Base Load Power Hub (BLPH)

Transition Piece and Caisson Frame Yard Checklist

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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.

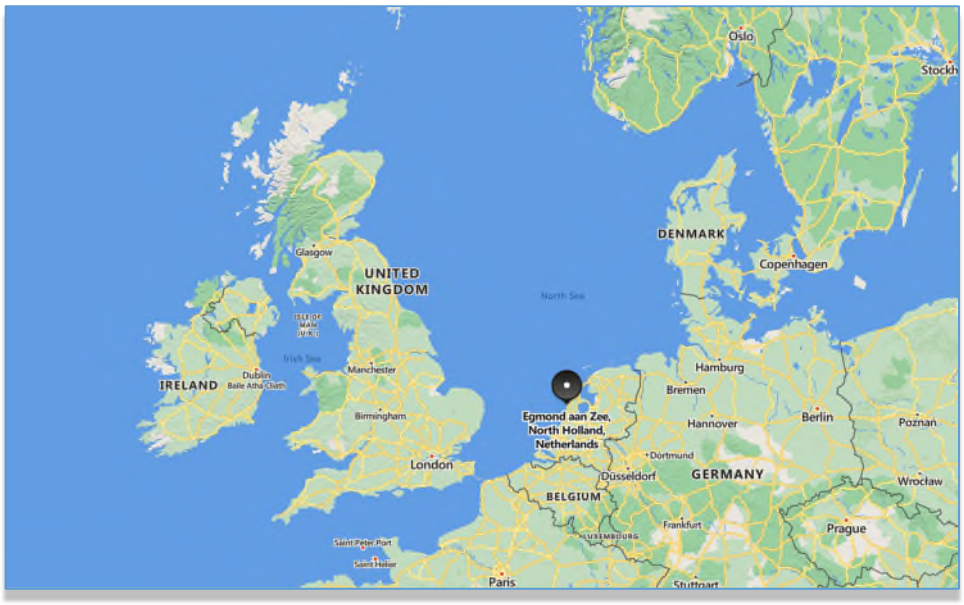


Figure 1.1 - HOLLANDSE KUST NOORD WIND PARK Location Map

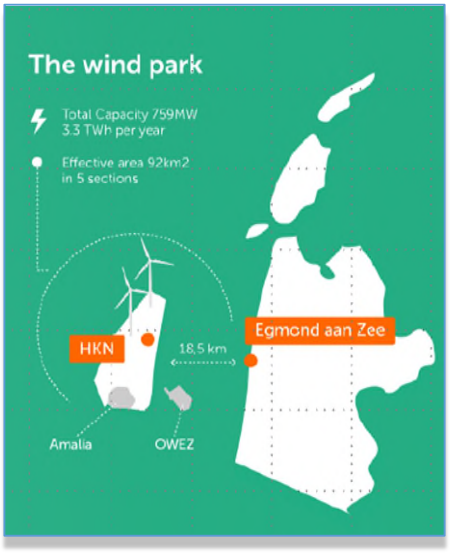


Figure 1.2 - Wind Park Details

The wind farm 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.

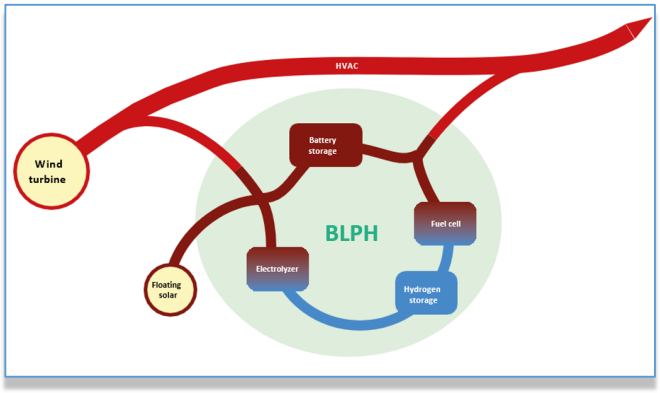


Figure 1.3 – BLPH Concept

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.

