered through the corner sleeves of the template into the seabed. The truss beam construction between the sleeves facilitates a guaranteed centre to centre distance of 20 meters between the foundation piles. The template is able to keep all four piles stable in upright position despite the loads induced by waves and current. After all piles are placed in the correct position, a hydraulic hammer drives the piles into the seabed.

The piling template is an indispensable piece of equipment for fast and accurate installation of offshore pile foundations.

### Scia Engineer

Temporary Works Design (TWD) used Scia Engineer for both the global strength check as for the local detailing of the template.

First a global 1D beam model of the structure is built. This model is subjected to the several load conditions which will occur during the installation process. If local effects may prevail a 2D plate model is built to pinpoint local stresses and deformations.

### Transit condition

In the transit condition the template is pulled against the bottom of the jack-up barge into docking cones. The current loads are the most onerous applied forces in this stage. The 1D structure is subjected to distributed line loads. Local bearing effects at the bottom of the jack-up and docking cones are analysed in more detail in a 2D plate model.

### Template lowering condition

In this stage the template is suspended on 4 winch wires and is exposed to current loads and wave slamming. Particularly the guiding constructions will encounter the majority of the loads. The global structure is analyzed on stress and stability. The 4 lifting points in the template are analyzed in detail by means of a 2D model.

### Pile pitching condition

All four steps of the pile pitching sequence into the corner sleeves are analyzed. Moments in the template caused by wave and current loads on the piles are modelled. The template is checked for its structural integrity and stability. Deformations are checked whether or not they comply with the desired installation tolerances.

### Pile driving condition

In this stage the corner sleeve is subjected to large vertical forces due to friction between corner sleeve and pile. A 2D plate model showed the local stress effects. The wall thickness is adjusted and local reinforcement plates are modelled in order to find appropriate stress levels.

### Conclusion

The design process resulted in a template of 170 T dry weight. Several auxiliary equipment items (i.e. winch foundations, hammer sea fastening supports, access bridges) are designed with Scia Engineer as well. The installation of the Ormonde wind farm foundations is accomplished. It was a successful project without any significant delays. GeoSea requested TWD for two more templates for the coming offshore season.

# Piling Frame for Ormonde Wind Farm

Irish Sea, United Kingdom

## Project information

Owner Geosea (Belgium)  
General Contractor G&G International (Belgium)  
Engineering Office Temporary Work Design BV  
Construction Period From November 2009 to April 2010  
Location Irish Sea, United Kingdom



## Short project description

The project concerns the design of a piling template for the Ormonde wind farm in the Irish Sea (UK), built by offshore contractor GeoSea. For fast and accurate installation of the foundation piles a 'piling template' is used. GeoSea requested Temporary Works Design to make a design for this template, from concept to detailed drawings. The strength of both the global design and local details are checked with 1D and 2D models built in Scia Engineer. Several auxiliary equipment items (such as winch foundations, hammer sea fastening supports and access bridges) are designed with Scia Engineer as well.

