

## NAREC ANEMOMETRY HUB, NORTHUMBERLAND, UNITED KINGDOM

During the installation of NAREC's Met Mast in the North Sea, LDD was called upon to use all its drilling capability to provide an innovative foundation solution for a project in challenging offshore conditions.

At short notice, the LDD team provided the client, SeaRoc, with an innovative solution to install drilled and grouted pin piles for the installation of a Met Mast 3 nautical miles off Blyth, Northumberland.

LDD's engineers and project team provided a solution to overcome the major project challenge; the available space within the sleeves of the structure did not allow the use of a casing which, typically, would have been employed to support the top 5m of unstable overburden during socket drilling.

In response to this problem, LDD ensured a costly modification to the tripod structure was avoided and worked with SeaRoc to find an alternative, bespoke solution to achieve satisfactory installation of the pile to the client's design.

### THE PROJECT

In response to an enquiry from SeaRoc, the LDD team was asked to install drilled and grouted pin piles through the skirt sleeves of an existing tripod structure for the installation of a Met Mast three nautical miles off Blyth, Northumberland.

The difficulty posed was that the available space within the sleeves of the structure did not allow the use of a casing which, typically, would have been employed to support the top 5m of unstable overburden during socket drilling.

Rather than a costly modification to the tripod structure, to achieve satisfactory installation of the pile to the client's design, we worked with SeaRoc to find an alternative, bespoke solution. Teaming up with sister company MENCK, our answer used a combination of under-reaming drilling equipment, subsea pile driving and creative engineering to solve the problem.

The installation methodology started with carefully controlled driving of the piles through the jacket sleeves to rock-head through the overburden, whilst limiting the damage caused to the top of rock.

Planning of this phase was backed up with drivability analysis to assist with hammer energy management. Following first stage driving, our crew drilled out material from within the 60in pile using a 54in under-reaming drill bit to an elevation 500mm below the pile toe. Geotechnical analysis established that the 500mm collar of material left under the pile would be sufficient to support the weight of the 60inch pile above. At this point, the 54in under-reaming drill bit was expanded to 66in and the rock socket was completed to target elevation 12m below.

On completion of drilling, the drilled socket was filled with grout before re-installing the hammer on top of the pile and driving the pile to target elevation within the grout filled socket. This method guaranteed complete annular grouting around all three foundation piles at the required elevation, thus fulfilling the design specification.

An additional problem that had to be overcome was that no additional weight was allowed to be placed on the tripod structure which would normally be used to support the weight of the drilling equipment. LDD designed and delivered a cantilevered drill rig mounting frame to be secured to the deck of MPI Adventure from which drilling operations were supported.

### THE RESULT

The design team worked closely with MPI to ensure that loads from the drilling operation could be acceptably transferred through the deck of the Adventure. LDD also carried out extensive riser analysis of the proposed drill string operating in 38m water depth at maximum expected current and limit of wave loading.

The design allowed for movement of the drill rig +/- 1.5m from a central position to ensure the drill string could be located in the top of the pile accounting for wave and current loads forcing the drill string off position as determined by the riser analysis. Subsea visuals were supplied by client's ROV with LDD manoeuvring the drill deck to stab the drill string into the pile.

Design and delivery of LDD's under-reaming drill bit and drill rig mounting frame was completed in an eight-week period from contract award in order to achieve final Anemometry Platform commissioning.



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