

Installation of Foundations for Offshore Windturbines at Horns Rev

Content

- Organization
- Mobilisation Buzzard
- Work Cycle
- Foundation Works
- Monopiles, history and future

I assume that the general knowledge on Horns Rev is sufficiently available, not a word on the windfarm itself

Organization

- | | |
|------------------------|------------------|
| • Client | Elsam |
| • Foundations | MTH |
| • Marine Subcontractor | Mammoet van Oord |
| • SEP Buzzard | Ballast Nedam |

Mobilization

- SEP Buzzard
 - Dimensions 43,00 x 30,00 x 4,20
 - Draft max. 2,97 m
 - Manitowoc 4100 Ringer Crane (200 tonnes at 13 m.)
 - Pile gate
 - Tilting Frame

Mobilization



Mobilization



Mobilization



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Mobilization



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Work Cycle Buzzard

1 Transport	
2 Sailing to Esbjerg	
3 Move alongside and jack up	
4 Load piles and radar reflectors	
5 Jack down, remove moorings and attach tugs	
6 Sailing	16 hrs.
7 Piling Cycle 1	
8 Temporary location jack-up	
9 Running anchore wires	
10 Jack down and winch to location	
11 Jack up and preload	
12 Remove sea fastenings	
13 Boom up and attach upender	
14 Lift pile and transfer to gripper	
15 Attach to hammer, place on pile and remove up end	
16 Piling	10 hrs.
17 Remove hammer and seafasten	
18 Lift and place radar reflector	
19 Sea fasten crane	
20 Jack down and tighten anchore wires	
21 Winch to temporary location	
22 Jack-up at temporary location	
23 Disconnect anchores haul in wires, move anchors	
24 Jack down	

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Work Cycle Buzzard

23 Move to temporary location	20
24 Piling Cycle 2	
25 Temporary location jack-up	
26 Running anchore wires	
27 Jack down and winch to location	
28 Jack up and preload	
29 Remove sea fastenings	
30 Boom up and attach upender	
31 Lift pile end transfer to gripper	
32 Attach to hammer, place on pile and remove up end	
33 Piling	10 hrs.
34 Remove hammer and seafasten	
35 Lift and place radar reflector	
36 Sea fasten crane	
37 Jack down and tighten anchore wires	
38 Winch to temporary location	
39 Jack-up at temporary location	
40 Disconnect anchores haul in wires, move anchors	
41 Jack down	

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Work Cycle Buzzard

- Optimum 36 hours for 2 piles
- First pile in place 31st of March 2002
- Last pile in place 1st of August 2002
- Total 4 Months, 122 days, average 1,5 day (36 hrs) for each pile
 - Examples
 - Due to weather, period June 22 – July 3 > waves over 1 meter, no production.
 - Period July 4 – July 17 > 16 piles in 14 days

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Foundation Works -Loading Esbjerg



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Foundation Works - Loading Esbjerg



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Foundation Works – Transport to Horns Rev



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Foundation Works - Transport to Horns Rev



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Foundation Works - Transport to Horns Rev



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Foundation Works - At Horns Rev



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Foundation Works – Pile Gripper



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Foundation Works – Tilting Frame



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Foundation Works – Pile Gate



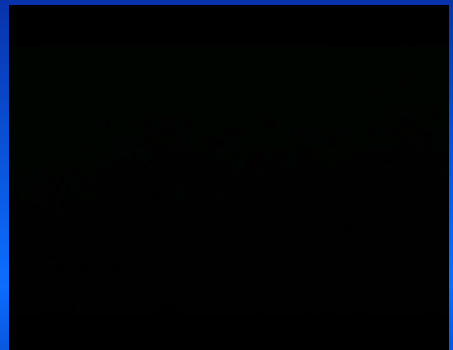
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Foundation Works - Piling



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Foundation Works – Short Impression



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Foundation Works – Radar Reflector



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Foundation Works – To the next foundation



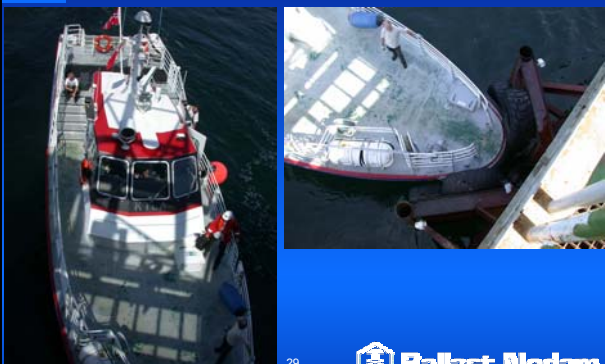
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Foundation Works – Back Home



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Monopiles, history



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Funderingstechnieken

Monopiles, the future



	6MW	
	CD-20	CD-35
Tripod and piles (3)	388	525
Suction bucket and tripod	606	-
Monopile	591	775
- concrete monopile	-	2400
- excl. scourprotection	733	917
	Equipment	Activities
Tripod and piles (3)	+	- +/.
Suction bucket and tripod	+ / -	+ / - +/.
Monopile	+	+ **
- concrete monopile	-	+ / - -
- excl. scourprotection	+ / -	+ +



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