## Base Load Power Hub (BLPH)

# PRE-INSTALLATION SURVEY
# Check List

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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.

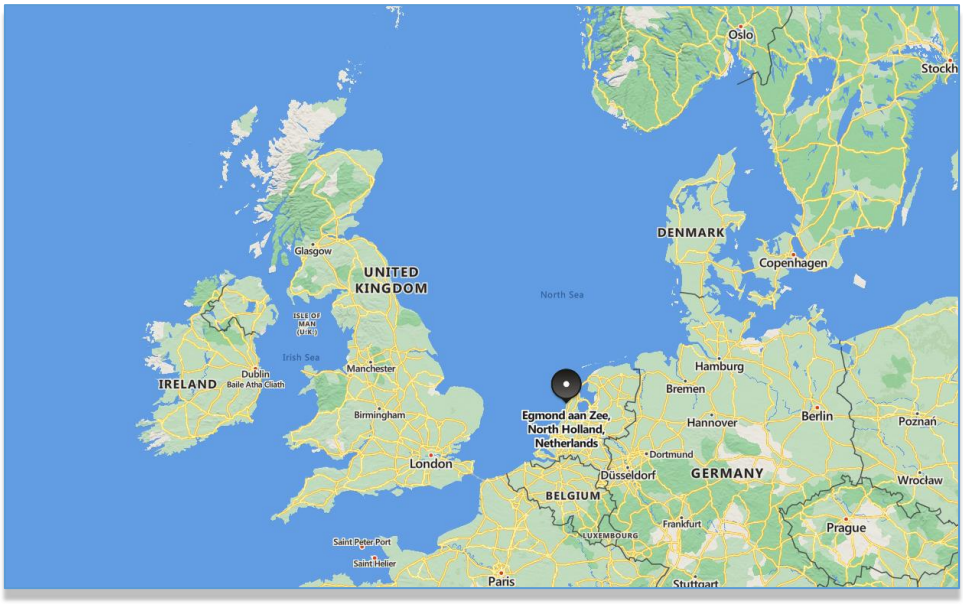



*Figure 1.1 - HOLLANDSE KUST NOORD WIND PARK Location Map*

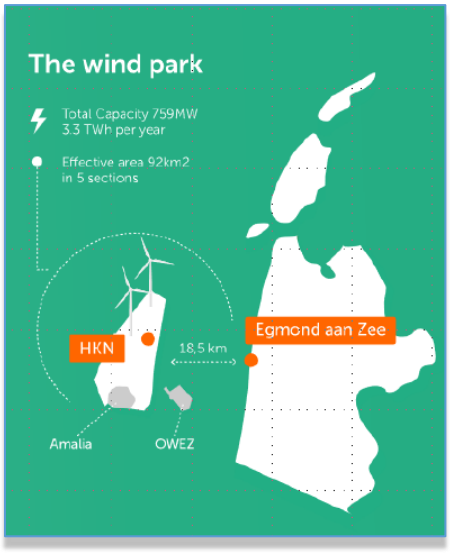



*Figure 1.2 - Wind Park Details*

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.

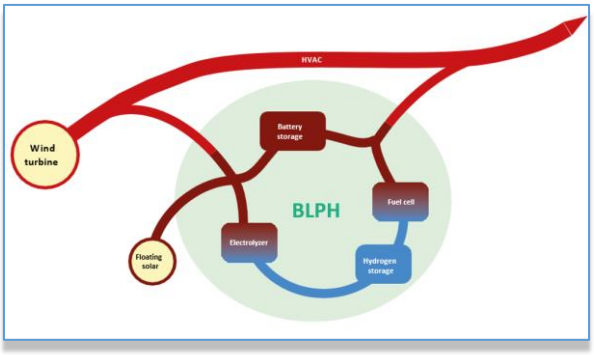



*Figure 1.3 – BLPH Concept*

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.

# 2 DOCUMENT SCOPE

The purpose of this document is to present the checklist of activities and inspections to be performed on the CW70 monopile during the site visit scheduled for fall 2024.

The inspection survey is required to verify the readiness of the monopile to receive the transition piece, caisson frame and topside as part of the offshore installation campaign planned for Summer 2025 with focus on

1. Taking a lot of pictures, to incorporate in the method statements, and provide to bolting subcontractor to verify what method is the best;
2. Verification of what equipment/things might be in the way for a smooth installation.

Tools, personnel and equipment required to be brought on board for the 2024 inspection are summarized in Section 6.

# 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 - 2014 |
| /4/ BS EN ISO 19901-5 | Specific requirements for offshore structures – Part 5: Weight Management - 2021 |
| /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/ EN 1993-1-1 | Design of steel structures - Part 1-1: General rules and rules for buildings |
| /9/ EN 1993-1-5 | Design of steel structures - Part 1-5: Plated structural elements |
| /10/ DNV-ST-N001 | DNV GL - Marine operation and marine warranty - 2021 |
| /11/ DNV-ST-0145 | DNV, Offshore substations |
| /12/ DNV-RP-C201 | DNV, Buckling Strength of Plated Structures, October 2010. |
| /13/ DNV-ST-0126 | Support structures for wind turbine, 2018 |
| /14/ DNV-RP-C205 | Environmental conditions and Environmental loads, 2019 |

## 3.2 COMPANY SPECIFICATIONS

| Doc. No. | Description |
|---|---|
| /15/ DEP 37.19.00.12 | Gen - Offshore Topsides Structures |
| /16/ DEP 37.19.00.30 | Gen - Fixed Steel Offshore Structures (Adoption of IOGP S-631-11, Amendments / Supplements to ISO 19902:2020). |
| /17/ 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 |
|---|---|
| /18/ 123A90-DDL-ST-SP-90017 | Structural Design Basis |
| /19/ 123A90-DDL-MD-RE-01006 | Monthly Weight Report |
| /20/ 144671-VOOW-TF-ENG-DWG-1190 | Primary and Special steel Monopile CW70 BLPH |
| /21/ 144671-SIF-TF-FAB-MRB-1067 | Manufacturing Record Book MP67-CW70 |
| /22/ 144671-VOOW-GEN-SUR-REP-0074 | Foundation As-built Survey CW70 HNA6 |
| /23/ 144671-VOOW-TF-INS-REP-0001 | Mock-up report MP Cover |
| /24/ D3151392 | Prepare foundation |

## 3.4 OTHER DOCUMENTS

| Doc. No. | Description |
|---|---|
| /25/ K559–2254-ST-PHI-001 | BLPH Structural Topsides Design & Installation Philosophy, Rev.1, 09 December 2022 |

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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 |
| BESS | BATTERY ENERGY STORAGE SYSTEM |
| BG | Box Girder |
| BLPH | Base Load Power Hub |
| BL | Boat Landing |
| CL | Concentrated Load |
| CF | Caisson Frame |
| CoG | Centre of Gravity |
| CW | CrossWind |
| DAF | Dynamic Amplification Factor |
| DLB | Ductility Level Blast |
| DNV | Det Norske Veritas |
| DP | Dynamic Positioning |
| El. | Elevation |
| EPCI | Engineering Procurement Construction and Installation |
| FEED | Front End Engineering Design |
| FEA | Finite Element Analysis |
| FEM | Finite Element Method |
| HAT | Highest Astronomical Tide |
| HKN | Hollandse Kust Noord |
| IAC | Inter array cable |
| ICCP | Impressed Current Corrosion Protection |
| LAT | Lowest Astronomical Tide |
| LRFD | Load and Resistance Factor Design |

| | |
|---|---|
| MSL | Mean Sea Level |
| NTE | Not-to-Exceed |
| OD | Outside Diameter |
| PAU | Pre-Assembled Unit (H2 Vessels) |
| PG | Plate Girder |
| SHL | Static Hook Load |
| T&I | Transport & Installation |
| ToS | Top of Steel |
| UC | Unity Check |
| UDL | Uniformly Distributed Load |
| VM | Von Mises |
| VMS | Von Mises Stress |
| WTG | Wind Turbine Generator |
| W2W | Walk to Work |

*Table 4.1 - Definitions and Abbreviations*

# 5 BLPH PLATFORM DESCRIPTION

The final configuration of BLPH platform is shown in fig. 5.1.

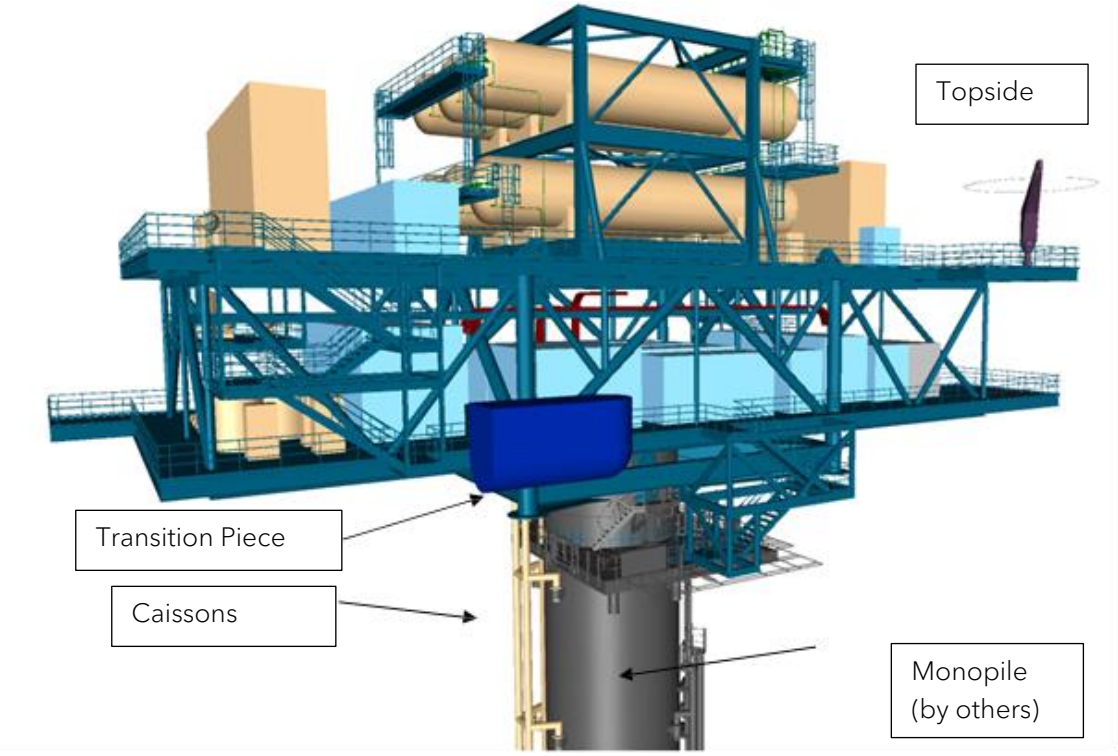



*Figure 5.1 – BLPH platform*

The monopile CW70 was installed in Jan. 2023. The monopile has been surveyed on 29 May 2023, which revealed the following as built data, as reported in Ref. /22/.

## 5.1 MONOPILE AS BUILT DATA

| Description | Tolerance | Design | As-built | Δ design |
|---|---|---|---|---|
| Easting [m ETRS89 UTM31 N] | ± 0.50 | 590719.10 | 590718.95 | 0.15 |
| Northing [m ETRS89 UTM31 N] | ± 0.50 | 5841602.30 | 5841602.42 | -0.12 |

*Table 5.1- As built coordinates Ref. /22/*

The above co-ordinates are referenced to ETRS89 / UTM zone 31N global coordinate system.




