



High Performance Corer (HPC) Launch and Recovery onboard MV Normand Mermaid

Procedure | EUAF-FNLM-NMM-PR-004 | Issue 05

Responsible Person: Service Line Director Marine Geotechnical Europe & Africa

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1. Objectives

The objective of this procedure is to conduct safe and efficient operations using the Fugro High Performance Corer (HPC) onboard the vessel MV Normand Mermaid and to ensure prevention of any injury to personnel or damage to the environment.

2. Scope

This procedure applies to High Performance Corer (HPC) Operations onboard MV Normand Mermaid.

3. Responsibilities

To ensure safe operations of the HPC, a minimum of 2 crew is needed. All team members shall be qualified for their position and adequately trained to carry out their delegated tasks and responsibilities safely.

3.1 Operating Team

Table 3.1 Operating Team

1	Bridge Officer
1	Surveyor
1	Senior Operator / Shift Lead Operator operating A-Frame and Lift Winch
2	Operator / AB
1	Geotechnical Engineer
Other crew	
1	Master
1	Party Chief
Optional additional crew on shift depending on workload / project scope	
1	Geotechnical Engineer(s)

Table 3.2: Responsibilities of given roles for the activities described in this document

Role	Responsibility
Bridge team	<u>Master</u> : Has overriding authority and ultimate responsibility for the safe execution of all vessel operations, including DP operations.
	Ensures the vessel will be set on DP and grants permission to start operation.
	Ensures the Bridge team keep in communication with deck operations.
	<u>Officer on Watch</u> : Representative of the Master.
	Ensures the Bridge team keep in communication with deck operations when on duty.
Party Chief	Responsible to the Master for the safe rigging and Deployment/Recovery of the equipment and for the safety of all personnel involved in the operation. In the Party Chief's absence, this responsibility may be delegated to the Senior Operator / Shift Lead Operator.

Role	Responsibility
	The Party Chief will work closely with the Senior Operator / Shift Lead Operator to ensure the safe execution of all tasks in line with Fugro's vessel safety policies.
Senior Operator / Shift Lead Operator	Responsible for directing safe execution of the Geotechnical operations on the deck. The Senior Operator / Shift Lead Operator will be the main point of contact between the deck and the Bridge & Survey. The Senior Operator / Shift Lead Operator will lead the launch & recovery operations and will give commands (verbally, hand signals or by radio) and he will also be responsible for operating the A-Frame and Lift Winch. Prior to launch and when safely deployed, the Senior Operator / Shift Lead Operator will control the operation of the unit. The Senior Operator / Shift Lead Operator will co-ordinate geotechnical deck operations
Operators / AB	Assisting the Senior Operator / Shift Lead Operator with preparing, deploying and recovering the HPC. Attaching/Removing tripping chains during launch & recovery.
Surveyor	Responsible for correct and safe positioning of the vessel and the underwater equipment in accordance with the client's contract and informing the Senior Operator / Shift Lead Operator about the depth of the HPC while submerged.
Geotechnical Engineer	Follows instructions by Senior Operator / Shift Lead Operator and may assist recovering samples from HPC barrel and transport to the laboratory.

4. Related Documents

Procedures

- High Performance Corer (HPC) Operations (generic) EUAF-FNLM-OPL-PR-006
- Procedure Lost Frame or Power to Frame EUAF-FNLM-OPL-PR-035
- QHSSE Governance Management of Change FS-01-IMS03-001 Ch 17
- Seabed and downhole operations within the 500mtr zone & working near man-made structures EUAF-FNLM-OPL-PR-038
- Guidelines for Safe Working of Site Investigation Vessel in Marginally Shallow Water EUAF-FNLM-OPL-PR-032
- Working on a ship with an open aft-deck or in a moon pool EUAF-FNLM-OPL-PR-036
- In-Office Mobilisation EUAF-FNLM-OPL-PR-034
- Health & Safety at work Working at Height and over the side FS-01-IMS03-001 Ch 9
- Personal Protective Equipment Standards App. FS-01-IMS03-001-F
- SMART Mobilisation (Process)

