Base Load Power Hub (BLPH)

Human Factors Terms of Reference

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Table of contents

1 INTRODUCTION 5
1.1 PROJECT OVERVIEW 5
1.1.1 Project Location 5
1.1.2 Project Concept 6
2 DOCUMENT SCOPE 8
2.1 MAIN REFERENCES 8
2.2 DEFINITIONS AND ABBREVIATIONS 8
2.2.1 Definitions 8
2.2.2 Abbreviations 9
3 METHODOLOGY 10
3.1 HFE MODEL VERIFICATION 10
3.2 HFE CHECKLIST 11
3.3 REPORTING 11
3.4 DOCUMENTATION 12
3.5 HFE TEAM 12
4 LOCATION, DATE & TIME 14
ANNEX 1 - GUIDEWORD 15

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List of Figures

Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map 5
Figure 2 - Wind Park Details 6
Figure 3 – BLPH Concept 6

List of tables

Table 1 - Reference Documents 8
Table 2 - Definitions 9
Table 3 – Abbreviations 9

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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.

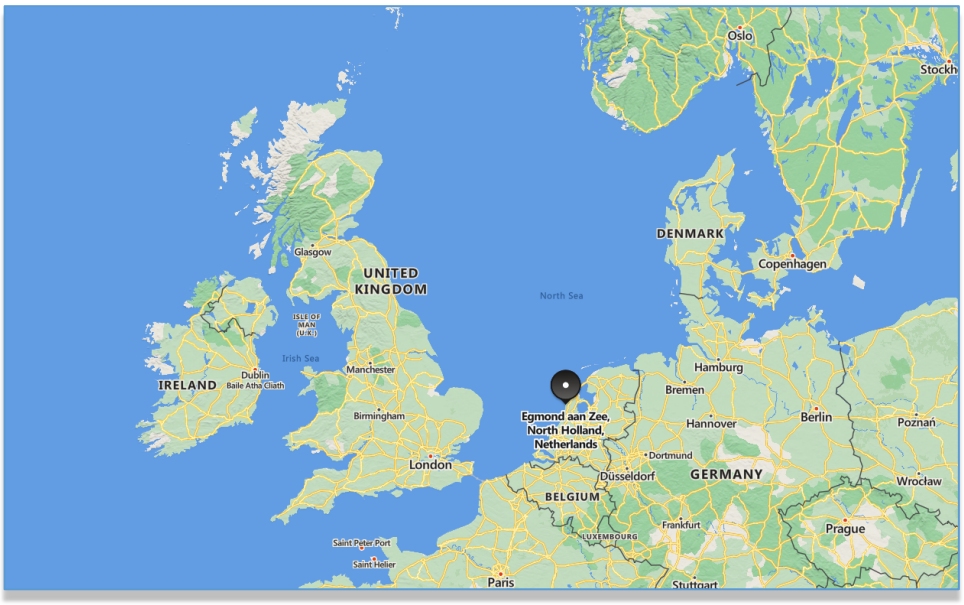


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

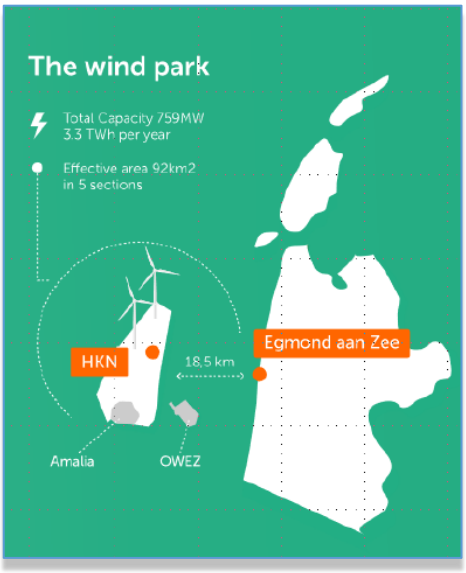


Figure 2 - Wind Park Details

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.

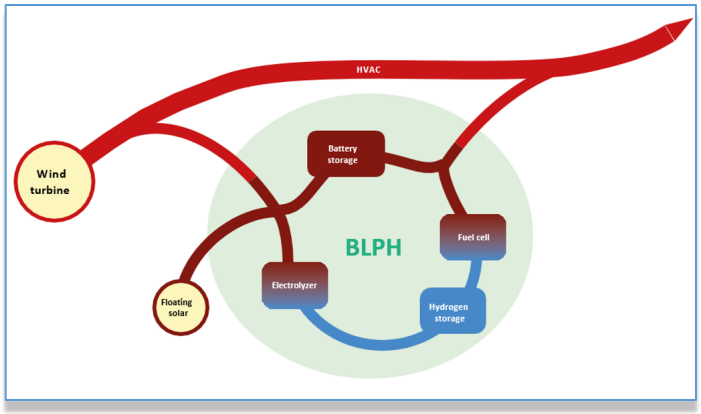


Figure 3 – BLPH Concept

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.