*Figure 5.2 – CW70 monopile (access ladder and main access platform)*

## 5.2 MP FLANGE AS BUILT DATA

The interface level between Monopile and Transition piece is at El.+17.090 m relative to LAT.

| Description | Tolerance | Design | As-built | Δ design |
|---|---|---|---|---|
| Top of Flange Level [m NL LAT 2018] | ± 0.10 | 17.05 | 17.09 | -0.04 |
| Flange heading referenced to True North [°] | ± 5.00 | 0.00 | -2.25 | 2.25 |

*Table 5.2- MP flange elevation and heading Ref. /22/*

| Description | Tolerance | Design | As-built | Δ design |
|---|---|---|---|---|
| Flange (Inclination) [°] | <= 0.25 | 0.00 | 0.04 | -0.04 |
| Flange inclination heading referenced to True North [°] (Heading towards lowest point) | | | 269 | |

*Table 5.3- MP flange inclination. Ref. /22/*

NOTE the consequence of existing flange inclination on TP shall be assessed after receiving the TP as built survey, and accordingly decision will be taken on the cut of extra lengths.

| No. | Direction [°] | Boltholes | Distance [mm] |
|---|---|---|---|
| 1 | 0 - 180 | 1 - 79 | 6680.7 |
| 2 | 45 - 225 | 20 - 98 | 6679.3 |
| 3 | 90 - 270 | 40 - 118 | 6680.0 |
| 4 | 135 - 315 | 60 -138 | 6679.0 |

| Description | Tolerance | Design | As-built | Δ design |
|---|---|---|---|---|
| Single measurement BCD Max. [mm] | +/- 3.0 | 6681.0 | 6680.7 | 0.3 |
| Single measurement BCD Min. [mm] | | | 6679.0 | 2.0 |
| Flange Ovality [mm] | ≤ 5.0 | 0.0 | 1.7 | 1.7 |

*Table 5.4- MP bolts holes position and flange ovality Ref. /22/*

| Description | Tolerance | Design | As-Built | Δ design |
|---|---|---|---|---|
| Overall Flange Flatness Outer Flange [mm] | ≤ 2.5 | 0.0 | 1.1 | -1.1 |

*Table 5.5- MP flange flatness Ref. /22/*

| [°] | Inner Diameter [mm] | Outer Diameter [mm] | Flange Angular Displacement [mm] | Local Flatness Outer Diameter [mm] |
|---|---|---|---|---|
| 0.0 | -5.35 | 0.59 | -5.94 | 0.50 |
| 7.5 | -5.10 | 0.69 | -5.79 | 0.39 |
| 15.0 | -5.05 | 0.82 | -5.87 | 0.36 |
| 22.5 | -4.94 | 0.87 | -5.81 | 0.33 |
| 30.0 | -4.93 | 0.95 | -5.88 | 0.23 |
| 37.5 | -4.92 | 1.02 | -5.94 | 0.21 |
| 45.0 | -4.88 | 1.05 | -5.93 | 0.13 |
| 52.5 | -4.93 | 1.08 | -6.01 | 0.09 |
| 60.0 | -4.86 | 1.04 | -5.90 | 0.12 |
| 67.5 | -4.92 | 0.99 | -5.91 | 0.19 |
| 75.0 | -4.94 | 0.96 | -5.90 | 0.18 |
| 82.5 | -4.92 | 0.89 | -5.81 | 0.19 |
| 90.0 | -5.04 | 0.86 | -5.90 | 0.19 |
| 97.5 | -5.04 | 0.80 | -5.84 | 0.18 |
| 105.0 | -5.10 | 0.77 | -5.87 | 0.20 |
| 112.5 | -5.04 | 0.71 | -5.75 | 0.29 |
| 120.0 | -5.11 | 0.66 | -5.77 | 0.41 |
| 127.5 | -5.13 | 0.51 | -5.64 | 0.38 |
| 135.0 | -5.18 | 0.36 | -5.54 | 0.49 |
| 142.5 | -5.27 | 0.33 | -5.60 | 0.44 |
| 150.0 | -5.36 | 0.17 | -5.53 | 0.36 |
| 157.5 | -5.36 | 0.07 | -5.43 | 0.33 |
| 165.0 | -5.34 | 0.00 | -5.34 | 0.17 |
| 172.5 | -5.40 | 0.13 | -5.53 | 0.28 |

| [°] | Inner Diameter [mm] | Outer Diameter [mm] | Flange Angular Displacement [mm] | Local Flatness Outer Diameter [mm] |
|---|---|---|---|---|
| 180.0 | -5.41 | 0.17 | -5.58 | 0.41 |
| 187.5 | -5.32 | 0.28 | -5.60 | 0.46 |
| 195.0 | -5.29 | 0.41 | -5.70 | 0.61 |
| 202.5 | -5.21 | 0.59 | -5.80 | 0.66 |
| 210.0 | -5.15 | 0.78 | -5.93 | 0.57 |
| 217.5 | -5.04 | 0.94 | -5.98 | 0.49 |
| 225.0 | -4.96 | 0.98 | -5.94 | 0.30 |
| 232.5 | -4.80 | 1.08 | -5.88 | 0.14 |
| 240.0 | -4.79 | 0.99 | -5.78 | 0.13 |
| 247.5 | -4.85 | 1.00 | -5.85 | 0.17 |
| 255.0 | -4.81 | 0.95 | -5.76 | 0.22 |
| 262.5 | -4.88 | 0.91 | -5.79 | 0.44 |
| 270.0 | -5.06 | 0.78 | -5.84 | 0.59 |
| 277.5 | -5.26 | 0.56 | -5.82 | 0.65 |
| 285.0 | -5.40 | 0.36 | -5.76 | 0.61 |
| 292.5 | -5.51 | 0.26 | -5.77 | 0.50 |
| 300.0 | -5.60 | 0.17 | -5.77 | 0.36 |
| 307.5 | -5.64 | 0.06 | -5.70 | 0.26 |
| 315.0 | -5.69 | 0.00 | -5.69 | 0.17 |
| 322.5 | -5.71 | 0.06 | -5.77 | 0.23 |
| 330.0 | -5.58 | 0.11 | -5.69 | 0.32 |
| 337.5 | -5.54 | 0.23 | -5.77 | 0.42 |
| 345.0 | -5.47 | 0.32 | -5.79 | 0.48 |
| 352.5 | -5.41 | 0.48 | -5.89 | 0.46 |

*Table 5.6- MP flange flatness – detail Ref. /22/*

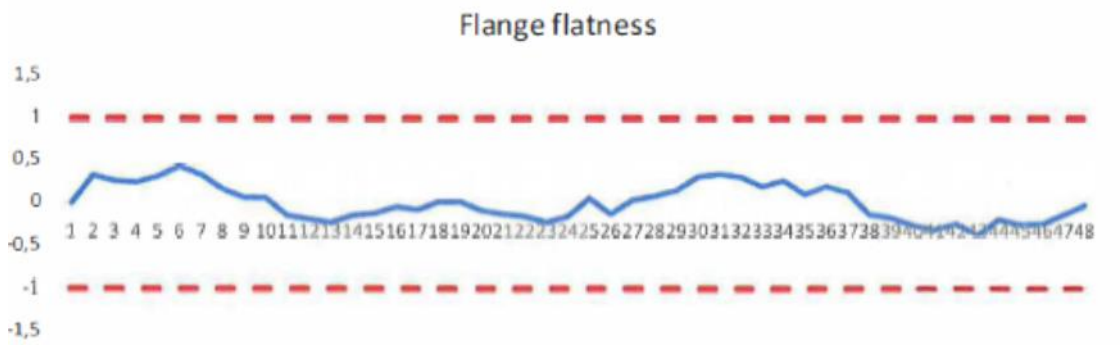



*Table 5.7- MP flange flatness, Ref. /21/*

## 5.3 MONOPILE FITTINGS AND CABLES

### 5.3.1 Temporary Cover

To protect the monopile and the internal fittings a temporary cover has been installed just after the installation (Jan 2023). The cover will be removed few days before installation.



*Figure 5.3 – CW70 monopile temporary cover*

### 5.3.2 Access ladders

As shown in Figure 5.2 above, the monopile is externally equipped with a boat landing and access ladder to the main access platform, located at El. +16.850m LAT.

Internally, the monopile is equipped with vertical access ladders, both temporary and permanent. The temporary ladder connects the flange elevation El. +10.050m to the internal platform at 15.790m LAT (see Fig. 5.4).

Procedure for cover removal is described in report 144671-VOOW-TF-INS-REP-0001 Mock-up report MP Cover, ref. /23/.

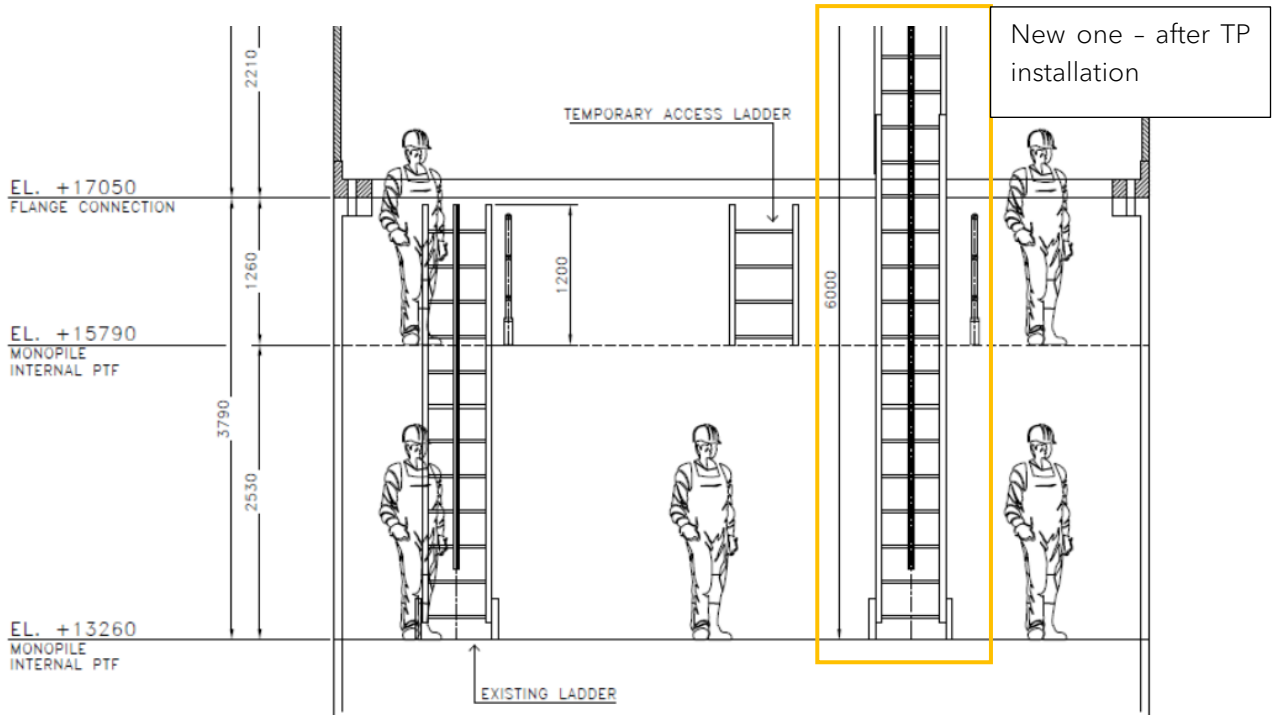



*Figure 5.4 – CW70 monopile internal section*



*Figure 5.5 – Temporary access ladder to EL. +15.790m LAT*



*Figure 5.6 – Access ladder to EL. +13.260m LAT*

### 5.3.3 Internal Cables

Inside the monopile, a few cables have been pulled and new cables are expected to be pulled. The pulling and hanging of the infield electrical cables (IAC – inter array cable) and the fiber optic cable was done after the monopile was installed. The same was done for the ICCP cathodic protection cable. See below Table 5.6. Pulling and hang-off of solar panel cables will be done by the floating solar system contractor/supplier, Terminations will be inside the monopile

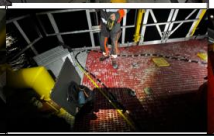
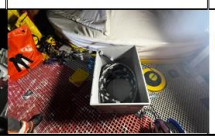
| | | | | | |
|---|---|---|---|---|---|
| **IAC cable measurement** |  |  | | | **minimum lentgh mesured : 10 Meter** |
| **Fiberoptics cable measurement** |  |  |  | | **minimum lentgh mesured : 10 Meter** |
| **ICCP cable @ HOP measurement** |  |  | | | **minimum lentgh mesured : 11Meter** |
| **ICCP cable @ BL measurement** |  |  |  |  | **minimum lentgh mesured : 11Meter** |

*Table 5.8- MP internal cables*



*Figure 5.7 – CW70 internal Cables*

### 5.3.4 Marking

Internal and external marking on monopile and flange are present identifying North (RED) and south (GREEN)

