Base Load Power Hub (BLPH)

Visual Examination Procedure – Structure

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

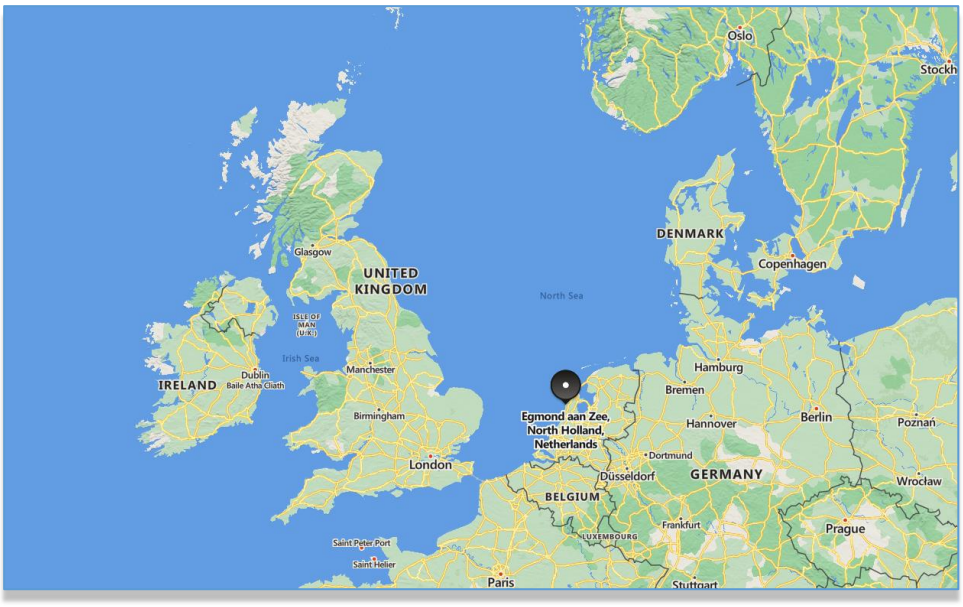


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

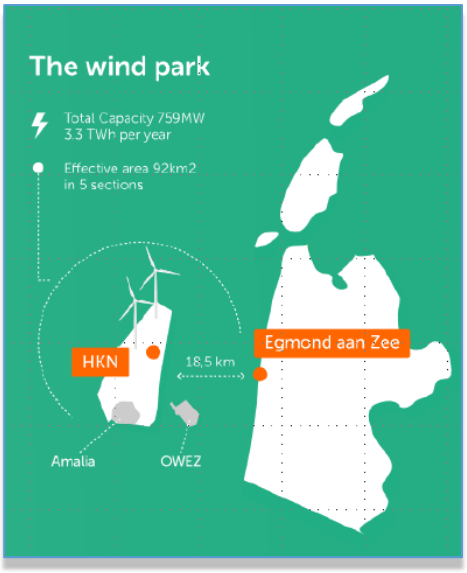


Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

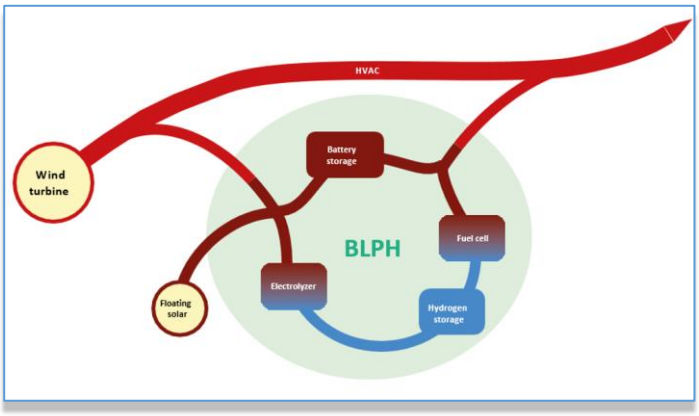


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind

turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

2 DOCUMENT SCOPE

The purpose of this procedure is to define the methods to be applied for the performance of visual examination on welding structure.

It describes the preparation grades of welds, edges and other areas, on steel surfaces to be reached before painting.

This procedure is applicable also during the qualification of welders and the qualification of welding procedures.

All welds shall be subject to 100% visual examination and the examination shall be performed as soon as is practical after the item has cooled down to ambient temperature, after completion weld.

2.1 REFERENCES (Applicable edition)

Doc. No.	Description
K559-2254-MT-SPE-001	Structural Fabrication Specification
EEMUA_158	Construction Specification for fixed offshore structures
UNI EN ISO 17637	Non-Destructive testing of welds – Visual testing of fusion-welded joints
ISO 9712	Non-destructive testing – Qualification and certification of NDT personnel
CSWIP	International certification welding inspector
PCN	Certification Scheme for Personnel

Table 1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project
NDT:	Non Destructive test

Table 2 - Definitions and Abbreviations

3 PERSONNEL QUALIFICATION

The operator who carries out visual examination and evaluates indications on all the welds shall be qualified as a Level 2 or 3 in the applicable method and on the relevant product sector in accordance with the requirements of ISO9712, CSWIP, PCN in relevant industry sector.