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2 DOCUMENT SCOPE

This document has the purpose of detailing the methodology to be applied for the HFE (Human factor engineering) study in the scope of BLPH project.

The study will be carried out by ICARO, a 3rd party qualified specialist, not involved in the project development. ICARO is a consulting & engineering company located in Cortona, (Italy), established in 1985, which in 38 years has cumulated, for the major Oil & Petrochemical Industries in Italy and abroad, a deep experience and worldwide references in Risk Assessment & Management Systems, Firefighting and Safety Engineering, Environmental Protection and Contaminated Sites Reclamation, Chemical Substance Hazards and Occupational Health Management, Training and Risks.

2.1 MAIN REFERENCES

Ref.	Description
1	Human factors engineering in projects, IOGP Report No. 454, 2020
2	EU Framework Directive: Council Directive of 12 June 1989 on the introduction of measures to encourage improvement in the safety of workers at work
3	DEP 30.00.60.20-Gen. 2011 - Human Factors Engineering – Workspace Design
4	OFFSHORE STANDARDS DNVGL-OS-A101 Safety principles and arrangements July 2019
5	NORSOK Standard S-002 Working Environment, 2018
6	ICARO Guideline, 2017 - "Specification for Human Factor Engineering in projects"
7	3D model of platform / layouts
8	123A90-DDL-PR-RE-80040 – Process Design Philosophy
9	123A90-DDL-SAF-RE-30046 – HSE Design Philosophy

Table 1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

2.2.1 Definitions

COMPANY or Client (CPY):	Crosswind
EPC CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.

PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project
RISK	Combination of frequency and consequence of scenarios.

Table 2 - Definitions

2.2.2 Abbreviations

ALARP	As Low As Reasonably Practicable
HKN	Hollandse Kust Noord
HFE	Human Factor Engineering
HSE	Health, Safety and Environment
IOGP	International Association of Oil & Gas Producers
TOR	Terms of Reference

Table 3 – Abbreviations

3 METHODOLOGY

HFE is a multidisciplinary approach to engineering that focuses on the integration of following five elements:

- People: The characteristics, capabilities, expectations, limitations, experiences and needs of the people who will operate, maintain, support and use the facilities.
- Work: the nature of the work involved in operating, maintaining and supporting the facility.
- Work organization: How the people are organized, in terms of, for example, team structures, responsibilities, workings hours and shift schedules.
- Equipment: the equipment and technology used, including the way equipment is laid out and the elements that people need to interact with, both physically and mentally.
- Environment: the work environment in which people are expected to work, including the climate, lighting, noise, vibration and exposure to other health hazards.

HFE activities during the design stage consist of the HFE design analysis and verification. They are critical to analyze the design HFE risks as well as to identify specific mitigation and actions to be incorporated in the design to ensure that the identified risks are as low as reasonably practicable (ALARP).

The HFE activity included in the scope of this document is the HFE Model Verification.

3.1 HFE MODEL VERIFICATION

HFE Model Verification is conducted for the purpose to verify that the design complies with human factor design principles.

As the review utilizes graphical 2D or 3D, it may also highlight additional HFE design issues related to main operations for workers in the plant.

The main objectives of the study / workshop are:

- Verify that the design is as per HFE design principles.
- Walk through Model to identify any design issues or improvement opportunity.

HFE Model Verification will be conducted together with the completion of Project Model Review (60%).

The study will be carried out based on the principles reported in the project HSE philosophy and applicable standards/ reference guidelines. Whenever a requirement is not met modification to the design can be proposed or technical deviation can be requested, if properly justified.

The analysis will be carried out through a workshop that will be held in the manner, places and times described in paragraph 4.

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During the workshop, as a first step, all the working areas in the platform and the main activities performed by the operators will be identified and grouped into homogeneous areas (nodes) agreed with the HFE Team to allow more efficient coverage of the whole.

Based on the information currently available, the following nodes can be identified:

1. Interface Level: Access to platform
2. Lower Deck: workplaces and equipment inspection activities
3. Lower Deck: Technical rooms
4. Upper Deck: workplaces and equipment inspection activities

Homogeneous areas and nodes will be reviewed and confirmed at the beginning of the workshop. After confirming the nodes, the HFE Check list reported in Annex 1 will be applied for each node.