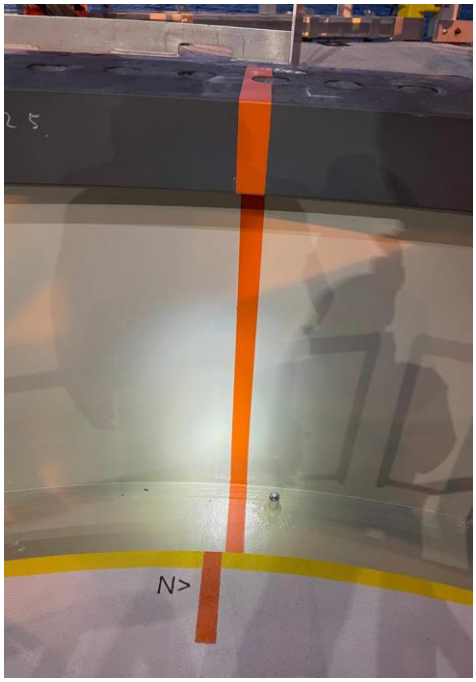



*Figure 5.8 – North marking internal (external see Fig. 5.2)*

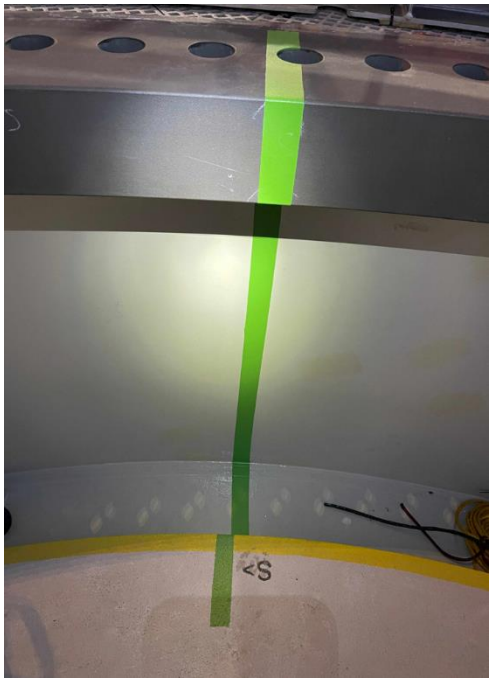



*Figure 5.9 – South marking internal (external see Fig. 6.2)*

# 6 INFORMATION TO BE COLLECTED OR VERIFIED OFFSHORE

The following table lists the activity to be performed during the site visit in preparation of the offshore installation campaign planned on summer 2025. Dedicated column lists the tools requested during the site visit.

| n. | Activity | Item to be checked | Tools required during site visit | Ref. figure | CHECK Y/N |
|---|---|---|---|---|---|
| 1 | Top part of access ladder to be removed | Diameter of the bolts to be removed | Measuring caliper / camera | Fig. 6.1 | |
| 2 | Removal of cover | Fixing system | camera | Fig. 5.3 | |
| 3 | Internal temporary access ladder to El. 15.790m LAT to be removed | Diameter of the bolts to be removed / weight of the ladder | Measuring caliper | Fig. 5.5 | |
| 4 | Internal Cables | | Taper meter /camera | Fig. 5.7 | |
| 5 | Flange overall dim. | Spot check | Taper meter | - | |
| 6 | Bolt holes diameter and relative distance | Spot check | Measuring caliper and taper meter | - | |
| 7 | Items protruding above flange level | Handrail / lighting poles / … | Taper meter<br>camera | - | |
| 8 | Sleeves for caisson frame installation | Sleeves internal diameter / position/ alignment | Camera/plumb | Fig. 6.2, 6.3 | |
| 9 | Internal platform elevation EL. 15790 | Distance from flange for installation guides | Taper meter | Fig. 5.4, 5.5 | |
| 10 | Access ladder protruding above MAP | Distance of the first step above MAP, for cutting purpose | Taper meter | Fig. 6.1 | |
| 11 | Electrical cables check | See appendix A | Camera | Sect 5.3.3 | |

For items 1, 2, 3, 7 need to be decided where them will be put. Base case on CTW.

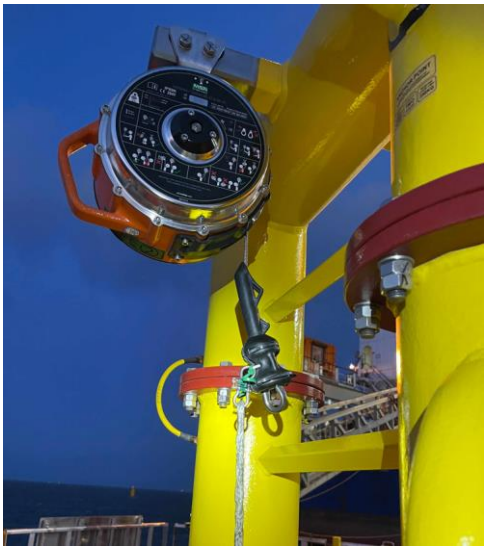


*Figure 6.1 – Top portion of access ladder*

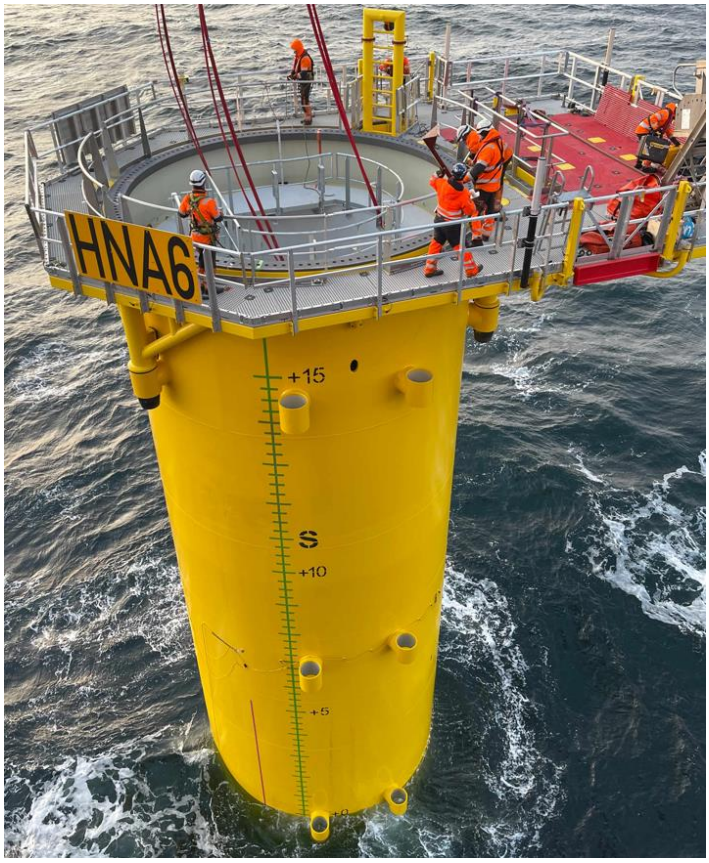



*Figure 6.2 – CW70 monopile – south view*

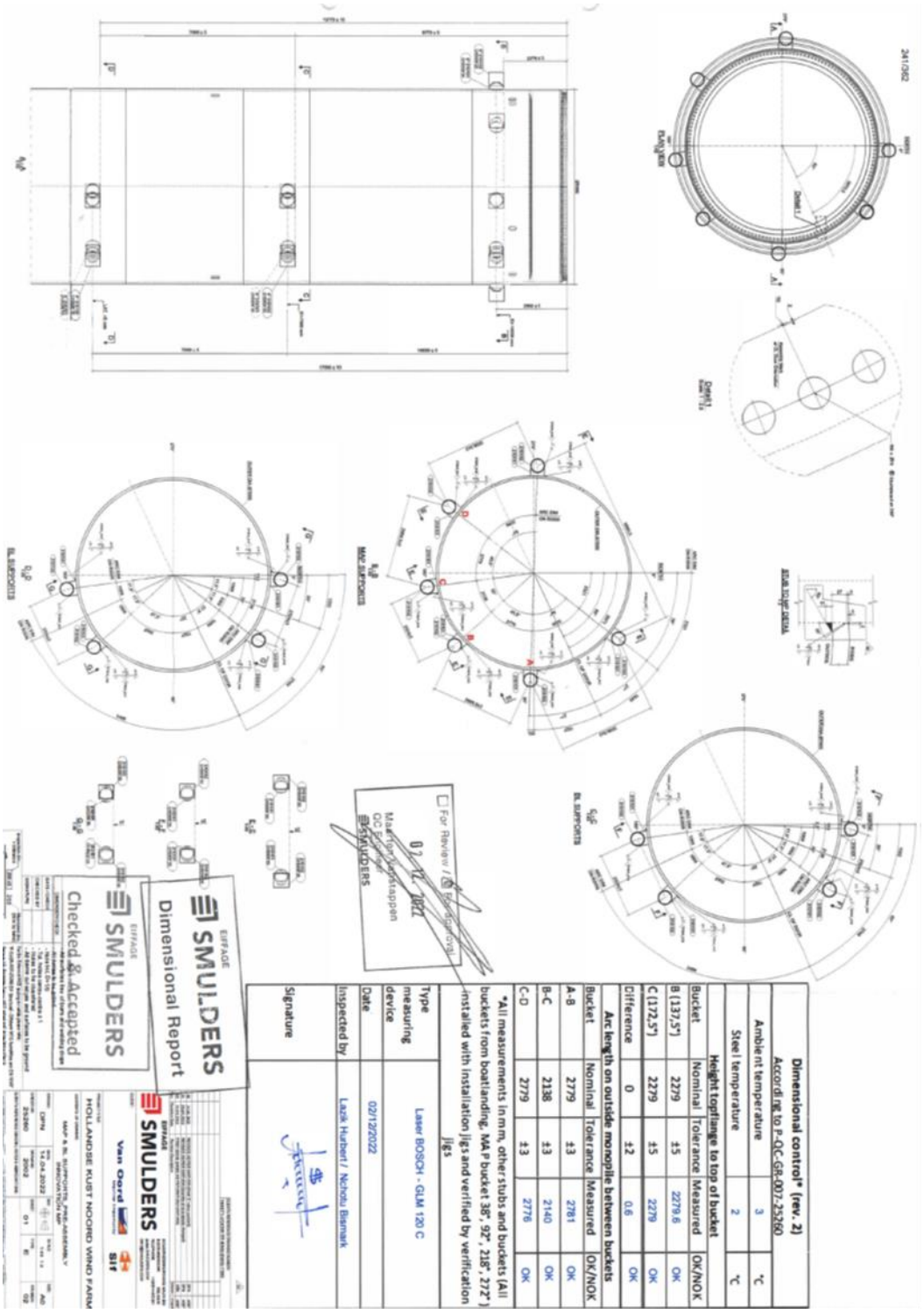
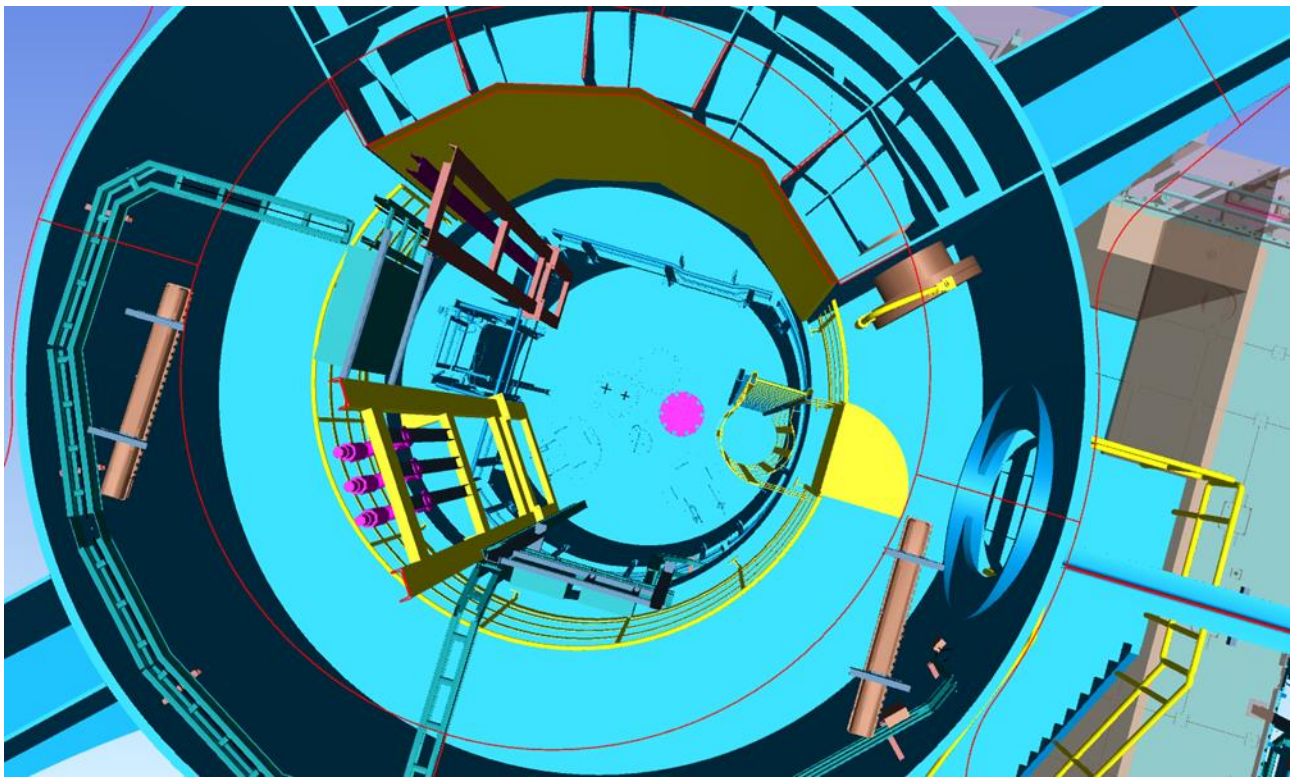