Technical manuals

- HPC (technical) Manual M1506001.THE

Risk Assessment

- TRA HPC onboard Normand Mermaid EUAF-FNLM-NMM-RA-003
- TRA Mobilisation/Demobilisation EUAF-FNLM-OPL-RA-001
- TRA Lifting Operations (General) EUAF-FNLM-OPL-RA-002

5. Definitions and Abbreviations

An overview of the definitions and or abbreviations used in this document.

Table 5.1: Definitions and abbreviations

DP	Dynamic Positioning
ERP	Emergency Response Procedure
MOB	Man Overboard
OOW	Officer on Watch
PEP	Project Execution Plan
PPE	Personal Protection Equipment
TBC	To be Confirmed
TBT	Toolbox Talk
TRA	Task Risk Assessment
USBL	Ultra-Short Baseline (USBL) Positioning
HPC	High Performance Corer

6. Approximate duration of Operation

- Pre-deployment: approx. 30 minutes;
- Deployment of HPC: approx. 5 mins at 25 m water depth;
- Sampling: approx. 5 mins depending on ground conditions;
- Recovery of HPC: approx. 5 mins at 25 m water depth.

7. Known Limitations

Item	Details
HPC	The HPC has a base frame of 2.4 m x 2.8 m
Weight	3.1 ton in air; During deployment and recovery, the HPC must be controlled against unexpected swinging due to the vessel motion
Length	The HPC has an overall length of 8.1m
Sea state	Hs 1.5 m / winds 30 knots, depending on roll and pitch of the vessel

Working near man-made structures, Operators shall follow the procedure Seabed and downhole operations within the 500mtr zone & working near man-made structures EUAF-FNLM-OPL-PR-038. When working in shallow water, Operators shall follow the guideline *Marginally Shallow Water*.

8. General Statements

If there is any doubt as to the safety of the operation, the operation shall be stopped until the situation is assessed, potential hazards have been removed and the site is under control.

Non-essential personnel shall not be on deck during operations.

9. Equipment Specification

The HPC has a base frame of 2.4 x 2.8 m, has an overall length of 8.1 m and weighs in air approx. 3.1 ton. The HPC is fitted with a 6 m core barrel. The HPC can be operated in water depths up to 350 m.

The HPC will be mobilised together with:

- An operating container from where the Operator can control the HPC;
- An umbilical winch and cable for communications with the HPC;
- A lifting wire winch and cable for deployment.

For launch and recovery of the HPC, the A-Frame will be used together with the lift winch on the back deck. A CTD probe (mini transponder) and 2 USBL beacons will be fitted for water depth measurement and positioning.

9.1 Equipment Specifications

HPC	3.1 ton (in air)
Lift Winch	SWL 20 ton
Lift Wire	32mm 550 m
A-Frame	SWL 15.5 ton

During mobilisation, all sheaves, wires, shackles, hooks and connections will be checked to ensure they are fit for their purpose. All lifting equipment in use has to have current certification.

Prior to any deployment, all equipment will be visually inspected by the Senior Operator / Shift Lead Operator.

10. HSSE

A Toolbox Talk (TBT) will be held before the start of operations. All personnel involved with this operation will attend the TBT. Only personnel who have attended the TBT can be involved in the operation. The TBT will consist of, but won't be limited to:

- Type of operation to be carried out;
- Equipment used;
- PPE needed;
- Environmental conditions (weather, sea state, wind speed/direction, etc.);
- Vessel motion;
- Work area (slip/trip hazard including ice/snow), lighting (working at night);
- Safety barriers in place;
- Line of fire (no walking under suspended loads and wires under tension)
- Etc.

