Base Load Power Hub (BLPH)

Supply Specification for **HV (66kV-6.6kV) Switchroom B-100**

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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.

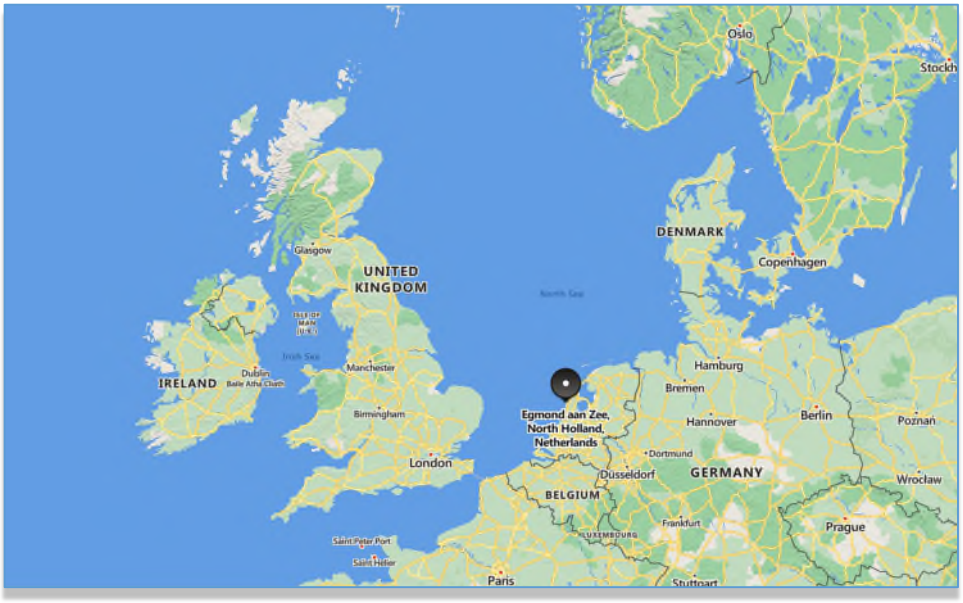


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

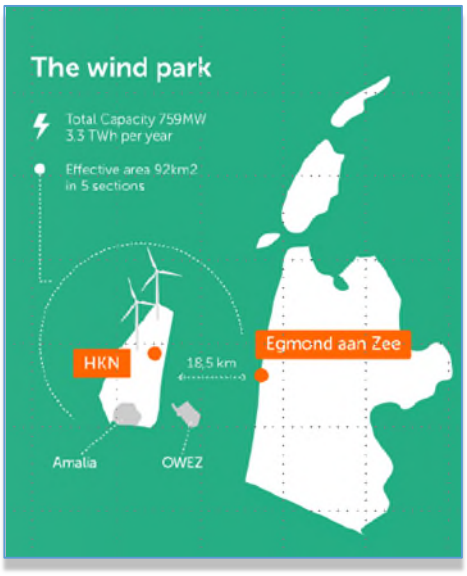


Figure 2 - Wind Park Details

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.

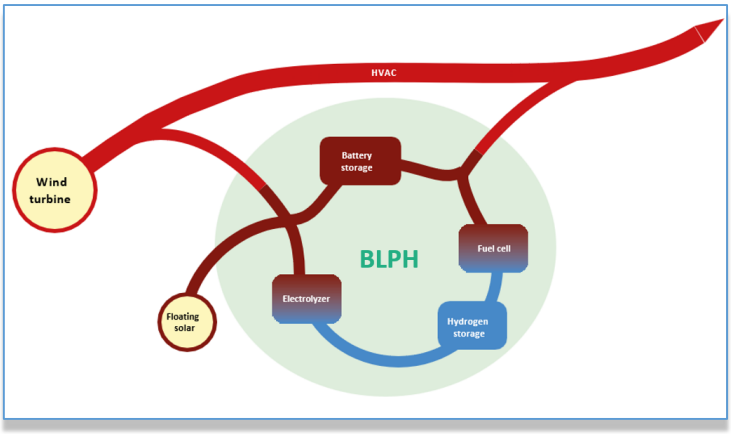


Figure 3 – BLPH Concept

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 defines the minimum requirements for the design, materials manufacturing, assembly, delivery, installation, connections, inspection and testing for the Module object of this document named:

HV (66kV-6.6kV) Switchroom B-100

with the estimated dimensions (mm):

Internal clear 12674x4574x4014h

External 13000x4900x4500h

Any failure by the Vendor to take exception to any part of this specification in the initial bid proposal shall indicate complete compliance to the specification.