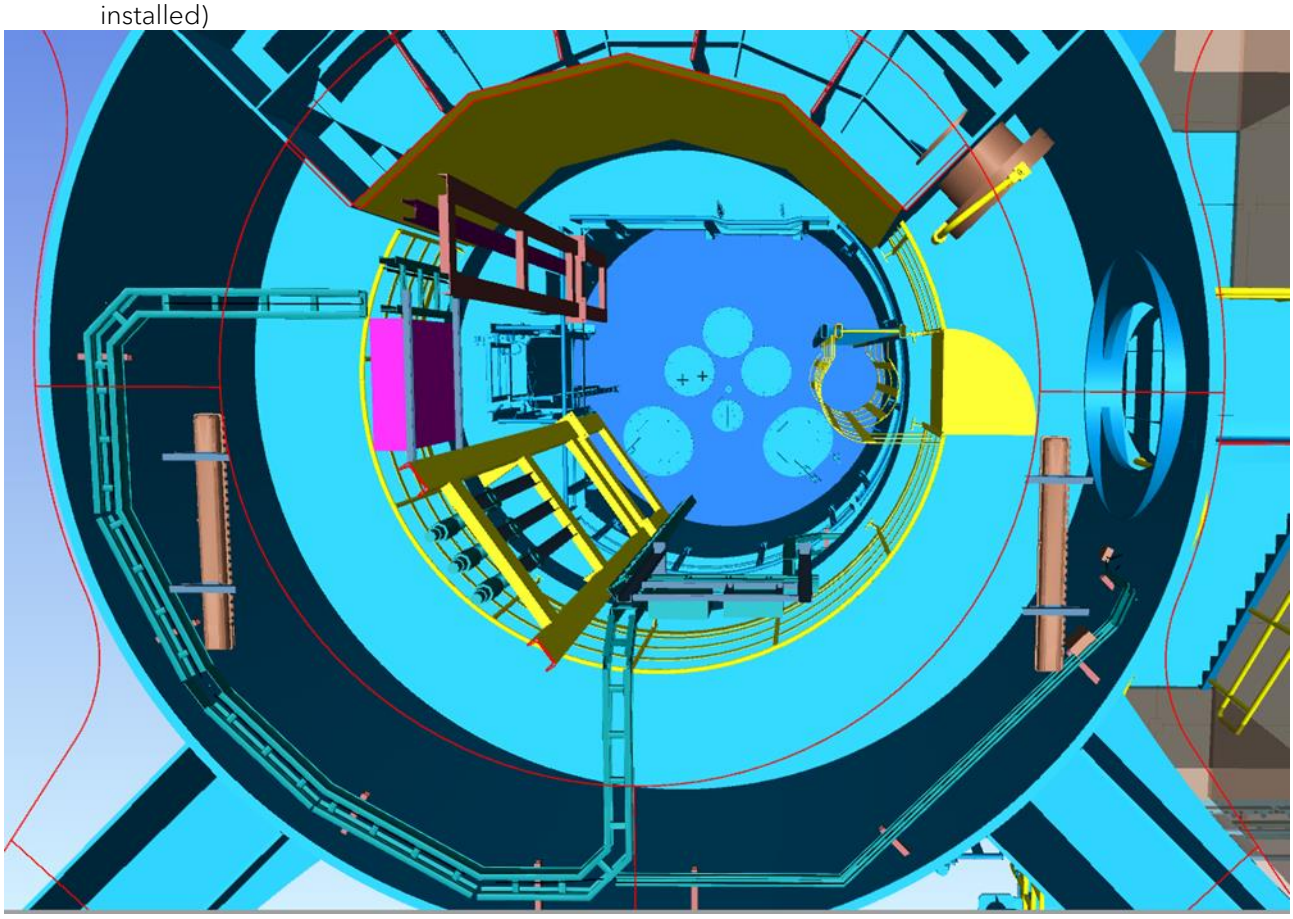

*Figure 6.3 – CW70 monopile – CF support position – dim. Survey, ref. /21/*

# A APPENDIX 1 – CHECKS REQUESTED BY ELECTRICAL DEPT.

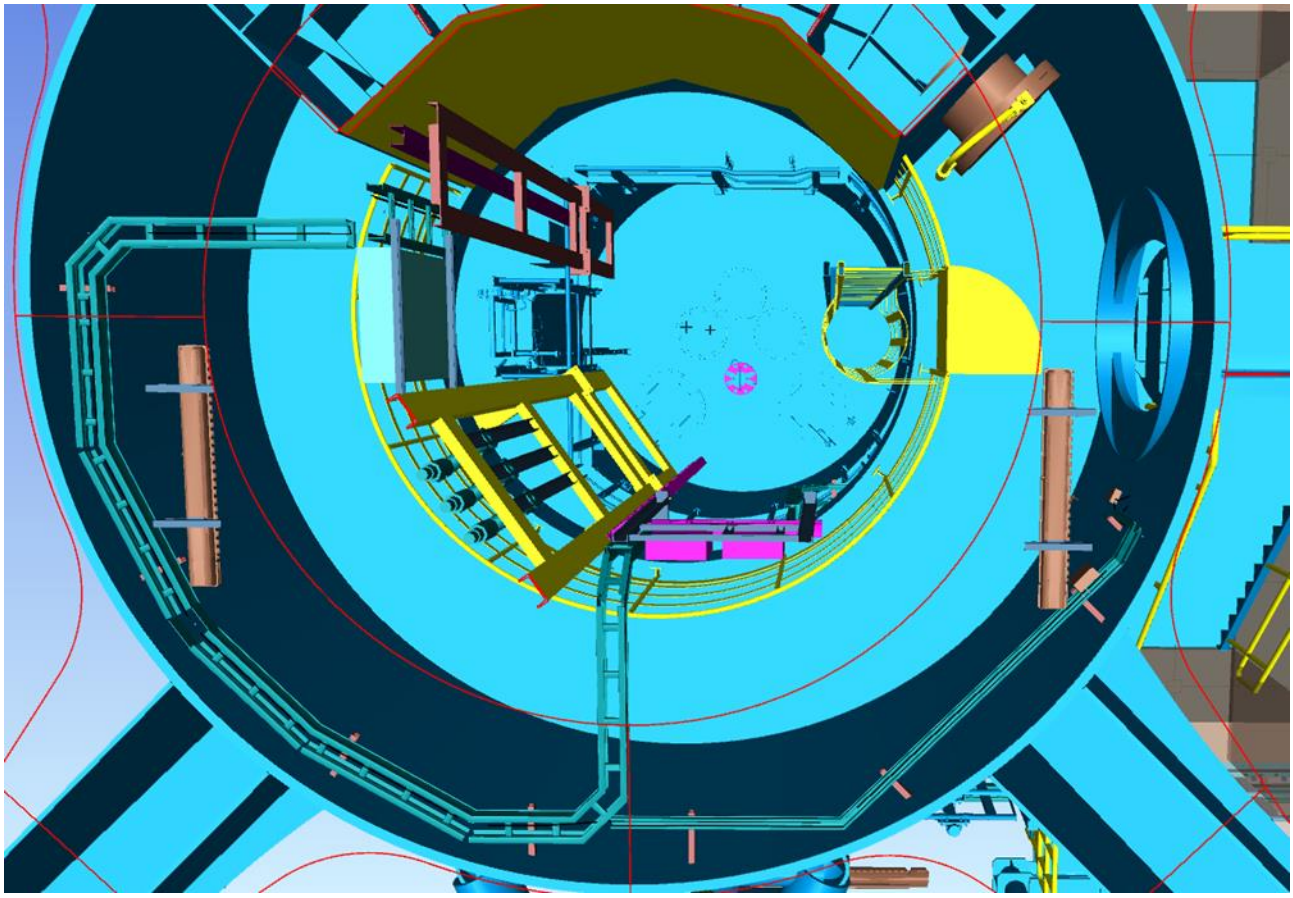
1. Check the cables for streaks or damage/compression in the outer sheath
2. Check that the terminals or insulations of the cable heads are well preserved and have no damage/compressions
3. Check that the cables are protected from weather conditions
4. Check that the T-connectors are sealed on both sides
   - And that there are no rust spots in any temporary fastening
5. Check that the cables are not "dry"
6. Check grounding point in the pole
7. Check cable lengths as identified in par. 5.3.3
8. Verify and validate the 66kV cable path with the location of the T-connectors holder



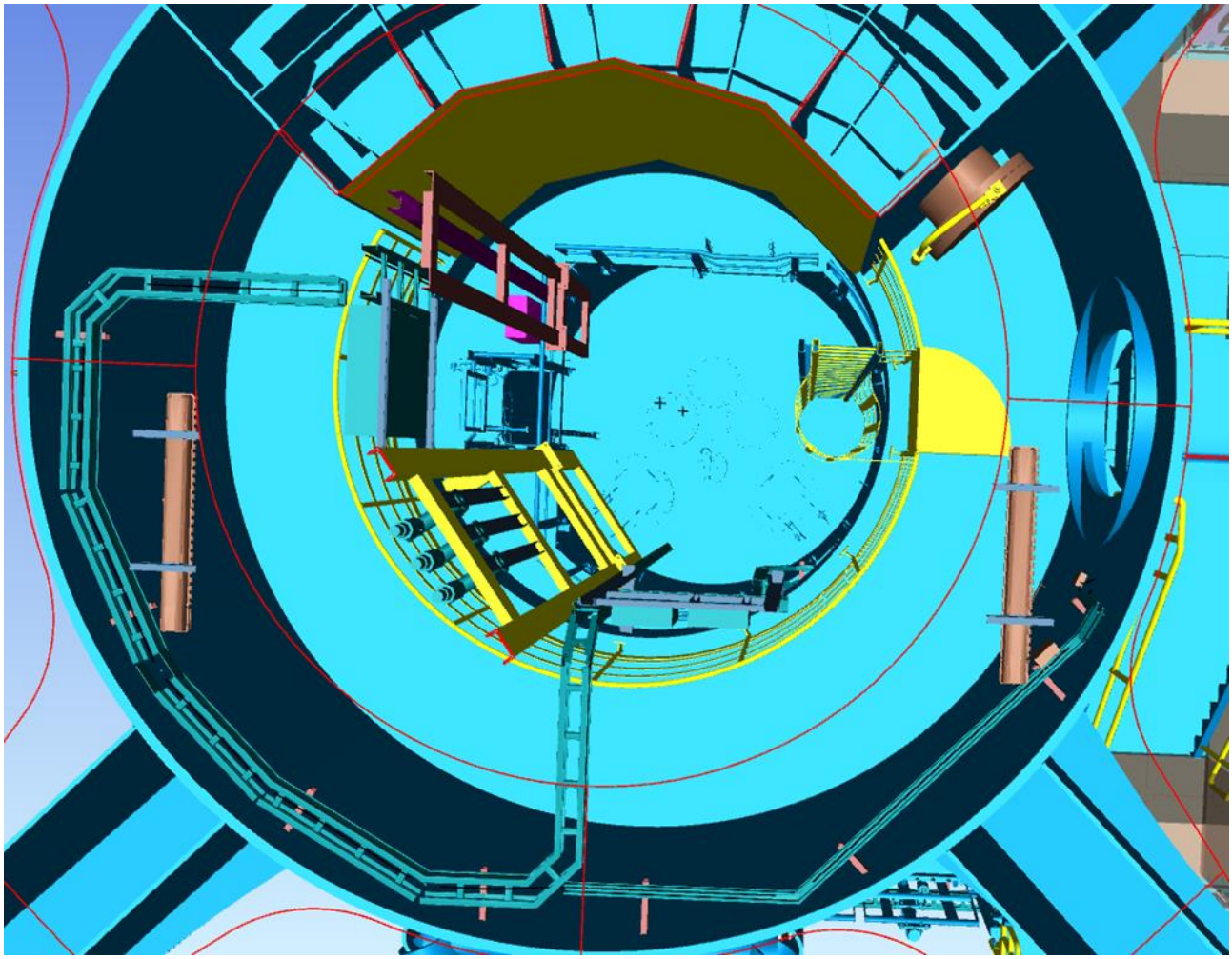
9. Verify and validate the 800V cable path with the location of the interface JB (cable not currently installed)