3.2 HFE CHECKLIST

HFE checklists / worksheets will be used as tools to help the HFE analysts to verify that the layout and workplaces comply with the technical standards requirements of applicable regulations and identify the potential human factors issues associated with workplaces and equipment.

The HFE Check list has been prepared specifically for the Base Load Power Hub (BLPH), based on the principles and requirements reported in:

- NORSOK Standard S-002 Working Environment, 2018
- ICARO Guideline, 2017 - "Specification for Human Factor Engineering in projects"
- OFFSHORE STANDARDS DNVGL-OS-A101 Safety principles and arrangements July 2019

The platform is completely unmanned and the presence of operators is expected once every 6 months for a total period of 2 years only to perform maintenance activities, with the platform that is shut-down. Operators will visit the platform a total of 4 times during the life of the platform.

For these reasons, some aspects are considered partially applicable or not applicable to the BLPH. In addition, other aspects such as platform evacuation and the presence of hazardous areas have been addressed (or will be addressed) through specific studies and are partially taken into account in this study.

The HFE worksheet is reported in Annex 1.

3.3 REPORTING

All the information collected during the workshops will be recorded and processed by the HFE specialists in the days following the meetings. All the results of the studies and corrective measures will be resumed into

dedicated worksheets that will be delivered for sharing and discussion of the results to all the interested parties within two weeks after the workshop.

After completion of the HFE Study, a dedicated HFE report will be issued describing the following main topics:

- introduction;
- study scope / objectives;
- reference to the adopted procedures / standards;
- list of reference drawings and documents;
- HFE Model Verification results
- HFE worksheets / check lists (completed);

3.4 DOCUMENTATION

The basic documentation required to properly carry out the HFE Model verification includes, but not limited to the fallowing:

- BLPH 3D Model at least 60% completion
- BLPH plot plans
- Project Design basis.
- Process description.
- HSE Design Philosophy
- Equipment / facilities layout.
- Material Handling Report (if available)

It will also be necessary to have specific information on the working methods of the operators in the plant. All the documentation should be provided at least one week before the Workshop.

3.5 HFE TEAM

The HFE team shall be a highly experienced multidisciplinary group. The members are requested to be proactive in providing input and information essential for the study successful execution and recognition of all the HSE issues.

The key figures required for a successful development of HFE, are:

- HFE analyst (3rd Party)
- 3D Model Expert

- Project Engineering Manager
- Piping Engineer
- HSE Engineer
- Process Engineer
- Mechanical (Static, Rotating), structural, architectural, electrical and I&C department representative (Presence can be requested part Time base)
- Operation / Maintenance representative members from Company side

All the team members shall be present or available on call to provide the requested information in the most appropriate manner of communication (web conference, e-mail, phone call) when required. In case information is not available a recommendation will be raised

4 LOCATION, DATE & TIME

The HFE workshop will be held at Rosetti Marino offices, located at Assago (Milano).

The meetings will take place the 28th of February 24.

The session is scheduled to start at 9.00 am and end at 6.00pm, with a lunch break approximately between 12.30 am to 1.30 pm.

The following facilities will be provided:

- Sufficient room and tabletop lay-down area for team members to deploy drawings and documents
- Wall area to stick up master copies of drawings if necessary
- Laptop computer and software tool fit for purpose
- Electronic Projector for 3D model.

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ANNEX 1 - GUIDEWORD

HFE CHECKLIST	
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project
VENDOR / PACKAGE:	
NODE / AREA / ACTIVITY:	
GENERAL COMMENTS:	
REV. / DATE:	
ROLE / SIGNATURE:	

HFE CHECKLIST - ACCESS				
	REQUIREMENT	**REF.**	**STATUS**	**COMMENTS**
1.1	**HORIZONTAL / VERTICAL DISTANCES**			
1.1.1	Are horizontal workspaces for fixed equipment minimum 700 mm?	NORSOK S-002, Annex B		
1.1.2	Are centre heights of control devices for standing operations (including valve handles) max. 1800 mm above base ? Are the centre heights of control devices for normal operation controls and for controls where access in an emergency is required 900-1500 mm above base? **ALSO REFER TO FIGURE 2.1**	NORSOK S-002, Annex B		
1.1.3	Are visual displays located 1100-2000 mm above floor level?	NORSOK S-002, Annex B		
1.1.4	Are electrical contacts and switches located 900-1500 mm above floor level?	NORSOK S-002, Annex B		
1.1.5	Are access ways to permanently and intermittently manned workplaces: - when technically practicable, min. 900 mm wide ? - In any case min 800 mm wide ?	NORSOK S-002, Annex B		