All persons involved in the deployment of the equipment will be required to have read and understood this procedure and to know their role(s) and responsibilities on deck. Personnel will remain alert, follow instructions carefully and be prepared to carry out urgent, immediate instructions should these be given.

Everybody has the right and duty to STOP the Job if they see an unsafe situation or act.

The Stop-the Job is fully supported by Fugro Management.

A Task Risk Assessment (TRA) has been carried out and all crew involved shall familiarise themselves with the TRA before starting operations. The TRA will be regularly reviewed by the crew involved and updated if necessary.

Prior to commencement of each operation a Risk Assessment will be made. A risk assessment can be a TBT, discussion between 2 or more crew or a quick assessment following the SLAM (Stop, Look, Assess, Manage) technique and is not necessarily always documented on paper.

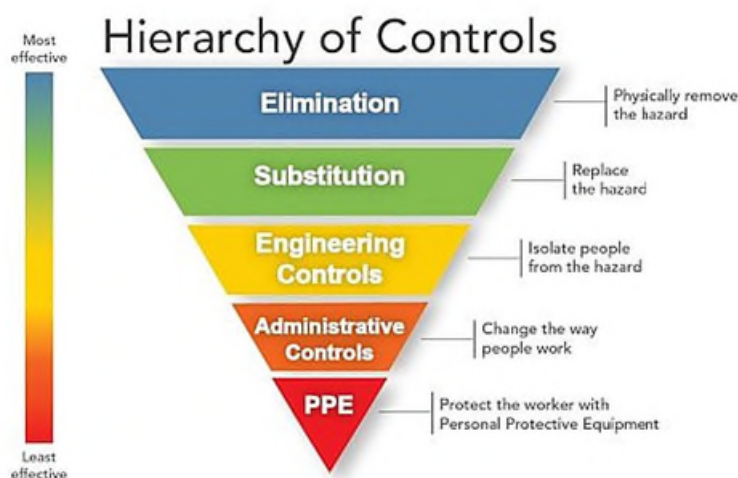
All Personnel involved with the deck operation will wear appropriate mandatory PPE.

Standard, mandatory PPE on the back deck consists of:

- Helmet;
- Safety glasses;
- Coverall;
- Safety footwear;
- Fall arrestor;
- Gloves (task dependent)

10.1 Hierarchy of Controls

Remember: PPE is only the last line of defence



Special PPE shall be worn by crew when working in the restricted area between the foundation of the A-Frame when the safety chains are removed for deployment/recovery of the HPC:

- Harnesses and Fall Restrictors: These harnesses must be connected to a suitable anchoring point by fall restrictors;

In case of a MOB, crew members need to keep an eye on the MOB at all times, throw life buoys and raise the alarm through radio or phone to the Bridge. The Bridge will then raise the vessel wide MOB alarm and announce the MOB situation via PA system.

10.2 Positions of the life buoys on back deck

There are three (3) life buoys on deck, one on starboard side at stern and one on port side at the aft of the crane pedestal and one at the forward side of the moon pool.

11. Procedure

11.1 Communications

Good communications are essential to both the safety and efficiency of the operation. The primary means of communication between the Deck, Bridge and Survey will be by the use of handheld VHF radios. The primary means of communication on deck will be verbal and well-defined hand signals. The hand signals to be used must be fully discussed at the Toolbox Talk stage. Correct use of both the radios and hand signals shall be fully understood before commencement of the operation and correct radio procedures adopted.

Prior to the deployment of the HPC, lines of communications between Operators, Surveyor and Bridge are verified to be clear and operational.

Communication links between the deployment area and the Bridge will be established before the start of any deck operation. The Sr. Operator / Shift Lead Operator, Bridge and Surveyor will be equipped with VHF Radios. A clear link must be established and all commands replied to in clear concise manner.

If there is a communications break or any uncertainty the job must be **STOPPED** immediately before operations can commence. All communications are to be in English.

As per the flow diagram below, the Senior Operator / Shift Lead Operator will be the prime and common point of contact between the parties during operations.