10. Verify and validate the cable routing of the Internal and External cathodic protection with the position of the interface JBs



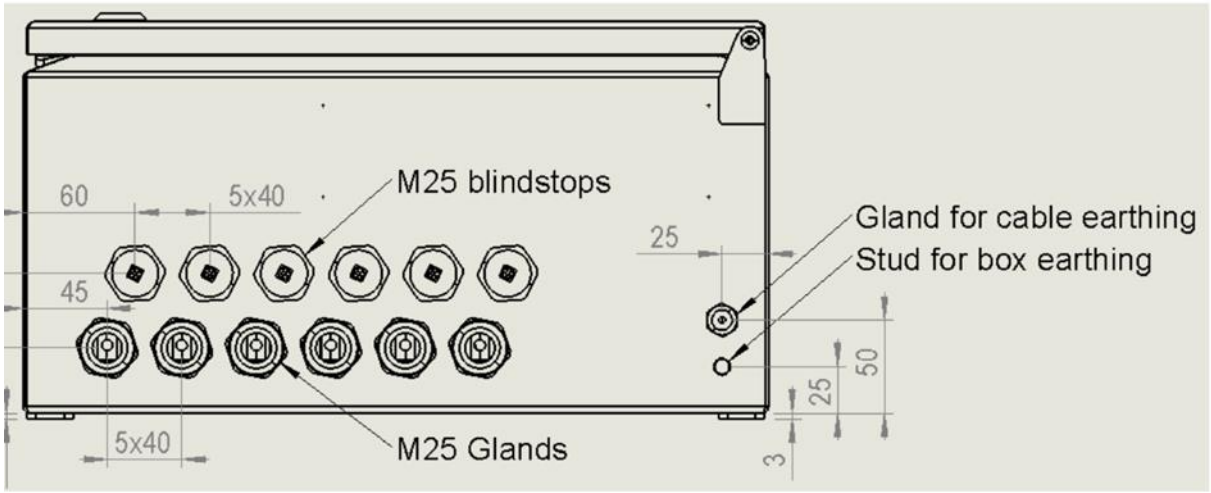
11. Verify and validate the path of the communication cables descending from the roof of the TP with the position of the splice box



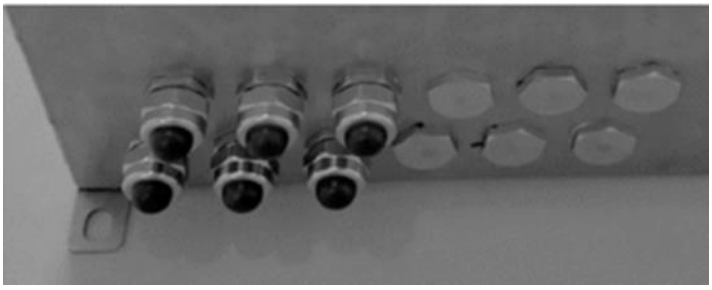
12. Check that the fiber splice box has:
    - N°1 cable gland occupied by fiber arriving from IAC cable
    - N°1 hole for future fiber cable arriving from the submarine cable of the solar park (not yet installed)
    - N°3 holes M20




13. Check that the unused holes in the splice box are closed with plugs



14. Check that any installed and unused cable gland (without cable passage) of the splice box are closed



15. Check for cable gland spares (perhaps inside the splice box)
16. Check the splice box for proper grounding

# B APPENDIX 2 – PREPARE FOUNDATION

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# ZWI-Prepare foundation

| Document ID and revision | Status | Date (yyyy-mm-dd) | Language |
|---|---|---|---|
| #docid/#revid | #status | #releasedate | en-US |

| Applicability | Project | Risk assessment | Checklist |
|---|---|---|---|
| SG-11.0-200 | HKN | D3151394 | D3151393 |

## Work instruction - Tower installation

SIEMENS Gamesa
RENEWABLE ENERGY

# ZWI-Prepare foundation

| Document ID and revision | Status | Date (yyyy-mm-dd) | Language |
|---|---|---|---|
| #docid/#revid | #status | #releasedate | en-US |

| Original or translation of | RDS-PP® | DCC |
|---|---|---|
| Original | =MD | &MDC070 |

| File name |
|---|
| #filename |

| ECN | Updates made since the previous revision |
|---|---|
| #ecnnumber | See change history |

| Applicability |
|---|
| SG-11.0-200 |

| Source XML number and revision |
|---|
| X01067263/001 |

| Project | Risk assessment | Checklist |
|---|---|---|
| HKN | D3151394 | D3151393 |

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# 1. Updates made since the previous revision

| Section | Description |
|---|---|
| N/A | New document. |


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# 2. Introduction

X01067270/001

## 2.1. Scope of work

X00820881/002

This is an installation instruction. It is undertaken offshore at the foundation. It prepares components, tools and the foundation flange to receive the tower. All tasks in the work instruction are presented as step-by-step instructions in section 4 Task. Significant risks related to the tasks are included in this work instruction.

All relevant documents to be used in addition to this instruction are listed in section 6.2 Relevant document information. All technicians must be familiar with this information prior to commencing work.

The risk assessment is applicable for this work instruction. The risk assessment informs in detail all hazards and required control measures to be taken related to the tasks.

Technicians must complete the checklist for this work instruction during work to confirm that the work is carried out in accordance with the work instruction.

## 2.2. Prerequisite

X00927315/002

Technicians must read and understand section 3.3 Safety procedures to prepare for safe work before carrying out the tasks described in the work instruction. This section overall informs about important risks and control measures to be taken related to the tasks.

## 2.3. Document structure

X00927314/001

This document is primarily designed for use on electronic devices such as iPads or tablets. Smart navigation is possible throughout the document where hyperlinks are available.


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# 3. Preparation X01067271/001

## 3.1. Competences and job profiles for technicians X01067276/001

Number of technician job profiles required to complete this work instruction (according to INS-19394).

| Job profiles | | | |
|---|---|---|---|
| Min. no | | Abbreviation | Job profiles title |
| | 2 | TT-I | Tower Technician in Installation |

Definition of competence categories.

| Competence Categories | | |
|---|---|---|
| Color | Category | Definition |
| Red | Technician | This technician category is defined by the very basic competencies that all project wind technicians must possess to work safely |
| Yellow | Special technician | This technician category is defined by the very basic competencies that all project wind technicians must possess, in a specialized field of work, to work safely |
| Green | Competent technician | This technician category is defined by the advanced competencies that enables project wind technicians to perform independently, train and direct others in working safely and effectively as well as ensure safety within the specific job profile |
| Blue | Lead technician | This technician category is defined by the expert competencies that enable project wind technicians to plan, supervise, and contribute to a safe execution of wind turbine projects |

## 3.2. Special training requirements X01067273/001

The following special training of technicians are required to carry out the tasks in this work instruction.

| Pictogram | Information |
|---|---|
|  | 1 technician to have received Tower Guide System (TGS) training |

## 3.3. Safety procedures to prepare for safe work X01067274/001

The following safety procedures must be completed before starting the tasks in this work instruction.

| Pictogram | Information |
|---|---|
|  | It is mandatory for all involved technicians to comply with PRO-106614 Setting to Work. It is mandatory for all involved technicians to participate in Pre-job brief and perform a Take 5 as per "PRO-106614 Setting to Work" before the work is started. |
|  | Before commencing the installation job, a safe gangway must be established by the vessel crew between the installation vessel and the foundation |


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## 3.4. Personal Protective Equipment (PPE)

X00927307/003

Wear applicable Personal Protective Equipment (PPE) in compliance with site-specific rules for site entry.

| Standard PPE |
| --- |
|  |

Wear required Personal Protective Equipment (PPE) to carry out specific tasks in this work instruction.

| Task-specific PPE | |
| --- | --- |
|  | Personal Fall Protective Equipment (PFPE) required when working at heights. |
|  | Tether tools and items to prevent dropped objects when working at heights. |

## 3.5. Special tools and equipment required

X01067272/001

Tools and equipment such as screwdrivers, socket wrenches, spanners, and so on are considered standard equipment and thus not listed in the special tools list.

Special tools and equipment required for this work instruction are listed here.

| Number | Tool description |
| --- | --- |
| | Step ladder (for accessing Flange Access Platform) |
| | Hot water high pressure washer PW-H50 |

## 3.6. Location overview for tasks

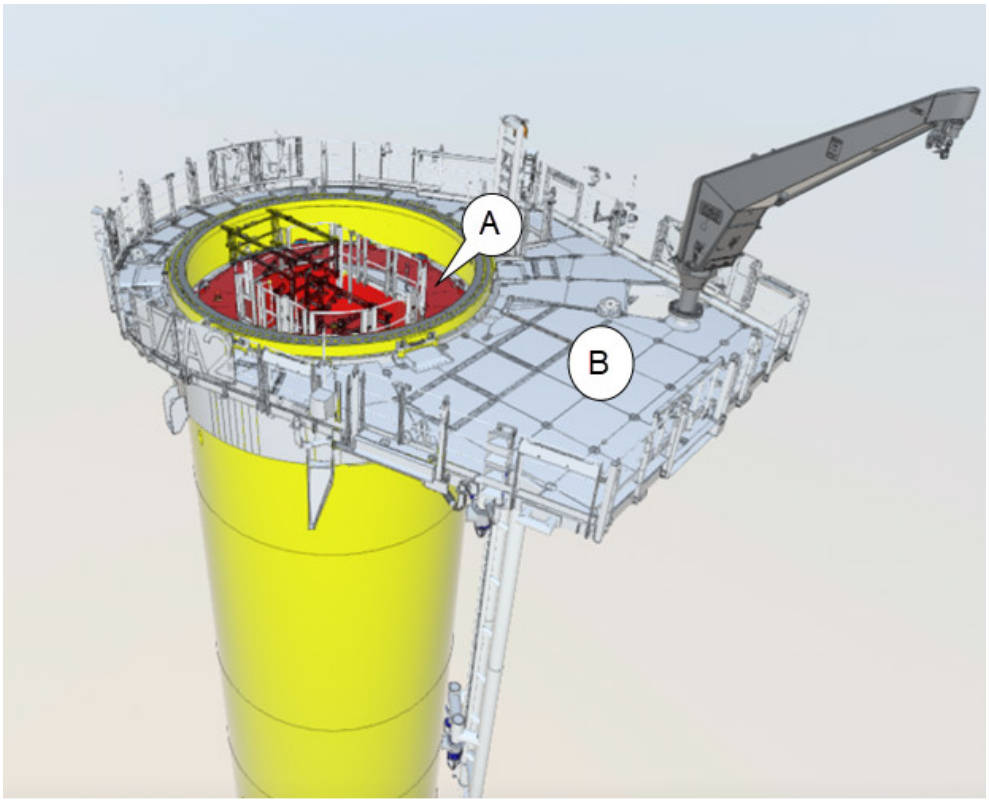
X01067275/001

This work instruction describes tasks taking place on following locations.

| Reference | Location name |
| --- | --- |
| (A) | Bolt tightening platform |
| (B) | External platform |


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| Reference | Location name |
|---|---|




X01227183_001


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# 4. Task

X01067264/001

## 4.1. Clean Transition Piece (TP)

X01321509/001

| About this task - Before you begin | | | |
|---|---|---|---|
| | **Location**<br>Transition Piece | | **Number of technicians**<br>1 TT-I & 1 CT-I required for this task |

**WARNING**

**Biological Hazard - Guano**

**Risk:** When removed from a surface using a high pressure washer or other means, the guano becomes airborne and can cause serious respiratory issues.