HFE CHECKLIST - ACCESS				
REQUIREMENT		**REF.**	**STATUS**	**COMMENTS**
1.1.6	Are vertical clearances in access ways min. 2100 mm?	NORSOK S-002, Annex B		
1.1.7	Are vertical clearances in work areas and stairs min. 2300 mm?	NORSOK S-002, Annex B NORSOK C-002, 5.7		
1.1.8	Is space between fixed cabinets and floor min. 250 mm (or preferably fixed on floor without space underneath)?	NORSOK S-002, Annex B		
1.1.9	Are workplace envelopes in compliance with requirements of **Figure 2.2** ?			
1.1.10	Has an assessment on HFE valves and instruments criticality been performed?	OGP 454, 7.2		
1.2	**PIPES AND FLANGES**			
1.2.1	Are spaces between pipe bottoms and floor min. 150 mm?	NORSOK S-002, Annex B		
1.2.2	Are spaces between external diameter of flanges and fixed obstructions min. 250 mm?.	NORSOK S-002, Annex B		
1.3	**GUARDRAILS**			
1.3.1	Are guardrails provided on elevations higher than 500 mm?	NORSOK S-002, Annex B		
1.3.2	Is height from floor to top of the guardrail min. 1100 mm?	NORSOK S-002, 5.1.2		
1.3.3	free space between handrail, knee rail and toe plate not more than 380 mm? Are minimum two knee rails included?	NORSOK S-002, 5.1.2		

HFE CHECKLIST - ACCESS				
REQUIREMENT		**REF.**	**STATUS**	**COMMENTS**
1.3.4	Are toeboards of min. 100 mm height provided on passageways located over frequented areas and open sea? Is the opening between floor and toe board max. 15mm?	NORSOK S-002, 5.1.2 EN 12437		
1.3.5	Is diameter of handrails within the range 25–50mm or in compliance with NORSOK C-002?	NORSOK S-002, 5.1.2. NORSK C-002 EN 12437		
1.3.6	Are stairways, stepladders and inclined ladders provided with continuous railing on both sides, from the top to the lower level and safely terminated at both ends?	NORSOK S-002, 5.1.2 NORSOK C-002, 5.8		
1.3.7	Is distance between handrails and any obstruction min. 75 mm?	NORSOK C-002, 5.8		
1.4	**STAIRS**			
1.4.1	Are stairs or ladders provided where there is a change of elevation exceeding 350 mm and access is required?	NORSOK S-002, Annex B		
1.4.2	Are stairs provided where daily access is required?	NORSOK S-002, 5.1.2		
1.4.3	Is width of stairway passage min. 1000 mm, as measured between the inside of handrails (or min. 1200 mm for access to more than two levels) or in compliance with NORSOK C-002?	NORSOK C-002, 5.2		
1.4.4	Is the inclination of stairways within the range 21° - 45° ? (Recommended range 30° - 38°)	NORSOK S-002, Annex B		
1.4.5	Are the following requirements for steps met: a) Height riser (h) ≤ 250 mm b) Going (g) ≥ 100 mm c) 600 mm ≤ g+2h ≤ 660 mm	EN 12437		
1.5	**LADDERS AND STEPLADDERS**			
1.5.1	Is the inclination of: - fixed ladders within the range 76° - 90° ? - fixed stepladders within the range 46° - 75° ?	NORSOK S-002, Annex B		
1.5.2	Is the width between upright bearers at least 400 mm?	NORSOK S-002, Annex B		
1.5.3	Is there a horizontal clearance of 650 mm in front of ladders, and a horizontal clearance of 200 mm behind the front of the rungs (150 mm for discontinuous obstacles)?	NORSOK S-002, Annex B		
1.5.4	Are rungs evenly spaced, with vertical spacing min. 250 mm and max 300 mm.	NORSOK S-002, Annex B		
1.5.5	Are rungs provided with a non-slip surface?	NORSOK S-002, Annex B		