The operator shall have a valid near vision acuity test, which permits reading a minimum of Jaeger number 1 or Times Roman N4.5 or equivalent letters, having a height of 1,6mm at distance not less than 30cm with one or both eyes, either corrected or uncorrected.

Colour vision shall be sufficient that the candidate can distinguish contrast between the colours used in NDT method.

4 SURFACE PREPARATION

The examination surface and the adjacent area shall be dry and free of rust, grease, oil, water, welding flux, weld spatters or any other impediments for the application of paints and related products.
The weld shall be prepared by grinding if necessary, to assure that the examination shall be performed properly and that the surface condition of the weld is not causing misleading interpretations of the results. VIEWING CONDITION

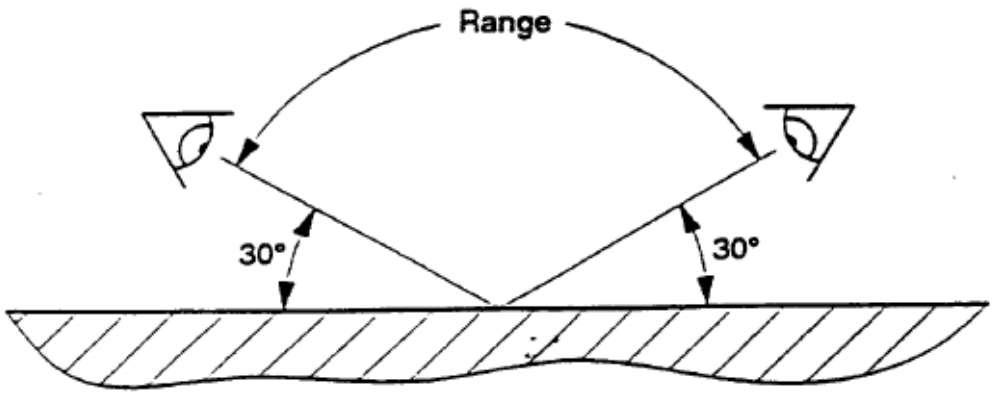
The surface to be examined shall be sufficiently lighted by natural or artificial light (a minimum light intensity of 500 lx is required on the surface to be examined).

Examination shall be performed using a direct viewing at a distance of 600 mm from the surface and the viewing angle shall be minimum 30° in conditions of adequate visibility of parts to be examined; in case of limited access the remote viewing by inspection mirrors can be used.

The surface and the adjacent area to be examined shall be clean and free of all dirt, grease, paint, spatter, heavy oxidation, etc., that may interfere with the examination.

Visual weld examination shall be carried out if necessary by using the following equipment:

- Inspection mirror
- Misalignment gauge
- Magnifying lens X2 to X5
- Radius gauge
- Various set of weld gauges for measuring fillet welds, reinforcement, undercuts, misalignment etc



5 VISUAL EXAMINATION PROCEDURE

5.1 EXECUTION OF VISUAL EXAMINATION

Visual examination shall be performed during the following operations:

- after cutting and beveling parts to be welded
- after fit-up
- after welding
- after performing repairs by grinding.

5.2 VISUAL EXAMINATION ON BEVELS

For visual examination of bevel ends, the following shall be verified:

- all surfaces shall be clean and free from paint, oil, scale, rust and any other deleterious foreign material prior to welding. Degreasing shall be applied where applicable.
- bevels are in accordance with applicable Welding Procedure Specification (WPS) and applicable shop drawings.

5.3 VISUAL EXAMINATION ON FIT-UP

For visual examination of fit-up, the following shall be verified:

- root face and root opening of the joint are in accordance with Welding Specifications and applicable shop drawings.
- Tack welds are removed prior to final welding.

5.4 VISUAL EXAMINATION ON WELD

During visual examination of welds, the following shall be verified:

- complete removal of all extraneous material resulting from the use of temporary alignments near the joint
- possible arc strikes
- possible surface defects such as visible cracks, craters, undercut
- profile of the weld face and the height of any excess weld metal meet the requirements of the acceptance standard.
- weld reinforcement.

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6 ACCEPTANCE CRITERIA

The acceptance criteria shall be in accordance with TABLE 14 as per EEMUA_158.