- When removing the guano with a pressure washer or equivalent, ensure that it is done from a distance and the spray/mist does not travel in the direction of anyone nearby.
- Wear face mask conforming to EN149 such as FFP2.
- Wear safety glasses conforming to EN166.

**Pressurized Systems - Pressure washer**

**Risk:** When the pressure washer is in operation there is a risk of injury through pressurized cutting action and hot water leading to burns.

- Complete a pre-use check of the equipment to ensure that the Pressure output is set to no more than 100 Bar and the water temperature output is no higher than 60°C.
- Where appropriate, barrier the area in which the pressure washer will be being operated in.
- Ensure the nozzle is set correctly according to manufacturers instructions and task
- Do not aim the nozzle of the pressure washer in the general direction of any persons in case of any sudden changes in pressure.
- Ensure that nozzle distance from the cleaned surface is appropriate for the pressure and temperature used.
- Wear safety gloves conforming to EN407.
- Wear face visor conforming to EN166.
- Wear protective suit conforming to EN369.

**Manual Handling - High Pressure Water Hose**

**Risk:** When handling the hose, there is a risk of injury through ergonomic stress and strain.

- Remove obstructions (incl. unsafe trip and slip conditions) from the task area before start of manual handling the load
- Pay special attention to the hose to ensure that no kinks form when being handled.

**Fall or drop hazard- Floor Openings / hatches.**

**Risk:** When exposed floor openings there is a risk of serious injuries or a fatality from falling into it or through it.

- Visually identify floor openings or open hatches before the start of work.
- Ensure hatches and any floor openings on TP are closed before starting the work.
- Use fall protection equipment if task requires to work in the vicinity of a platform opening or open hatch.

**Trip hazard-cable and water hose lying on floor**

**Risk:** When exposed to power cables and water hose lying on a walkway there is a risk of serious injuries from tripping and falling.

- Visually indicate / self-identify potential floor trip hazards (cable) before, during and after work.
- Remove or securely route cable and hose at floor level or overhead to prevent tripping.


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| About this task - Before you begin | |
|---|---|
| **WARNING** | |
|  | **Electricity Hazard - Connecting cleaner with power supply.**<br>**Risk:** When exposed to live electrical parts, there is a risk of electrical injuries especially under wet environmental conditions.<br>• Ensure that the socket is in the OFF position before connecting or disconnecting cables from it.<br>• Ensure there are no broken sockets or open wires left upon completion of the task<br>• Do not connect plugs if they are wet.<br>• If the cable is supplying power, ensure that the power source is disconnected before creating or dismantling the connection to the socket. |
|  | **Falling Objects - Tools, equipment, and small Items/components**<br>**Risk:** When items and hand tools are potentially able to drop, there is an increased risk of injury through being struck by the falling object.<br>• Inspect work area and identify potential falling objects before during and after work, remove or safeguard potential falling objects.<br>• Tether all tools and equipment.<br>• Use tool bag attached to harness for small items e.g. bolts and nuts etc., Max 5 Kg.<br>• Radio to be secured in its holster.<br>• Ensure there are no loose items left in pockets.<br>• No personnel allowed to work below. |
|  | Wear all required PPE for the activity – suits, gloves, helmet visor, respiratory masks. |

| Step 1 | |
|---|---|
| | Ensure all TP cover hatches are properly closed and no water can enter the TP. |

| Step 2 | |
|---|---|
| | Ensure there is suitable access to the Guano affected area. |

| Step 3 | |
|---|---|
| | Transfer the high-pressure cleaner from the vessel to the external platform. |

| Step 4 | |
|---|---|
| | Connect the high-pressure cleaner to power and supply fresh water from the vessel through the gangway. |

| Step 5 | |
|---|---|
| | Operate the high-pressure cleaner according to the device manual.<br>Ensure to operate with a max pressure of 100 bar.<br>Keep the nozzle of the spray gun at a safe distance of min 50 cm from any coated surface or electrical item.<br>Do not use a water temperature above 60 °C. |

| Step 6 | |
|---|---|
| | Clean the affected surface until all Guano is removed. |

| Step 7 | |
|---|---|
| | After cleaning, record the condition of the TP. |

| End |
|---|


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## 4.2. Remove monopile cover

X01133988/001

| About this task - Before you begin | | | |
|---|---|---|---|
| | **Location**<br>External platform, Bolt tightening platform | | **Number of technicians**<br>1 TT-I & 1 CT-I required for this task |

**WARNING**



**Suspended load - monopile cover**

**Risk:** There is a risk of serious injuries or death from the load falling on someone and or crushing someone standing or working between the load and a fixed structure.

- Competent crane operator is part of planning the lift.
- No persons to be underneath suspended load.
- No person to be between the load and a fixed structure.
- Barrier crane's work areas/lifting areas.
- Undertake pre-use check of lift equipment and accessories before lift and lift equipment and accessories confirm to local legal regulatory requirements.
- Working load limit (WLL) not to be exceeded.
- Ensure clear and understood communication with all parties before start of lift.
- Assess weather conditions.
- All involved in the lift shall work according to SGRE approved lift plan and lift instructions.



**Falling Objects - Tools, equipment, and small Items/components**

**Risk:** When items and hand tools are potentially able to drop, there is an increased risk of injury through being struck by the falling object.

- Inspect work area and identify potential falling objects before during and after work, remove or safeguard potential falling objects.
- Tether all tools and equipment.
- Use tool bag attached to harness for small items e.g. bolts and nuts etc., Max 5 Kg.
- Radio to be secured in its holster.
- Ensure there are no loose items left in pockets.
- No personnel allowed to work below.



**Fall hazard - MP ladder**

**Risk:** When using step ladder there is a risk of serious injuries or a fatality from falling from it.

- Carry out pre-use checks and suitability of ladder for the task.
- Ensure ladder is certified for use i.e. has an in-date sticker visibly/legible on it.
- Adhere to 3-points-of-contact when using the ladder.



**Overhead obstacles-metal poles**

**Risk:** There is a risk that technicians can potentially hit their heads against overhead obstacles when working around them.

- Visually identify the overhead obstructions and be aware of the overhead obstacles before start of the work.
- Wearing helmet on site is mandatory.



**Manual handling - Tarpaulin and MP ladder.**

**Risk:** When manually handling tarpaulin and MP ladder, there is a risk of injuries from ergonomic stress, tripping, slipping and falling.

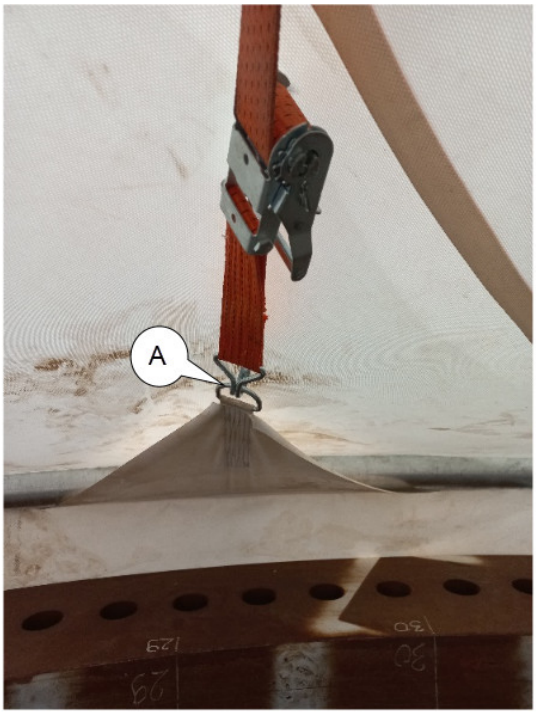
- Remove obstructions (incl. unsafe trip and slip conditions) from the task area before start of manual handling the load.
- Before manual handling, discuss mechanical means/aids of handling the load.

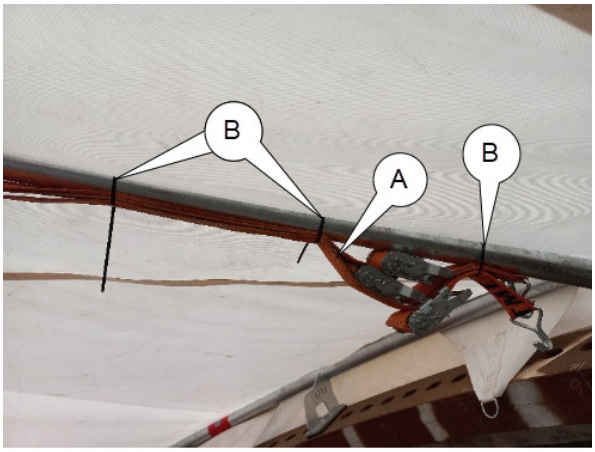

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| About this task - Before you begin |
|---|
| **WARNING** |
| • Plan a good posture before handling a load.<br>• Determine how many persons are required to lift and move a load safely.<br>• Adhere to TILE principle - Task Individual Load Environment when handling the load.<br>• Note: Particular consideration should be given to loads over 15 Kg, which are of a difficult size and shape. |
| **Trip hazard- ratchet straps and cables on platform**<br>**Risk:** When exposed to loose ratchet straps and cables lying on platform there is a risk of serious injuries from tripping and falling.<br>• Visually indicate / self-identify potential floor trip hazards (ratchet straps and cables) before, during and after work.<br>• Remove or securely route straps and cables at floor level or overhead to prevent tripping.<br>• |

| Step 1 | |
|---|---|
| Loosen the bolt (A) to release the tension in the ratchet strap around the outside of the MP cover. |  X01133961_001 |


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| Step 2 | | |
|---|---|---|
| | Release the tension in the internal ratchet straps and disengage the straps from the bottom connection (A). |  X01133970_001 |

| Step 3 | | |
|---|---|---|
| | Secure the loose ratchet straps (A) to the metal structure with the cable ties (B). |  X01133946_001 |


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| Step 4 | | |
|---|---|---|
| | Remove the ventilation cap (A) off x1 from the ventilation pipe brackets. |  X01133982_001 |

| Step 5 | | |
|---|---|---|
| | Remove the (x2) ventilation pipe brackets (A) from the MP flange. |  X01133952_001 |


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| Step 6 | | |
|---|---|---|
| | Release the cover from underneath the lateral metal pole so the cover is free to move. |  X01133955_001 |

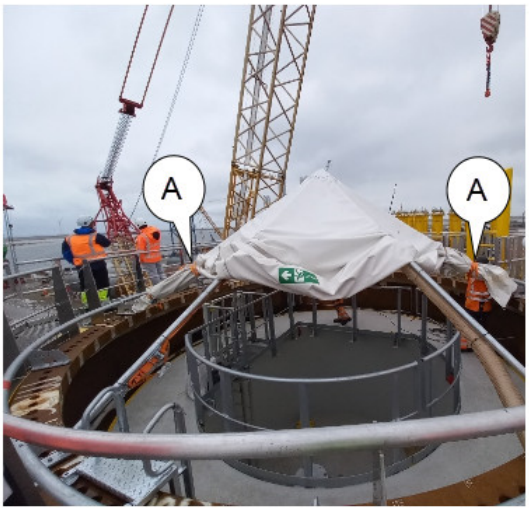
| Step 7 | | |
|---|---|---|
| | From opposite sides, roll the tarpaulin up across the diagonal in line with one of the metal poles.<br>Roll the tarpaulin up as high as possible to minimize the area left.<br>Roll the tarpaulin along a different metal tube to the one with the ventilation pipe. |  X01133976_001 |


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| Step 8 | |
|---|---|
| | After tarpaulin rolled up on both sides, connect the two rolled edges together with ratchet straps (A) on both sides of the cover. |