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2 DOCUMENT SCOPE

This document provides detailed check list to confirm the preparatory work on the fabricated component and transportation barge for the BLPH project, in particular for TP and CF.

The objective of the yard check list is:

- To enable proper checks being performed before loadout and sail away on all the items being fabricated in the yard
- To ensure client, RM and MWS are aware of the final configuration/content of the items to be transported.

3 REFERENCES

3.1 CODES AND STANDARDS

Doc. No.	Description
/1/ BS EN ISO 19900	General requirements for offshore structures – 2019
/2/ BS EN ISO 19901-1	Specific requirements for offshore structures - Part 1: Metocean design and operating considerations - 2015
/3/ BS EN ISO 19901-3	Specific requirements for offshore structures – Part 3: Topsides structure - 2024
/4/ BS EN ISO 19901-5	Specific requirements for offshore structures – Part 5: Weight Management - 2023
/5/ BS EN ISO 19901-6	Specific requirements for offshore structures – Part 6: Marine Operations – 2009
/6/ BS EN ISO 19902	Petroleum and natural gas industries - Fixed steel offshore structures – 2020
/7/ ISO 19906:2019	Petroleum and natural gas industries – Arctic offshore structures
/8/ UNI EN 1993-1-1	Design of steel structures - Part 1-1: General rules and rules for buildings
/9/ UNI EN 1993-1-5	Design of Steel Structures – Part 1-5: Plated structural elements
/10/ DNV-ST-N001	DNV - Marine operation and marine warranty - 2021
/11/ DNV-ST-0145	DNV, Offshore substations, 2021
/12/ DNV-ST-0126	Support structures for wind turbine, 2021
/13/ DNV-RP-C201	DNV, Buckling Strength of Plated Structures, October 2023.

3.2 COMPANY SPECIFICATIONS

Doc. No.	Description
/14/ DEP 37.19.00.12	Gen - Offshore Topsides Structures
/15/ DEP 37.19.00.30	Gen - Fixed Steel Offshore Structures (Adoption of IOGP S-631-11, Amendments / Supplements to ISO 19902:2020).
/16/ DEP 37.81.10.19	Gen - Marine Operations Requirements – Loadout, Transportation and Installation of Offshore Structures (Amendments / Supplements to ISO 19901-6)

3.3 PROJECT DOCUMENTS

Doc. No.	Description
/17/ HOLD	Weighing Report
/18/ 123A90-DDL-TI-SP-99014	Specification for TP, Topside and Caissons Transportation and Installation
/19/ 123A90-DDL-ST-RE-90009	TP Transportation Analysis
/20/ 123A90-DDL-ST-RE-90008	TP Loadout analysis
/21/ 123A90-DDL-TI-RE-99004	TP Grillage and SF calculation report
/22/ 123A90-DDL-TI-DD-99040	TP Grillage drawings
/23/ 123A90-DDL-TI-DD-99041	TP SF drawings
/24/ 123A90-DDL-TI-DD-99042	TP – installation AIDS – stabbing guides
/25/ 123A90-DDL-TI-DD-99043	TP – installation AIDS
/26/ 123A90-DDL-ST-RE-90015	CF – In service, Lifting and Transportation Design Report
/27/ 123A90-DDL-TI-RE-99007	CF Grillage and SF calculation report
/28/ 123A90-DDL-TI-DD-99047	CF Grillage and SF drawings
/29/ 123A90-DDL-EL-DL-20102	Base Load Power Hub (BLPH) - Electrical Equipment Layout - Below lower deck
/30/ 123A90-DDL-EL-DL-20120	Base Load Power Hub (BLPH) - Lighting & Socket Layout - Below Lower deck
/31/ 123A90-DDL-EL-DL-20109	Electrical Cables Routing Layout - Below Lower deck
/32/ 123A90-DDL-EL-DL-20134	Base Load Power Hub (BLPH) - Earthing & Lightining Layout - Below Lower deck
/33/ 123A90-DDL-EL-DL-20116	Base Load Power Hub (BLPH) - Electrical MCT Layout - Below Lower deck
/34/ 123A90-PML-DIG-LIS-00005	Master Tag Register