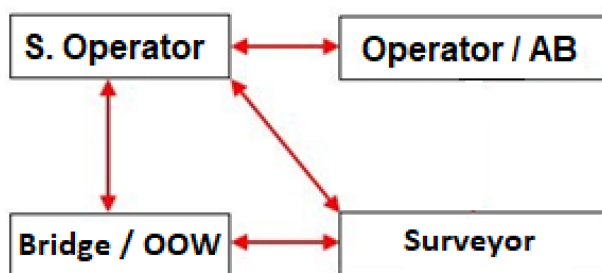


Figure 11.1

Besides radio contact, the Bridge and Surveyor (in Online Room) will have visual contact with the back deck by means of CCTV.

11.2 HPC Operations

The following steps will have to be followed for safe operations of the HPC:

1	TBT in online room. Discuss operations and confirm amount of people out on deck.
2	Team will perform radio check on back deck before starting operations.
3	Survey to plot location on survey screen.
4	Bridge to set up DP on location and monitor position.
5	Bridge to confirm vessel holding position and grant permission to start HPC operations: "Green light from Bridge"
6	Survey to confirm vessel is positioned correctly for HPC deployment: "Green light from Survey"
6a	-If correction is needed, survey will call stop lowering, inform Bridge "Distance & Bearing" -Bridge to confirm and, when ready, (move complete and vessel holding position) "Green light from Bridge" -Survey to confirm vessel is positioned correctly for HPC deployment "Green light from Survey"
6b	If crew on back deck is not ready yet after "Green light" from Bridge and Survey, they will inform "All stations to standby" . When back deck is ready, they will request green light from Bridge and Survey again.
7	Deck Crew will lift HPC in upright position with Lift Winch and launch HPC with A-Frame into the water: "HPC in water"
8	Survey to confirm vessel is positioned correctly for HPC deployment: "Green light from Survey"
	- If correction is needed, survey will call stop lowering, inform Bridge "Distance & Bearing" - Bridge to confirm and, when ready, (move complete and vessel holding position) "Green light from Bridge" - Survey to confirm vessel is positioned correctly for HPC deployment "Green light from Survey"
9	Sr. Operator / Shift Lead Operator to inform Bridge & Survey "Commence lowering" HPC with Lift Winch.
10	During lowering, Survey will inform Sr. Operator / Shift Lead Operator and Bridge about depth of HPC every 5 meters. From 20 meters above seabed, Survey will start counting down to 10 meters above seabed. Lowering will slow down and will stop at 10 meters above seabed.
11	Surveyor to confirm landing area is within contractual positioning limits: - HPC to be performed within 2.5m from intended location. Starting on the north, 1 st retest to the east, 2 nd retest to the south of intended location.
12	HPC will slowly be lowered on the seabed. Sr. Operator / Shift Lead Operator to inform Bridge and Survey when HPC is on seabed: "HPC on Seabed" - Survey will start taking fixes - Sr. Operator / Shift Lead Operator to monitor possible settlement of HPC.
13	Sr. Operator / Shift Lead Operator will inform Bridge and Survey at start of test: "Start of Test" and end of test "End of Test"

14	Survey to confirm and grant permission to retrieve HPC. "Green light from Bridge" .
15	HPC will be recovered back to the surface with Lift Winch. Survey will inform Operators in agreed intervals about depth of HPC in the water column during hoisting. HPC will slowly be hoisted to the surface when getting close to the waterline.
16	Sr. Operator / Shift Lead Operator to inform Bridge and Survey when "HPC at surface and start recovery" – Bridge & Survey to confirm
17	Sr. Operator / Shift Lead Operator to inform Bridge and Survey when "HPC back on deck"
18	Sr. Operator / Shift Lead Operator to inform Bridge and Survey when HPC is fastened and ready for transit. "Green light from Back Deck for move"