HFE CHECKLIST - ACCESS				
REQUIREMENT		**REF.**	**STATUS**	**COMMENTS**
1.5.6	Are safety cages, starting at height 2200 - 3000 mm, provided for ladders higher than 3000 mm?	NORSOK S-002, Annex B		
1.5.7	Is there a rest landing arranged at each 6000 mm for ladders above 10,000 mm?	NORSOK S-002, Annex B		
1.6	**GATES**			
1.6.1	Are self-closing gates arranged at the top of ladders	NORSOK S-002, 5.1.2		
1.7	**HATCHES AND MANWAYS**			
1.7.1	Do hatches provided have an access opening of min. 800x800 mm (min. 600x600 mm for access to cofferdams and tanks from floor/platform)?	NORSOK S-002, Annex B		
1.7.2	Are access openings in vertical partitions into cofferdams, tanks etc. equipped with hand grips on both sides above the opening ?	NORSOK S-002, 5.1.2		
1.7.3	Are inspection hatches side hinged ?	NORSOK S-002, 5.2.1.2		
1.7.4	Are openings in deck larger than 100x100 mm secured by guard-rail or similar?	NORSOK S-002, Annex B		
1.8	**DOORS**			
1.8.1	Do doors have a clear opening of at least 750 mm width and 2050 mm height?	NORSOK S-002, 6.1		

HFE CHECKLIST - ACCESS

HOLLANDSE KUST NOORD WIND PARK Project

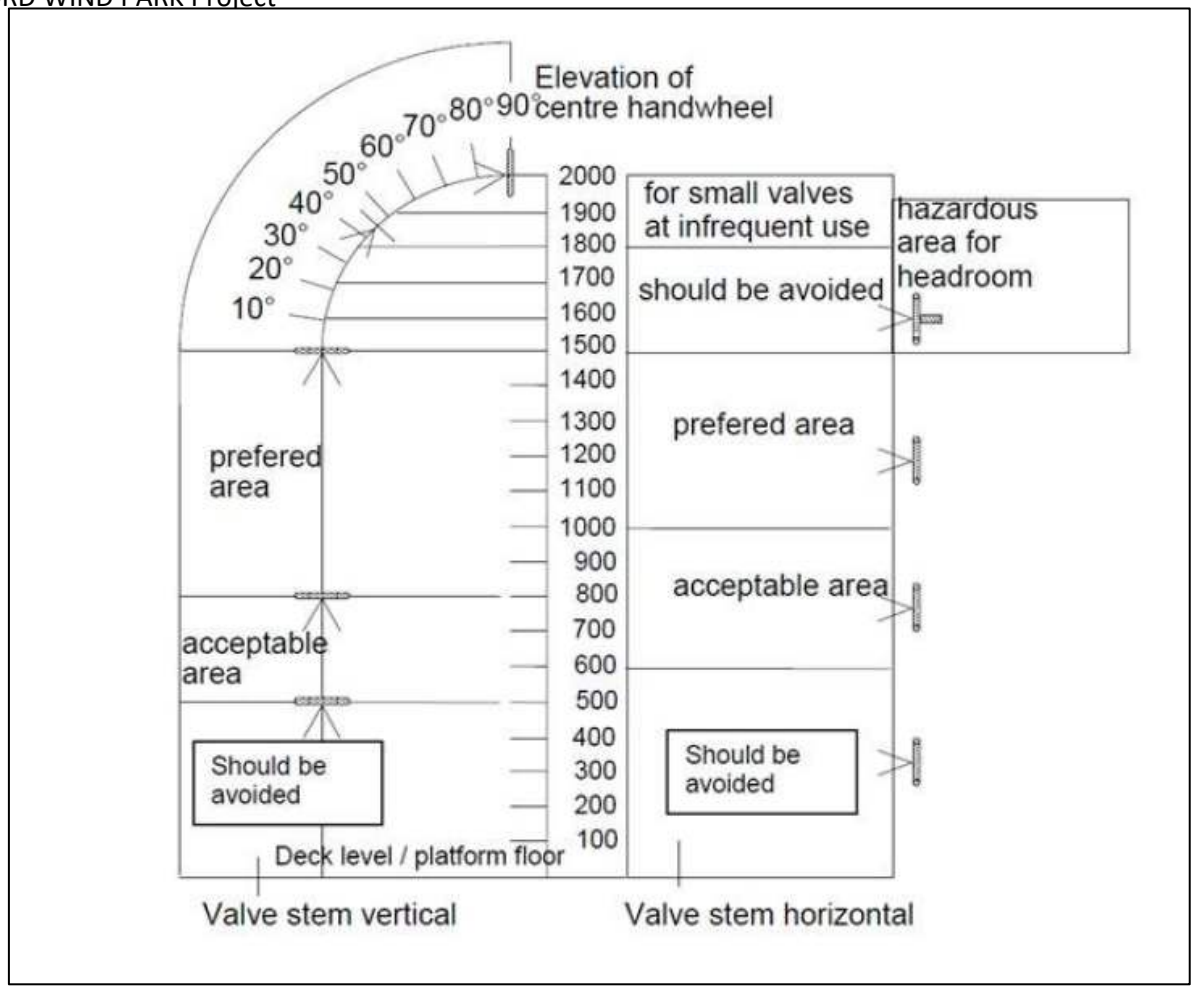


FIGURE 2.1: Siting / operating areas / levels for manually operated units such as instruments and valves