Defect Type	Permitted Maximum
Undercut	Slight intermitted undercut permitted; depth should not exceed approximately 0.5mm
Shrinkage grooves and root concavity	As for undercut, depth should not exceed 1.5mm
Excess penetration (girth welds only)	3mm maximum. Occasional local slight excess is allowable
Reinforcement shape	The reinforcement shall blend smoothly with the parent metal. Dressing is not normally required provided the shape does not interfere with the specified ndt technique
Overlap	Non permitted
Linear misalignment	See note K and L of para§4.5.2 of eemua_158 showed below

Note:

- K) For double-sided welds: if the root face is more than 2mm above or below that qualified or if the root gap exceeds 6mm

- L) If the joint misalignment on tubulars and skid beams exceeds the following:
  -
- For double-sided joints: the smaller of 6mm or 10% of the joint thickness, except that a 2mm misalignment is permitted regardless of thickness
  -
- For single-sided joints: the smaller of 3mm or 10% of the joints thickness, except that a 2mm misalignment is permitted regardless of thickness

7 WELD REPAIR

All defects after repair with a new visual testing examination, shall be carried out all over the interested area including 50 mm on either side of defects.
Welding repairs (or replaced welds) shall be examined with the methods prescribed for the original WPS.

8 EXAMINATION REPORT

The visual inspection of weld joints at Fit-Up stage and Weld Completion will be reported through the output of the welding register / IWM database system.

Trough the production log and the welding register summary report the following data will be recorded

- project number
- reference to relevant shop drawing
- weld identification
- welder identification
- WPS used
- material type and dimensions
- weld length
- bevel
- post weld heat treatment (if required)
- result of visual inspection
- date of visual inspection
- initial / name of the welding inspector

9 ATTACHMENT

Attachment 1 – Production Log And Welding Register Summary Report

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Attachment 1 – Production Log And Welding Register Summary Report

Production Log

ROSETTI MARINO Group of Companies	PRODUZIONE SALDATURE WELDS PRODUCTION LOG	Progetto / Project: TOLMOUNT DEVELOPMENT PROJECT - TOPSIDE Cliente / Client: PREMIER OIL	Comm. / Job: 118A50C	Data / Date: 20-12-2019 Nr. 208 VT Procedure AB-TO-ROG-PM-QA-PR-0005 Rev.C01
Disciplina / Discipline: Piping	Fabrication	Ubicazione / Location : YARD AXO		Preparato da / Prepared by: AXO

PRODUZIONE - PRODUCTION DEPT.								QC		CONTROLLI NON DISTRUTTIVI - NON-DESTRUCTIVE EXAMINATION				
Dis/Fg/Marca/N° Sald Dwg/Sh/Mark/Weld Nr.	Saldatore Welder	Root Hot Fill/Cap Back	WPS	Spess. Thk	Dimensioni Dimension	Visivo Visual	Firma Signature	Metodo Tecnique	%	IDL	Esito Result	Operatore / Operator	Data / Date	Note / Remarks
C 1 59/1/_/1			C1B	15,240	Hub 3,000	OK	DDP	ITEM						Inspection Cat: A
Marca/Mark 1: _ Marca/Mark 2:	Pos.1: 5 Pos.2: 1		Tipo.Mat./Mat.Type 1: Stainless steel Tipo.Mat./Mat.Type 2: Stainless steel		Colata/Heat 1: 106837 Colata/Heat 2: 55247									Weld Length: 0,279 Mt
	AX47	Root Hot Fill/Cap						LP	100					
								PMI	10					
								RT	100					

Welding Register

Rosetti Marino S.p.A.

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Welding Register

Project: 118A50C TOLMOUNT DEVELOPMENT PROJECT - TOPSIDE
Client: PREM PREMIER OIL **Order Number:** ITT-POUK/C2296
Discipline: ST Structure **ITEM**

Weld Number Class	Insp.	Rev. Cont	Prod. Date Examination phase	Fog.Prod	Welders IDL	Oper.	Item type Exam. %	Dimension Report n.	Films n.	Thickness Result	Bevels WPS	Rip.	Weld Length Weld Tecn.	P/M Repair	Material length	WPS Exam.	Date	Weld Tecn. Remarks	Conn. type	Accept.	Date	Spool
1/278/1/DKA068		0	06-04-2019	62	AZFM		PIPE	406,00	MM	12,70 mm	FILL		0,688 m	P	C.S.	6AA		FCAW	F		10-04-2019	
	1	VIS	FIT-UP and on weld completion			GFUSSI	100 %	OK		A							08-04-2019					
		MT	Weld Completion		IDL-QCI-MT-0006-00	ROM	100 %	000746		A							10-04-2019					
2/278/1/DKA068		0	06-04-2019	62	AZFM		PIPE	406,00	MM	12,70 mm	FILL		0,678 m	P	C.S.	6AA		FCAW	F		10-04-2019	
	1	VIS	FIT-UP and on weld completion			GFUSSI	100 %	OK		A							08-04-2019					
		MT	Weld Completion		IDL-QCI-MT-0006-00	ROM	100 %	000747		A							10-04-2019					

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