It shall be the Vendor's responsibility to be, or to become, knowledgeable of the requirements of the standards and codes referenced below.

Related to the quality assurance and test shall be apply the Attachment 1: "Inspection Data Sheet".

The Documents that shall be supply along with the technical proposal and during the manufacturing phase are indicated in the Attachment 2: "Requirement Documentation Design Supply".

2.1 REFERENCES

2.1.1 PROJECT DOCUMENTS

Ref. No.	Doc. No.	Description
[1]	123A90-DDL-AR-DL-10001	HV (66kV-6.6kV) Switchroom B-100 - Architectural General Layout - Plan & Details
[2]	123A90-DDL-AR-DL-10002	HV (66kV-6.6kV) Switchroom B-100 - Architectural Door Map and Schedule
[3]	123A90-DDL-AR-DL-10003	HV (66kV-6.6kV) Switchroom B-100 - Architectural Flooring and Lining Layout
[4]	123A90-DDL-AR-DL-10004	HV (66kV-6.6kV) Switchroom B-100 - Architectural Fire Rated Req. - Plan & Details
[5]	123A90-DDL-EL-DL-20104	Electrical Equipment Layout - HV SwitchroomB-100
[6]	123A90-DDL-EL-DL-20111 (1)	Electrical Cable Routing Layout - HV Switchroom B-100
[7]	123A90-DDL-EL-DL-20122 (1)	Lighting & Socket Layout - HV Switchroom B-100
[8]	123A90-DDL-EL-DG-20129 (1)	Lighting & Socket Circuit Diagr. - HV Switchroom B-100
[9]	123A90-DDL-EL-DL-20136 (1)	Earthing & Lightining Layout - HV Switchroom B-100

[10]	123A90-DDL-EL-DL-20115 (1)	Electrical MCT Composition Layout - Lower Deck
[11]	123A90-DDL-IN-DL-40086 (1)	Instrument and Telecom MCT Layout - Lower Deck - TOS EL. 23.310m
[12]	123A90-DDL-ST- SP-90017	Structural Design Premesis
[13]	123A90-DDL-ST-SP-90018	Structural Material Specification
[14]	123A90-DDL-ST-SP-90019 (1)	Structural Fabrication Specification
[15]	123A90-PML-QHSE-QP-00002	Project Quality Plan
[16]	123A90-DDL-MAT-SP-60006	Coating and Painting Specification
[17]	123A90-DDL-SAF-RE-30001	Fire Protection Philosophy
[18]	123A90-DDL- SAF-DL-30025	Escape Routes, Fire Fighting, Life Saving Equipment and Safety Equipment Layouts Drawings - lower deck
[19]	123A90-DDL- SAF-DL-30027	F&G detectors Layout - lower deck
[20]	123A90-DDL-SAF-RE-30046	HSE Design Philosophy
[21]	123A90-DDL-SAF-RE-30041 (1)	Noise Assessment Study Report
[22]	123A90-DDL-OEM-LIS-02015 (1)	Two-year operating spares list

Table 1 – Project Reference Documents

(1): This document is applicable but has not yet been issued

2.1.2 COMPANY DOCUMENTS

Ref. No.	Doc. No.	Description
[23]	K559-2254-AR-REP-001	Architectural Basis of Design
[24]	K559-2254-AR-SPE-001	Architectural Material and Construction Specification
[24bis]	K559-2254-EL-PHI-001	Electrical Protection Philosophy
[25]	K559-2254-EL-PHI-002	Electrical System Description & Design Philosophy
[26]	K559-2254-IC-PHI-001	Control Systems Philosophy
[27]	K559-2254-MT-REP-001	Materials Selection Report
[28]	K559-2254-SE-REP-007	Fire and Explosion Risk Analyses (FERA)