HFE CHECKLIST - ACCESS

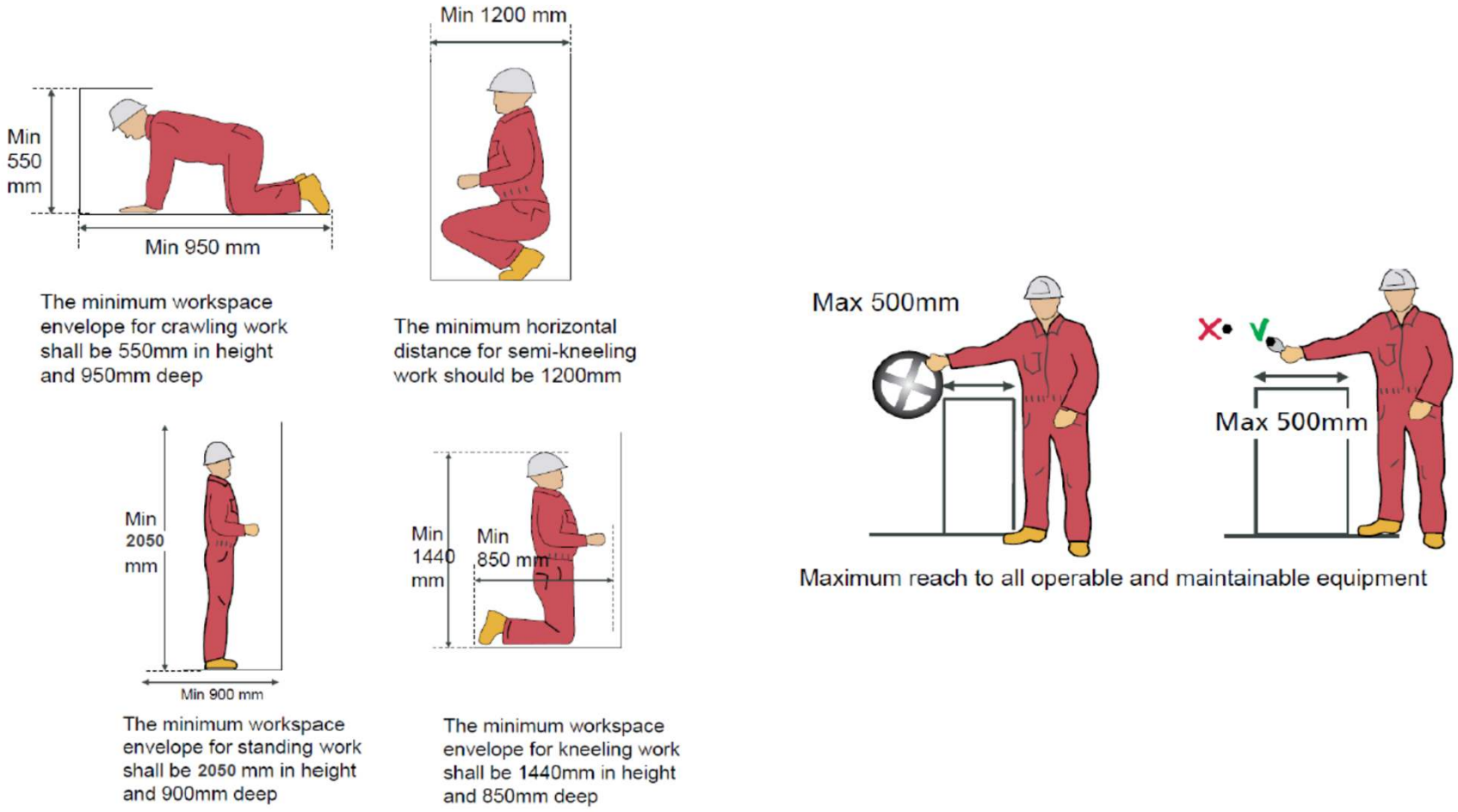


FIGURE 2.2: Workspace envelopes

HFE CHECKLIST - SAFETY PRINCIPLES AND ARRANGEMENTS				
REQUIREMENT		**REF.**	**STATUS**	**COMMENTS**
2.1	**Storage of dangerous goods**			
1.1.1	Areas for storage of flammable, radioactive, explosive or otherwise hazardous substances should be marked with appropriate warning signboards.	DNVGL-OS-A101		
1.1.2	Flammable liquids which give off dangerous vapours and flammable gases shall be stored in a well ventilated space or on deck.	DNVGL-OS-A101		
2.2	**Cranes and lay down areas**			
2.2.1	Cranes and lay down areas shall be located so as to minimise the risk of load handling or dropped object damage to systems and structures.	DNVGL-OS-A101		
2.2.2	The need for load handling above pressurised hydrocarbon equipment, hazardous inventories, and equipment important for safety should be avoided as far as possible. Suitable impact protection should be provided where such lifting cannot be avoided.	DNVGL-OS-A101		
2.2.3	Lay down areas should be provided with heavy-duty barriers to prevent damage to adjacent equipment.	DNVGL-OS-A101		
2.2.4	Lay down areas should be located outside hazardous areas.	DNVGL-OS-A101		
2.3	**Railings and barriers**			
2.3.1	The guard rails shall have at least three courses so arranged that the lowest rail is not more than 230 mm above the deck or toe board and the highest rail not less than 1 m above the deck.	DNVGL-OS-A101		
2.3.2	Every deck, gangway, stairway and opening from which an object could drop more than 2 m, shall, where practicable, be provided with a toe board of not less than 150 mm height.	DNVGL-OS-A101		
2.4	**General principles for Hazardous area (with potential for release of flammable / comburent gas, vapours or liquids during normal operation)**			
2.4.1	Location of a continuous source within an enclosed area, or in open areas with significant obstructions to ventilation, shall be avoided.	DNVGL-OS-A101 Best practice		
2.5	**Escape and Communication**			

HFE CHECKLIST - SAFETY PRINCIPLES AND ARRANGEMENTS				
REQUIREMENT		**REF.**	**STATUS**	**COMMENTS**
2.5.1	Rescue of injured personnel: for emergency response strategy relevant flag state requirements for flagged units and/or coastal state requirements shall be applied.	DNVGL-OS-A101		
2.6	**Escape routes**			
2.6.1	Safe, direct and unobstructed (not be blocked by portable equipment, supplies or piping/valves) exits, access, and escape routes shall be provided from all regularly manned areas of the mobile unit or offshore installation to temporary refuge, muster areas and embarkation or evacuation points.	DNVGL-OS-A101		