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4 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY)	Crosswind
CONTRACTOR (CTR)	ROSETTI MARINO S.p.A.
PROJECT	HOLLANDSE KUST NOORD WIND PARK Project
T&I CONTRACTOR	DEME
ALS	Accidental Limit State
BLPH	Base Load Power Hub
CF	Caisson Frame
CoG	Centre of Gravity
CW	CrossWind
El.	Elevation
EPCI	Engineering Procurement Construction and Installation
GR	Grillage
HKN	Hollandse Kust Noord
LAT	Lowest Astronomical Tide
LRFD	Load and Resistance Factor Design
MSL	Mean Sea Level
NTE	Not-to-Exceed
PAU	Pre-Assembled Unit (H2 Vessels)
PG	Plate Girder
SF	Sea fastening
SHL	Static Hook Load
T&I	Transport & Installation
TP	Transition Piece
UDL	Uniformly Distributed Load
WTG	Wind Turbine Generator
W2W	Walk to Work
SPMT	Self-propelled modular Trailer

Table 4.1 - Definitions and Abbreviations

5 SUMMARY

The following items are to be fabricated and Transported:

Transition Piece (TP)	Description
Expected weight	290 ton
CoG shift factor	5% (0.8m radius)
Weight Contingency factor	3% (based on weighing apparatus tolerance)
Length	16 meters (25m overall including stairs)
Width	16 meters (25m overall including stairs)
Height	10 meters
Caisson Frame (CF)	**Description**
Expected weight	28 ton
Weight Contingency factor	1.10 (item not weighed)
Length	23.1 meters
Width	2.8 meters
Height	2.3 meters

Table 5.1 – TP and CF properties

5.1 TRANSITION PIECE

Transition piece will be transferred onto the cargo barge by SPMT's. prior to performing the LO, the TP will be inspected to confirm its readiness (e.g. installation aids, internal fittings, etc)

After the signature of Ready for Loadout certificate the activity can commence. Once on the barge, the set down, shimming and seafastening activities will be carried out.

5.2 CAISSON FRAME

The Caisson frame will be loaded out by crane. Prior to performing the LO, the CF will be inspected to confirm its readiness.

After the signature of Ready for Loadout certificate the activity can commence. Once on the barge the set down, shimming and seafastening activities will be carried out.

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6 YARD CHECKLIST QUAYSIDE AND TRANSITION PIECE

BLPH Project
YARD CHECKLIST - TP

No.	Punch List Item	Drawing Ref.	Date	Comments	CHECK
A-1.0	Barge arrival				
1.1	Check if the quay is free of obstacles and appropriate berthing and mooring scheme is in place	123A90-DDL-TI-DD-99034 123A90-DDL-TI-DD-99035		latest bathymetry / tidal information / weather forecast to be shared to check UKC/mooring arrangement	
A-2.0	Transition Piece general inspection				
2.1	visual inspection			check for potential dropped objects	
2.2	TP marking				
2.3	check if top 150mm of TP cans are free of paint	123A90-DDL-TI-DD-99042		for welding with topside	
2.4	check compliance with drawings				
2.5	verify position of CoG				
2.6	entrance door	123A90-DDL-AR-DD-10036		installed and checked the closure system (external side doors will be edge sealed with heavy-duty tape)	
2.7	handrails all installed				
2.8	gratings all installed				
2.9	All the temporary preservatives applied during Construction and Commissioning phases shall be removed				