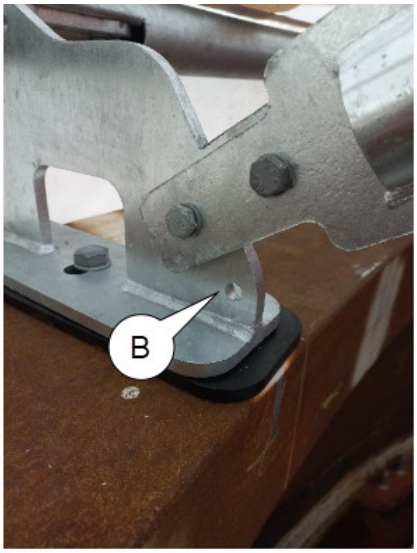


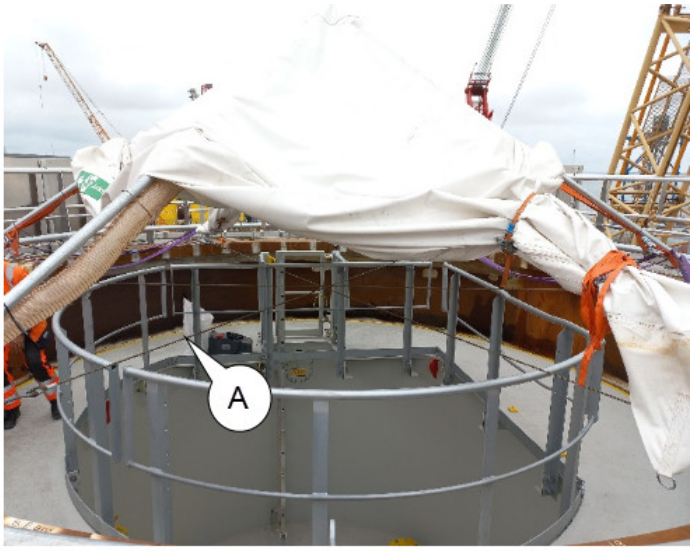

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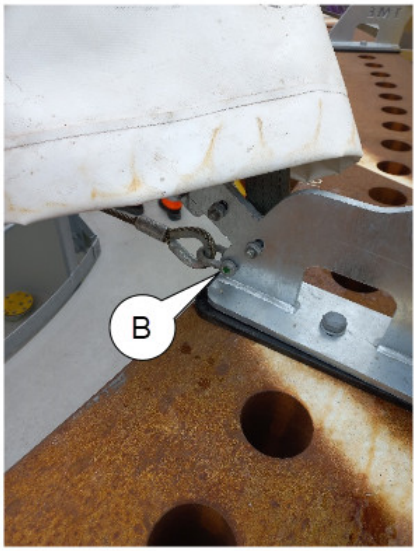

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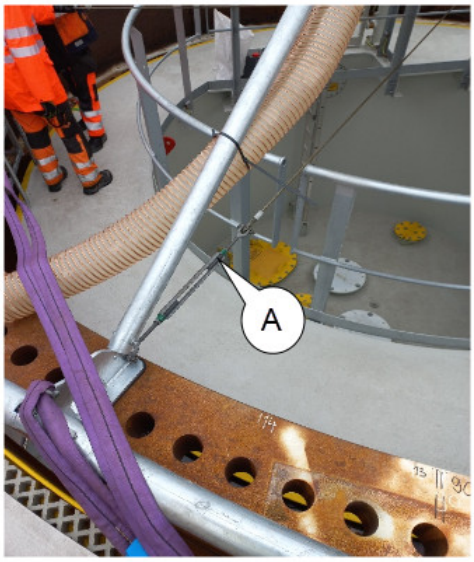
| Step 9 | |
|---|---|

Attach (x3) tensioning wires (A) to the x6 attachment points on the MP cover brackets (B).



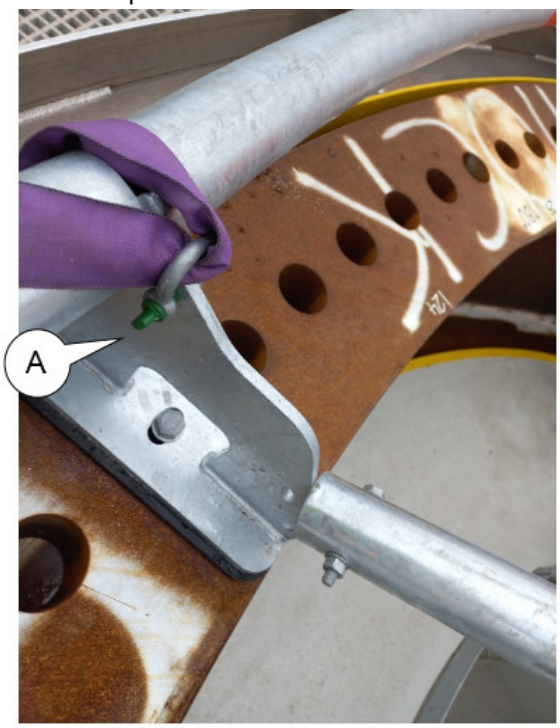



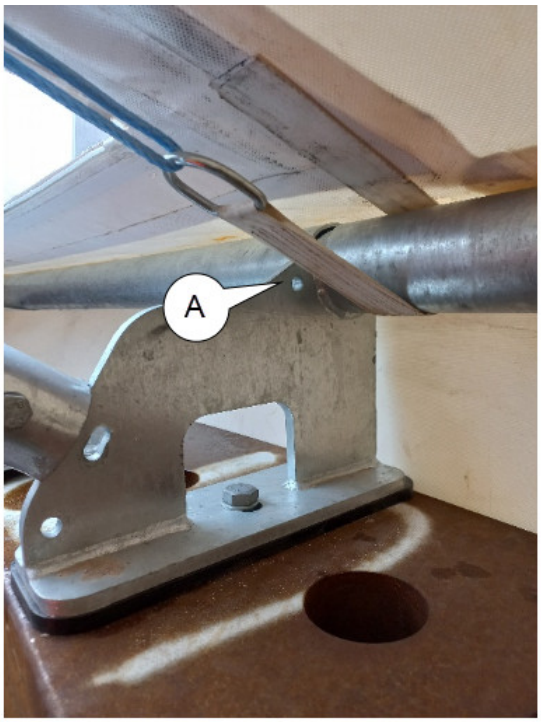




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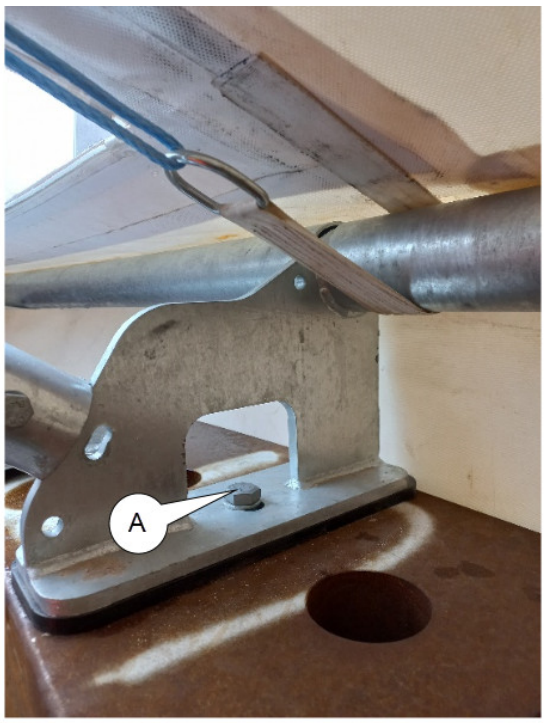
| Step 10 | |
|---|---|
| | Attach the shackles and lifting slings to the (x6) lifting points on the MP cover brackets (A) and on the MP external platform. |




X01133973_001

| Step 11 | | |
|---|---|---|
| | To remove the MP cover from the MP, remove the (x6) bolts (A) that attaches the (x6) MP cover brackets to the MP flange. | |




X01133958_001


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| Step 12 | |
|---|---|
| | Prepare for lifting by lowering the handles on the MP ladder (A) using the pin connection.<br><br>Ensure the handles are raised before using to access the MP after MP cover lift. |




X01133979_001

| Step 13 | |
|---|---|
| | Lift the MP cover according to the lift plan down to the vessel.<br><br>Use (x2) taglines tied to the diagonal struts to control the lift. |



X01133964_001

| Step 14 | |
|---|---|
| | Remove the black rubber pads that are left on the flange under the MP cover brackets. |


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| Step 15 | |
|---|---|
| | Remove the TP ladder by tilting forwards and lifting over the flange. To perform the task, either utilize 2 technicians or the crane directly.<br>Lift the ladder to the installation vessel. |

End


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## 4.3. Prepare tools and parts in foundation

X00820905/002

| About this task - Before you begin | | | |
|---|---|---|---|
| | **Location**<br>Vessel deck / foundation - Bolt tightening platform | | **Number of technicians**<br>2 TT-I required for this task<br>1 TT-I on vessel deck<br>1 TT-I in foundation |

**WARNING**

**Suspended load - Lifting of tools, parts and consumables to foundation**

**Risk:** There is a risk of serious injuries or death from the load falling on someone and or crushing someone standing or working between the load and a fixed structure.

- Competent crane operator is part of planning the lift on site.
- No persons to be underneath suspended load.
- No persons to be between the load and a fixed structure.
- Barrier crane's work areas/lifting areas.
- Undertake pre-use check of lift equipment and accessories before lift and lift equipment and accessories confirm to local legal regulatory requirements.
- Working load limit (WLL) not to be exceeded.
- Ensure clear and understood communication with all parties before start of lift.
- Assess weather conditions.
- All involved in the lift shall work according to SGRE approved lift plan and lift instructions.

**Collapsing platform**

**Risk:** When loading the platform, there is a risk that some of the floor panels may give way if the weight is not properly distributed leading to serious injury from falls/falling objects.

- Maximum 6 x 400 kg of nuts and washers bags distributed across the foundation floor in order to avoid point loads.
- No bags to be placed on access hatch covers.
- Ensure bags are not overfilled and can be closed before lifting.

**Drop or Fall Hazard - work platform (Step Ladder)**

**Risk:** When using step ladder there is a risk of serious injuries or a fatality from falling from it.

- Carry out pre-use checks and suitability of ladder for the task.
- Ensure ladder is certified for use i.e. has an in-date sticker visibly/legible on it.
- Adhere to 3-points-of-contact when using the ladder.
- Ladder must be footed.

**Manual tools and lifting bags**

**Risk:** There is a risk of ergonomic injuries when handling the heavy components and lifting bags.

- Remove obstructions (including unsafe trip and slip conditions) from the task area before manually handling the load.
- Plan a good posture before handling a load.
- Once the lifting bags are full, utilize the crane to move them.
- Determine how many persons are required to lift and move a load safely.
- Adhere to TILE principle - Task Individual Load Environment when handling the load
- Note: Particular consideration should be given to loads over 15 kg, which are of a difficult size and shape.


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| Step 1 | | |
|---|---|---|
| | Access into bolt tightening platform by using the step ladder. | <br>X00822909_001<br>*For illustrative purposes only* |

| Step 2 | |
|---|---|
| | Place the following tools and parts in lifting bags on vessel:<br>• Flat file for flanges.<br>• Various hand tools for assembly of ladders.<br>• PPE equipment required to perform the tasks safely.<br>• Battery nutrunners and battery impact wrenches for tower bolts.<br>• Washers and nuts for all M64 bolts.<br>• Tools and equipment.<br>• Hydraulic tightening tensioning tools for HKN with socket for tower bolts.<br>• Counterhold for studs.<br>• Window sockets for 10% tightening.<br>• Tower guide system components.<br><br>Nuts should always be kept dry. |


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| Step 3 | | |
|---|---|---|
| | Ensure lifting bags are not overfilled and correctly closed.<br>Instruct crane operator to lift lifting bags to bolt tightening platform.<br>Load of equipment and lifting bags shall be equally distributed on the platform. | <br>X01006407_001 |

End


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## 4.4. Clean foundation flange

X00820906/002

About this task - Before you begin

| | |
|---|---|
| **Location**<br>Foundation - Bolt tightening platform | **Number of technicians**<br>2 TT-I required for this task |

**WARNING**

**Secure all tools when working at height**

- Ensure tethering of flat file to technician when working on foundation flange.

**Falling objects - Flat file hand tool**

**Risk:** When items and hand tools are potentially able to drop, there is an increased risk of injury through being struck by the falling object.