2.6.2	All regularly manned areas shall be provided with at least two exits and escape routes, such that at least one exit and the connected escape route will be passable during an accidental event.	DNVGL-OS-A101		
2.7	**Muster areas**			
2.7.1	Easily accessible muster areas shall be clearly defined on the mobile unit or offshore installation. All muster areas shall be located with direct and ready access to survival craft or other life-saving appliances.	DNVGL-OS-A101		
2.7.2	Each muster station shall have sufficient space to accommodate all persons assigned to muster at that station, but at least 0.35 m2 per person.	DNVGL-OS-A101		
2.8	**Emergency lighting**			
2.8.1	All regularly manned areas on the mobile unit or offshore installation shall be equipped with emergency lighting, which is supplied from the emergency source of power. The illumination level shall be sufficient to ensure that necessary emergency response actions, including reading of signs and layouts, can take place efficiently.	DNVGL-OS-A101		
2.8.2	Escape routes, access routes and exit points shall be illuminated so they are readily identifiable in an emergency.	DNVGL-OS-A101		
2.9	**Marking and warning signboards**			
2.9.1	Signs and marking should show exit points and the direction to muster areas, embarkation areas and means of escape to sea.	DNVGL-OS-A101		
2.9.2	Fire fighting equipment should be present and well visible from any regularly manned area on the unit or installation.	Best practice		
2.10	**Communications and alarms**			
2.10.1	Communication and alarm systems shall be provided to alert all personnel on board, at any location, of an emergency. The systems shall be suitable to provide instructions for emergency response.	DNVGL-OS-A101		

HFE CHECKLIST - MATERIAL HANDLING				
	REQUIREMENT	**REF.**	**STATUS**	**COMMENTS**
3.1	Is enough space provided for use of lifting and transport gear where lifting or transport of single items of more than recommended weight kg is required? Recommended weight are indicated in table 3.1	NORSOK S-002, 5.2.1.1 Best practice		
3.2	Are items / equipment which need to be handled frequently (more than once every 6 months) and weighing 16 kg or more clearly labeled with their weight ?			
3.3	Are single handles located relative to the center of gravity of the unit to be lifted to preclude swinging or tilting when lifted?			
3.4	Are handes located to provide at least 75 mm of clearance between the handle and adjacent obstructions during handling?			