2.10	A thorough cleaning of external areas shall be executed				
2.11	A thorough cleaning of internal areas shall be executed				
2.12	A thorough cleaning of Equipment shall be executed				
2.13	Drying agents shall be used inside the TP. Desiccates for these purposes shall be placed inside each room but outside cabinets and not in direct contact with metallic surfaces				
2.14	4-legs cut and bevelled ready for topside connection	123A90-DDL-ST-DD-90054			
A-3.0	Lift points				
3.1	Dimensionally correct			check as-built report	
	Leg A2				
	Leg A4				
	Leg B2				
	Leg B4				
3.2	Angles and work point correct				
	Leg A2				
	Leg A4				
	Leg B2				
	Leg B4				
3.3	welds correct and NDT performed			collect NDT reports	
	Leg A2				

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	Leg A4				
	Leg B2				
	Leg B4				
A-4.0	Installation AIDS				
4.1	installation aids painted in yellow color				
4.2	check rescue anchor padeye - Leg A4	123A90-DDL-ST-DD-90127		tested according to EN795 – type A.	
4.3	check SRL support - Leg A4	123A90-DDL-ST-DD-90127			
4.4	check rescue anchor padeye TP roof	123A90-DDL-ST-DD-90127			
4.5	check SRL support TP roof	123A90-DDL-ST-DD-90127			
4.6	internal aluminium ladder upper part installed	123A90-DDL-ST-DD-90127		check no direct contact Al-steel for durability	
4.7	internal aluminium sliding part properly seafastened to the upper part	123A90-DDL-ST-DD-90127		trial fit performed in yard	
4.8	temporay handrails installed and certified			approved by supervisor	
	- on top of TP till the corners	123A90-DDL-TI-DD-99043			
	- around the corners	123A90-DDL-TI-DD-99043		2 steps present	
4.9	removable ladder + cage to reach top of TP	123A90-DDL-TI-DD-99043		alternatively anchor point	
A-5.0	Shipped loose items				
5.1	TP internal ladder fixing	123A90-DDL-ST-DD-90127		n. 2 C-shaped profiles	
	n.26 bolts M12 cl. 8.8	123A90-DDL-ST-DD-90127			
	hilty fixing system to MP	123A90-DDL-ST-DD-90127		tools and components	
A-6.0	Dimensional Control				
6.1	stabbing guides dim. control			collect dim. check and cross check with Topside legs distances	

6.2	dimensional data for liftpoints / padeyes available and within specification				
6.3	dimensional control of flange ovality and planarity				
6.4	dimensional control of TP legs and elevation at cut-off elevation				
A-7.0	Grillage and SF				
7.1	Lower grillage fabricated and positioned on barge as per drawing	123A90-DDL-TI-DD-99039			
7.2	SF pipes and gusset plates available	123A90-DDL-TI-DD-99041			
7.3	SF welded to cargo barge with barge in towing config.			check for min. SF. Collect NDT of GR&SF welds	
7.4	Shim plates available for set down			shims to provide 100% bearing	
A-8.0	Fluids				
	NA				
A-9.0	Mechanical				
9.1	Pumps string sections				
9.2	Bolts for string assembly				
A-10	Electrical and Instrumental				
10.1	Any multi-cable transits (MCT) aperture shall be fixed in the closed position and covered with a securely attached cover and edges sealed with appropriate tape.				
10.2	Panel internals and externals shall be cleaned				

10.3	Internal PLCs, cards and all other electronic devices shall be protect against shock and vibrations				
10.4	All panels doors shall be closed and locked				
10.5	All the delicate parts as ammeters, voltmeters, lights mounted in the external side of panels will be protected				
10.6	All glass doors shall be covered				
10.7	CORTEC VpCI Film (or equivalent) on all the external surface of Cabinets sensitive to moisture and/or corrosion shall be installed avoiding the risk of corrosion for 12 months, the locking of VpCI shall be executed with extendable film.				
10.8	Small electrical and instrument items (lightingh fixture, detectors, push button, jb, etc.):				
	Item externals shall be cleaned				
	Case A: Small items indoor installed (shelter) and for the small items with IP < 66 outdoor installed				
	CORTEC VpCI emitters (or equivalent) shall be placed inside the item				
	CORTEC VpCI film (or equivalent) on all the external surface of Item shall be installed avoiding the risk of corrosion for 12 months, the locking of VpCI shall be executed with extendable film.				