- Inspect work area and identify potential falling objects before, during and after work, remove or safeguard potential falling objects.
- Create exclusion zone / barrier area below working area above, before start of work.
- Tether hand tools.
- Ensure that hatches are closed before work.

**Manual hand tool use-flat file**

**Risk:** Improper use of hand tools can result in different injuries.

- Undertake a pre-use check of the tooling before use and quarantine/replace any damaged or defective tools.
- Only use the correct and approved tool for the task.
- Ensure body position is stable, balanced, and neutral where possible to minimize injury in the event the tooling slips.
- Wear gloves conforming to EN388 to protect against mechanical injuries.

**Metal dust - filing metal burs and high points**

**Risk:** When filing the high points or burrs from the tower flange, there is a foreseeable risk of persons inhaling metal dust.

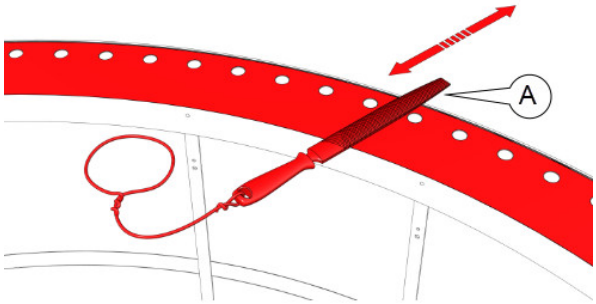
- Technicians are to not inhale or blow the metal dust from the flange.
- Standard PPE is to be used according to the site specific rules. Special care should be given regarding breathing and eye protection.

**Sharp element - burrs and sharp edges.**

**Risk:** When filing the metal burs and high points on flange, there is a risk of injury through laceration due to sharp metal edges and burrs.

- Beware of the risk and keep hand and fingers away from the sharp edges.
- Wear gloves conforming to EN 388.


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| Step 1 | | |
|---|---|---|
| | Remove high spots and burrs from the flanges with a flat file (A)<br><br>Be careful not to remove the entire surface treatment.<br><br>Pay extra attention to areas where lifting brackets and / or foundation cover have been mounted.<br><br>Repeat procedure for the underside of the flange. | <br>X00823043_001 |
| End | | |


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# 4.5. Distribute nuts and washers below the foundation flange

X00820908/002

## About this task - Before you begin

**Location**
Foundation bolt tightening platform

**Number of technicians**
2 TT-I required for this task

**WARNING**

**Fall hazard - Foundation bolt tightening platform hatch**

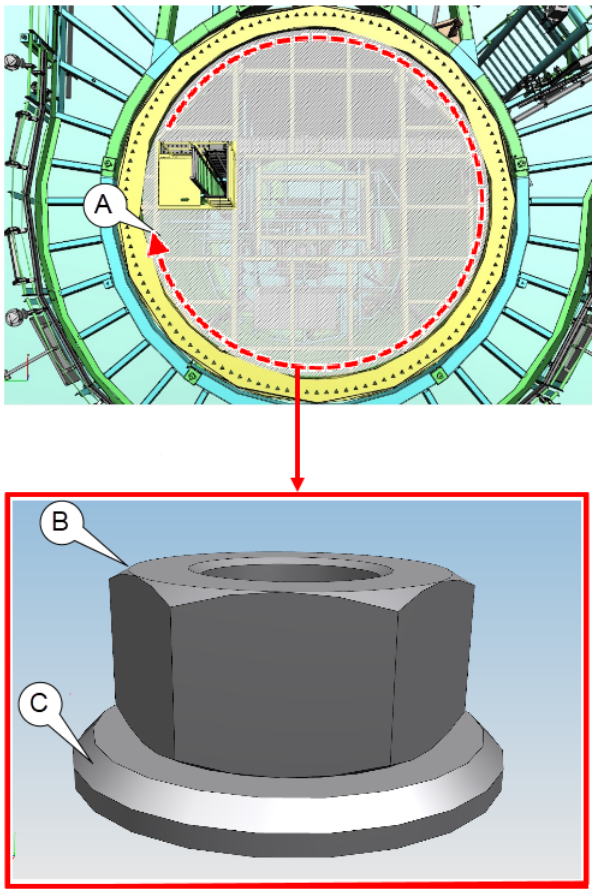
- Ensure all planned to work on the bolt tightening platform are shown the hatch opening.
- Ensure hatch is always kept closed.
- Close hatch after opening it.

## Step 1

Access the foundation bolt tightening platform.

Ensure the grating on the foundation bolt tightening platform is clean.Distribute all nuts and washers evenly (360°) below the foundation flange on the bolt tightening platform (A).Ensure that all nuts (B) are placed on top of washers, facing the chamfer side(C).

Writing on the nut must be visible/facing upwards.




X00822915_001

*For illustrative purposes only*

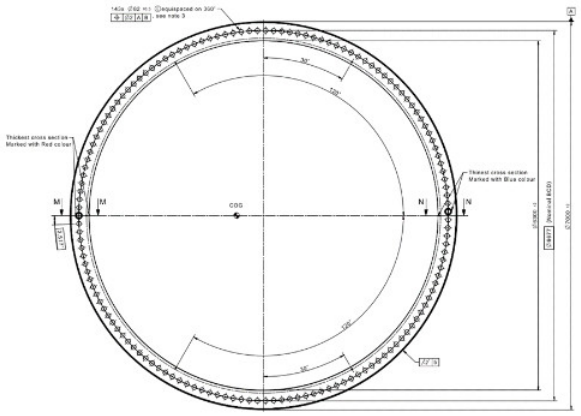
## End


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# 4.6. Wedge adapter (optional)

X00835103/001

| About this task - Before you begin | | | |
|---|---|---|---|
| | **Location**<br>Foundation | | **Number of technicians**<br>2 TT-I required for this task |
| | This section is only applicable for tower with wedge adapter. | | |

| Step 1 | | |
|---|---|---|
| | Check the wedge adapter ring is installed correctly.<br>Ensure the surface of the wedge adapter is in level.<br>Comply with D2421461-Adapter Flange Assembly. | <br>X00919176_001 |

End


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# 4.7. Apply Sikaflex

X00933521/002

## About this task - Before you begin

**Location**
Foundation - Bolt tightening platform

**Number of technicians**
2 TT-I required for this task

**WARNING**

**Chemical - SikaFlex-521 adhesive sealant**

**Risk:** When exposed to chemicals there is a risk of injury. Refer to Safety Data Sheet (SDS) for additional information.

- Wear suitable gloves conforming to EN 374. (0.4 mm Butyl rubber / nitrile rubber gloves).

## Step 1

Visually check the O-ring at the bottom flange of the bottom tower.

If the O-ring has been damaged, apply a thin line of sealant Sikaflex on the monopile flange.

On the monopile flange Sikaflex must only be applied for the damaged areas of the O-ring.

Sikaflex to be applied 13 mm from the edge of the monopile flange.

When applied under wet weather conditions, Sikaflex may be pulling strings. Be aware not to touch Sikaflex with hands or arms.

The red line on the flange illustrates Sikaflex.



X00822909_001

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## End


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# 5. Finalization

X00927303/001

## 5.1. Completion activities

X00927304/001

Finalize the tasks by completing all activities listed below.

| Activity list | |
|---|---|
| Pictogram | Description |
|  | Always keep work area clean<br>Clean the affected work area |
|  | Recycle any waste according to local legislation |
|  | Ensure that the checklist is completed. |


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# 6. Appendices

X01067265/001

## 6.1. Abbreviation list

X00820889/001

| Acronym | Definition |
|---|---|
| INS | Instruction |
| OF | Offshore |
| PFPE | Personal Fall Protective Equipment |
| PPE | Personal Protective Equipment |
| PRO | Procedure |
| SDS | Safety Data Sheet |
| SG | Siemens Gamesa |
| SGRE | Siemens Gamesa Renewable Energy |
| TGS | Tower Guide System |
| ZCH | Siemens Gamesa Checklist |
| ZRA | Siemens Gamesa Risk Assessment |
| ZWI | Siemens Gamesa Work Instruction |

## 6.2. Relevant document information

X01067267/001

### 6.2.1. Reference Information

X00927331/002

| Topic | Definition |
|---|---|
| Technician training level & competence | Siemens Gamesa Renewable Energy (SGRE) technician competency descriptions can be found in:<br>• INS-19394 SGRE Project wind technician competency framework.<br>The competence framework of project wind technicians describes working in business unit Offshore (OF) including but not limited to job profiles, roles and responsibilities, training requirements, and approval<br>The framework also covers OF contractors/subcontractors |
| Personal safety | All work must be carried out in accordance with:<br>• PRO 59501 Basic health and safety rules.<br>• PRO-13969 Ergonomic Risk Management<br>• PRO 106614 Setting to Work<br>Additional specific personal protective equipment requirements are included as required in this work instruction<br>Task-specific hazards are illustrated by a pictogram together with a detailed description of the hazard and required actions<br>Hazards which apply to the entire duration of a work task are described at the start work instruction<br>Hazards which apply to a specific part of a work task are at the beginning of the relevant instruction step |


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| Topic | Definition |
|---|---|
| Hazardous energies | All work shall be carried out in accordance with:<br>• PRO-18914 Control of hazardous energies.<br>• INS-29465 Control of hazardous energies SGRE OF.<br>Personnel carrying out installation, inspection, testing, and repair area of electrical or mechanical, pressurized installations and equipment must be:<br>• Instructed and authorized by Siemens Gamesa (SG).<br>• Have a valid safety certificate relevant for the task. |
| Lifting operations | Lifting operations shall be performed in compliance with:<br>• PRO 26711 OF lifting operation (lifting operations standard).<br>Local and site-specific requirements are listed in the detailed step-by-step instructions |
| Date format | The date format used in this document is YYYY-MM-DD (year-month-day) |

### 6.2.2. Reference list

X01067268/001

| Topic | Reference | Definition |
|---|---|---|
| Safety | PRO 59501<br>ZWI-1040332 | Basic health and safety rules<br>Turbine-specific safety instructions |
| Risk Assessment | D3151394 | Prepare foundation |
| Checklist | D3151393 | Prepare foundation |
| Training requirements | INS-19394 | Siemens Gamesa Renewable Energy (SGRE) Project wind technician competency framework |
| Bolt torque values | D2281948 | Tightening specification - Offshore (OF) |
| Substance management | PRO-18811 | Substance management procedure<br>Safety Data Sheet (SDS) database on SGRE intranet |
| Lifting operations | PRO 26711 | OF lifting operation (lifting operations standard) |
| Hazardous energies | PRO-18914<br>INS-29465 | Control of hazardous energies<br>Control of hazardous energies SGRE OF |
| Assembly drawing | D2421461 | Adapter Flange Assembly |


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## 6.3. Pictograms

X00927320/001

### 6.3.1. Document-related pictograms

X00927324/001

| Pictogram | Definition |
|---|---|
|  | Additional note or information |
|  | Number of technicians required for the task |
|  | Lubricate bolts according to bolt specification |
|  | Checklist to be filled in |
|  | One or more steps need to be repeated |

| Pictogram | Definition |
|---|---|
|  | Location in the wind turbine for the task |
|  | Reference to an external procedure-not detailed in this instruction |
|  | Specific torque/joint ID according to bolt specification |
|  | Waiting time until next step can be started. |

### 6.3.2. Hazard identification pictograms

X00927328/001

| Pictogram | Definition |
|---|---|
|  | A warning pictogram is pictured as a yellow triangle with a black border.<br>The black symbol within denotes the risk of a hazard, which is described in the corresponding text. |

### 6.3.3. Chemical hazard identification pictograms

X00927322/001

| Pictogram | Definition |
|---|---|
|  | A chemical pictogram is pictured as a white rhombus with a red border.<br>The black symbol denotes a chemical-related hazard for people or environment, which is described in the corresponding text. |

### 6.3.4. Prohibition identification pictograms

X00927321/001

| Pictogram | Definition |
|---|---|
|  | A prohibition pictogram is a red circular band with a diagonal cross bar on a white background.<br>The black symbol within denotes a certain behavior is prohibited, which is described in the corresponding text. |


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## 6.3.5. Mandatory action pictograms

X00927323/001

| Pictogram | Definition |
|---|---|
|  | A mandatory pictogram is blue circle with white symbol within<br>The white symbol within denotes a specific course of action to be taken, which is described in the corresponding text. |


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