Table 3.1 - Recommended maximum weight for manual handling

The maximum weight to be lifted and/or carried (by one (1) person using two (2) hands and standing erect with item held close to the body (max raching distance 300 mm) shall be 16 kg. Above limits are to an object with uniform mass istribution and compact size not exceeding 450 mm high, 450 mm wide
24 kg shall be used as the maximum value in determining the weight to be lifted by two persons standing erect, provided the load is uniformly distributed between the two persons.
The maximum weight to be lifted and carried for non-ideal lifting circumstances (bent over or when reaching out more than 300 mm from the front of the body) shall be 11 kg.
The maximum weight of an object carried at a person's side, with a top handle, shall be 14 kg.

HFE CHECKLIST - ERGONOMICS				
	REQUIREMENT	**REF.**	**STATUS**	**COMMENTS**
4.1	Is the height of table top for seated work within the range 680-750 mm, and easily adjustable from work position?	NORSOK S-002, Annex B		
4.2	Is the height of table top for standing work within the range 800-1050 mm, and easily adjustable from work position? NORSOK S-002, Annex B	NORSOK S-002, Annex B		
4.3	Is it possible to operate handles and push buttons with gloves on?	NORSOK S-002, Annex B		

HFE CHECKLIST - WORKING ENVIRONMENT				
	REQUIREMENT	**REF.**	**STATUS**	**COMMENTS**
5.1	Is lighting inside enclosed packages and on packages with more than two levels in accordance to applicable illumination requirements provided in table 5.1 ?	NORSOK S-002 Project requirements		
5.2	Are noise requirement stated table 5.1 fulfilled ?	NORSOK S-002 Project requirements		
5.3	Are vibration requirement stated table 5.1 fulfilled ?	NORSOK S-002 Project requirements		

HFE CHECKLIST - WORKING ENVIRONMENT

HOLLANDSE KUST NOORD WIND PARK Project

Area/room description	Average illuminance [lux]	Tempera-ture min./max. [°C]	Noise, total L_{pA} [dB]	Noise, HVAC L_{pA} [dB]	Whole body vibration [a_v, rms, m/s²]
General outdoor areas					
Mustering area, lifeboat stations and laydown area	200	Outdoor area	75 a),i)		0,07
Exterior gangways and access ways	100	Outdoor area	80 i)		-
General indoor areas					
Break room outside LQ	150	19–26	60 f)	50	0,07
Corridor in work areas (between areas with low noise levels)	100	5–35	60 f)	-	-
Crane cabin (includes all crane cabins – main and drilling)	400 Adjustable	19–26	65 g)	60	0,07
Switchboard and transformer room and battery room with similar function	200	5–35	85	70	0,21
Laboratory, workshops, paint shop and helicopter hangar	500	19–26	65 b),f)	50	0,07
Local control room, including helicopter and ROV control rooms	400 Adjustable	19–26	60	50	0,07
Electrical, instrument and telecom rooms	400	5–35	75	60	0,07
Stairs, elevators, gangways and access ways in closed work areas	150		80		-
Stores	300	16–26	65 f)	60	0,07
Toilets/changing rooms	200	20–24	60	50	0,07
Unmanned machine rooms (e.g. combustion engine room and BOP control unit, fire/water pumps, compressor room and drawworks room)	200	5–35	110 i)	80	0,21
Offices/meeting rooms outside LQ	500 Adjustable	19–26	50 k)	45	0,07

FIGURE 5.1: Working environment limits

HFE CHECKLIST - SAFETY PRECAUTIONS				
	REQUIREMENT	**REF.**	**STATUS**	**COMMENTS**
6.1	Are anti-skid surfaces provided in access ways and work areas? (The surfaces of decks, walkways, platforms, stairs and ladder rungs etc. shall be non-slip, and designed for drainage and easy cleaning of contaminants like mud and oil, where relevant)	EN 292-1, 4.2 NORSOK S-002, 5.1.2 DNVGL-OS-A101		
6.2	Is protection against personnel contact with hot surfaces above 70°C and cold surfaces below -10°C provided?	NORSOK S-002, 5.3.2 EN 292-1, 4.4		
6.3	Are dead end corridors and platforms exceeding 5 m length provided with min. 2 exits?	NORSOK S-DP-001, 7.2		
6.4	Are safe distances between possible moving objects exceeding the following minimum gaps to avoid crushing of the body parts at risk: • Body > 500 mm • Head > 300 mm • Leg > 180 mm • Foot > 120 mm • Toe > 50 mm • Arm > 120 mm • Hand > 100 mm • Finger > 25 mm	NORSOK S-002 EN 349		