	Case B: Small items with IP ≥ 66 (≤ 20 liters) outdoor installed				
	The item shall be only protected with heavy duty plastic sheet aim at cover it against sea spray and dirt from possible flocks of birds during transport.				
	Case C: Small items with IP ≥ 66 (> 20 liters) outdoor installed				
	CORTEC VpCI emitters (or equivalent) shall be placed inside the item				
	CORTEC VpCI film (or equivalent) on all the external surface of Item shall be installed avoiding the risk of corrosion for 12 months, the locking of VpCI shall be executed with extendable film.				
10.9	FRAGILE EQUIPMENT (e.g. computers, video units, etc)			Sufficient buffering material shall be wrapped around fragile items, including instruments, to protect against shock damage.	
10.10	For any cables disconnected at one side the cable terminations will be protected with extensible film “STRECH FILM VpCI” and multi bubble wrap, then placed on appropriate supports and fixed by textile strapping. No metallic strapping is allowed in order to avoid damage				
A-11	Barge Sail-Away documentation				

11.1	sail away certficate signed by MWS				
11.2	checklist signed by:				
	Client rep.				
	RM rep.				
	END of CHECKLIST	signatures		CW	RM

NOTE

1- Desiccants shall not be used in combination with VpCIs inside equipment.

2- If the item is ATEX certified the CORTEC VpCI emitters (or equivalent) shall be placed outside the item and under the CORTEC VpCI film (or equivalent).