Before start of operations, the HPC will be in horizontal position on the back deck. The base of the HPC will hang over the aft of the vessel. The A-Frame will be pulled back all the way and the HPC will be secured by the tripping chains and a lorry strap over the head. To safely launch the HPC, step 7 will be divided in the following sub-steps:

7a	Remove lorry strap from HPC head
7b	Lift HPC with Lifting Winch in upright position
7c	Lift HPC slightly to give slack on the tripping chains
7d	Two (2) Operators / ABs move into restricted area with harness connected on either side of the HPC launch area onto the Skylotec D-Rings on the A-Frame and release tripping chains on both sides of the HPC from deck and connect them to the HPC chains – crossing the deck underneath the lifting wire while it is under tension is prohibited
7e	Sr. Operator / Shift Lead Operator lowers HPC slightly, HPC resting against stern of vessel. Operator / AB to take out safety pin
7f	Operators / AB move out of restricted area
7g	A-Frame is boomed out until the HPC is at safe distance from the vessel for lowering

For the safe recovery of the HPC back to deck, step 16 is divided in following sub-steps:

16a	Lift HPC halfway out of water with Lift Winch. A-Frame is then boomed in
16b	If needed, Operator moves into restricted area with harness connected to the fall restrictor which is connected to the Skylotec D-Ring on the A-Frame, to turn HPC with a boat hook to have correct side of HPC face the aft of the vessel
16c	Pull in A-Frame till HPC is resting against the aft of vessel
16d	Operator to insert safety pin
16e	HPC will be lifted until base is just under the edge of deck
16f	Two (2) Operators / ABs move into restricted area with harness connected on either side of the HPC recovery area onto the Skylotec D-Rings on the A-Frame and release tripping chains from HPC chains and connect them to the deck and then move out of the restricted area – crossing the deck underneath the lifting wire while it is under tension is prohibited
16g	Operators / AB unclip and move out of restricted area
16h	HPC is lowered slightly with Lift Winch until hanging in tripping chain
16i	A-Frame is pulled back all the way and HPC is lowered by Lift Winch till horizontal on deck. HPC head to be secured with lorry strap (if necessary)

After the Sr. Operator / Shift Lead Operator has given **"HPC back on deck"**, the Lab team will come to assist the Sr. Operator / Shift Lead Operator and Operator with the retrieval of the sample. To remove the sample from the HPC the following step will have to be followed:

17a	Place barrel stands under the HPC
17b	Release the barrel from the head.

	8 bolts to be undone and place barrel on the stands
17c	Use the Pricy Pully to pull the liner out of the barrel. Only pull out approx. 1.5 meter
17d	The liner will be cut into 1 meter section for easier handling. Repeat steps 17c & 17d until end of liner
17e	Place new prepared liner into barrel
17f	Connect barrel to HPC head

To safely change out the barrels:

17g	HPC in horizontal position on deck
17h	Place barrel stands next to HPC
17i	Release the barrel from the head
17j	Lift barrel with sufficient crew and lay on deck
17k	Pick up new barrel and lift through base of HPC, top part resting on barrel stands
17l	Insert liner
17m	Connect top of barrel to HPC head

There will not be any difference in launch and recovery procedure for the 6m cores or 3m cores.

The Sr. Operator / Shift Lead Operator will be able to monitor the penetration of the HPC to stop the test when the head will be at the base of HPC.

12. Shallow Water

The minimum water depth for HPC operations on board MV Normand Mermaid is set at 15 m.

A site-specific risk assessment will be made to determine if operations can be carried out safe. The risk assessment will be based upon available data, for example:

- Geophysical data acquired for the project;
- Up-to-date charts;
- Tide and current data;
- Weather forecast.

In areas with high currents HPC operations might only be possible at slack tide. In areas with big tidal differences HPC operations might only be possible during high tide. The vessel will have to be positioned in such a way that the resultant effect of wind and tide pushes the vessel away from the HPC and any navigational hazards.