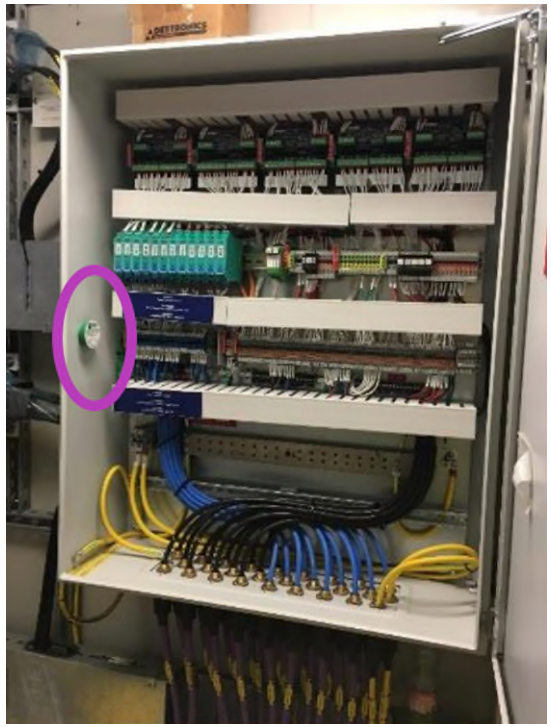


Figure 6.1 – Example of CORTEC VpCI Emitter

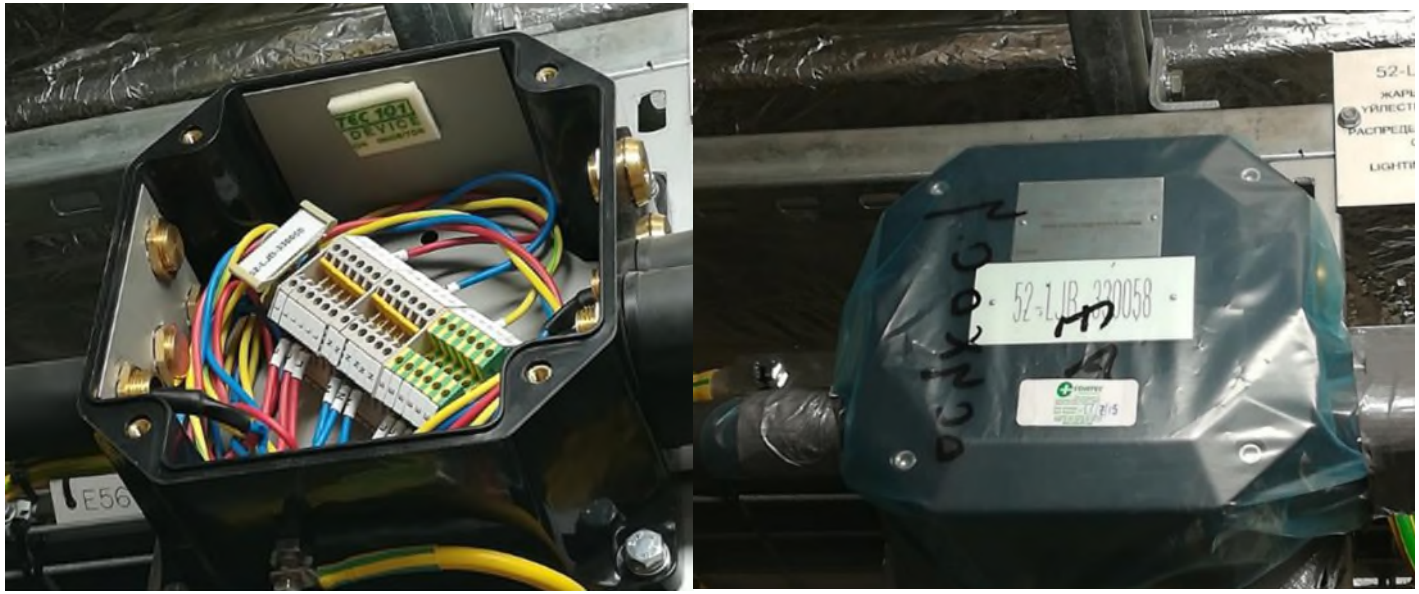


Figure 6.2 – Example of Item preserved with Cortec VpCI Emitters

7 YARD CHECKLIST QUAYSIDE AND CAISSON FRAME

BLPH Project
YARD CHECKLIST - CF

No.	Punch List Item	Drawing Ref.	Date	Comments	CHECK
A-1.0	Barge arrival				
1.1	Check if the quay is free of obstacles and appropriate berthing and mooring scheme is in place	123A90-DDL-TI-DD-99034 123A90-DDL-TI-DD-99035		latest bathymetry / tidal information / weather forecast to be shared to check UKC/mooring arrangement	
A-2.0	Caisson Frame general inspection				
2.1	visual inspection	123A90-DDL-ST-DD-90094 123A90-DDL-ST-DD-90095 123A90-DDL-ST-DD-90096		check for potential dropped objects	
A-3.0	Lift points				
3.1	Dimensionally correct			check as-built report	
	Lift point 1				
	Lift point 2				
3.2	welds correct and NDT performed			collect NDT reports	
	Lift point 1				
	Lift point 2				
A-4.0	Installation AIDS				
A-5.0	Shipped loose items				

5.1	n. 2 locking plates for the upper pins	123A90-DDL-ST-DD-90096 sh.2		To be stored close to CF upper pins	
A-6.0	Dimensional Control				
6.1	stabbing pins dim. control	123A90-DDL-ST-DD-90096		collect dim. check and cross check with MP sleeves distances	
A-7.0	Grillage and SF				
7.1	Grillage fabricated and positioned on barge as per drawing	123A90-DDL-TI-DD-99047		Collect NDT of GR welds	
7.2	SF (wedges) ready for installation	123A90-DDL-TI-DD-99047			
A-9.0	Barge Sail-Away documentation				
9.2	checklist signed by:				
	Client rep.				
	RM rep.				
	END of CHECKLIST	signatures		CW RM	