The site-specific risk assessment will be carried out by the Captain, the Party Chief and the Sr. Operator / Shift Lead Operator. The Captain is overall responsible for the safety of the vessel and therefore will determine which specific mitigations will have to be in place and will have to approve commencement of operations. If people, vessel, equipment or environment is deemed to be in danger the operations will be aborted.

13. Emergency Procedures

In case of any emergency situation the Bridge is to be informed immediately.

All personnel within a dangerous area shall immediately move to a designated safe area. Immediate action can be carried out if safe to do so.

If during a Hydraulic or Electrical Failure the equipment is suspended over the deck, all personnel are to move to a safe location away from the area and if possible the unit is to be lowered safely to deck. If this is not possible, repairs are to be carried out to Hydraulics and/or Electrical system. After power/pressure is back, the equipment is lowered safely to deck.

If a Hydraulic or Electrical failure occurs when the equipment is on the seabed, the Bridge will be informed and requested to keep the vessel on location. Repairs are to be carried out as a matter of priority. In the worst-case scenario, the lift wire will be severed and the umbilical paid out and disconnected from the vessel. The equipment will be left on the seabed for later retrieval.

The safe area may vary depending on the emergency. The Sr. Operator / Shift Lead Operator will determine what the safe area will be in the specific emergency and will inform crew.

In the event of a muster alarm during operations, the Sr. Operator / Shift Lead Operator will be contacted by the Bridge. If safe to do so, the equipment is to be immediately raised off the seabed and if possible returned to the deck / side of vessel.

A Toolbox Talk will be held to discuss the immediate situation and possible resolutions.

Personnel will remain alert and follow instructions carefully.

In the event of an incident resulting in an injured person, the ERP is to be followed a hard copy of which is to be kept on the Bridge.

Emergency	Communication	Action
DP Failure	Alarm from Bridge to deck	Pull HPC from seabed
Hydraulic, air or electrical failure (of HPC/HPC related equipment such as crane and A-frame) (HPC on seabed)	Deck informs Bridge immediately Deck informs Bridge when leaks are detected	Emergency repairs to be carried out. Check for leaks In worst case scenario: sever the wire*
Hydraulic, air or electrical failure (of HPC/HPC related equipment) (HPC suspended over deck)	Deck informs Bridge immediately Deck informs Bridge when leaks are detected	All personnel to move to safe area under supervision of Sr. Operator / Shift Lead Operator. Emergency repairs to be carried out when safe to do so. Check for leaks
Weather suddenly rapidly deteriorating	Bridge notifies Deck	Pull HPC from seabed, try to recover to deck if time permits
Black out of vessel	Alarm from Bridge	Clear deck, move to safe area and await instruction from Bridge

Other vessel emergencies	Alarm from Bridge	Pull HPC off seabed, try to recover to deck if time permits. Muster at appointed muster station
Incident resulting in injury	Deck informs Bridge immediately	ERP is to be followed. A hard copy of the ERP is kept on the Bridge.
Vessel Drills	Alarm from Bridge	Pull HPC from Seabed. After the drill a TBT to be held prior to resume operations.

14. Revision History

Table 14.1: Description of revision to document

Issue	Date	Description of changes	Prepared By	Approved By
1	03-Dec-2021	Initial Issue	R. Wojke / M. Hagens	D. Koenen
2	17-Oct-2022	Updated sections 3, 7 & 9 team composition, weather limits and equipment specifications	S. de Bruijn / R. Wojke	D. Koenen
3	27-Feb-2023	Reviewed, updated sections 3, 7, 9, 11.2	W. Pretorius, M. Mancani	D. Koenen
4	31-Mar-2023	Revised/updated sections 3.1, 10, 10.2, 11.2, Fig.1	R. Wojke / P. Morris	D. Koenen
5	23 Jan 2024	Updated sections 7d, 16b & 16f and Spell check	W. Pretorius	D. Koenen