[29]	K559-2254-PM-PLN-003	Basic Design Engineering Package
[30]	K559-2254-ST-PHI-001	Structural Topsides Design & Installation Philosophy
[31]	K559-2254-SE-REP-013	Noise Study

Table 2 – Company Documents

2.1.3 INTERNATIONAL DOCUMENTS

Ref. No.	Doc. No.	Description
[32]	DNVGL-ST-E272 2.7-2	Offshore service modules
[33]	DNVGL-ST-0145	Offshore Substations
[34]	SOLAS	International Convention for the Safety of Life at Sea (SOLAS), consolidated edition 2020
[35]	IMO Resolution A.754(18)	Recommendation on fire resistance tests for "A", "B" and "F" class divisions, adopted on 4 November 1993
[36]	IMO Resolution A.653(16)	Recommendation on Improved Fire Test Procedures for Surface Flammability of Bulkhead, Ceiling and Deck Finish Materials
[37]	IMO Resolution A.687(17)	Fire Test Procedures for Ignitability of Primary Deck Coverings
[38]	BS 476-7:1997	Fire tests on building materials and structures - Method of test to determine the classification of the surface spread of flame of products
[39]	IMO 844E - 2010 (FTP CODE)	International Code for Application of Fire test Procedures 2010 (2010 FTP Code)
[40]	Directive 67/548/CE	Regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances
[41]	IEC 60529	Degrees of Protection Provided by Enclosures (IP Code)
[42]	IEC 61892-1	Mobile and fixed offshore units – Electrical installations – Part 1: General requirements and conditions
[43]	IEC 61439-1	Low-voltage switchgear and controlgear assemblies - Part 1: General rules
[44]	IEC 61000-5	Electromagnetic compatibility (EMC) - Part 5: Installation and mitigation guidelines

[45]	IEC 60445	Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals, conductor terminations and conductors
[46]	ISO 19901-6	Petroleum and natural gas industries – Specific requirements for offshore structures – Part 6: Marine operations
[47]	DEP 33.64.10.10 – Gen. - February 2021	Electrical Engineering Design
[48]	ASHRAE	Handbook of Fundamentals
[49]	BS EN 62485-2: 2018	Safety Requirements for Secondary Batteries and Battery Installations – Part 2: Stationary Batteries
[50]	ISO 15138: 2018	Petroleum and Natural Gas Industries – Offshore Production installations – Heating, Ventilation and Air Conditioning
[51]	SMACNA	Low pressure metalsheet ductwork design
[52]	NFPA 90A	Standard for the Installation of Air-Conditioning and Ventilating Systems
[53]	DW 142	Specification for Sheet Metal Ductwork, Addendum-A
[54]	DW 143	Ductwork Leakage Testing
[55]	DW 144	Specification for Sheet Metal Ductwork
[56]	ASHRAE 15	Safety Code for Mechanical Refrigeration
[57]	ASHRAE 30	Methods of Testing Liquid Chilling Packages
[58]	UL	Underwriters Laboratories
[59]	Directive 2014/30/EU	Regulation aimed to ensure that any electrical and electronic equipment minimizes the emission of electromagnetic interference that may influence other equipment
[60]	Regulation EU No. 517/2014 (the 'F-gas Regulation')	It is aimed to control emissions from fluorinated greenhouse gases (F-gases), including hydrofluorocarbons (HFCs).
[61]	The Pressure Equipment Directive (PED) (2014/68/EU)	It is applied to the design, manufacture and conformity assessment of stationary pressure equipment with a maximum allowable pressure greater than 0,5 bar.

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[62]	NEN-EN 1991-1-3+A1: 2019 NB:2019 nl	National Annex to NEN-EN 1991-1-3+C1: Eurocode 1: Actions on structures - Part 1-3: General actions - Snow loads
[63]	2006/42/CE	European Machinery Directive

Table 3 – International Reference Documents

2.1.4 ORDER OF PRECEDENCE

The project shall apply relevant Standards and Codes as detailed in this Specification.

Where there is a conflict of requirements the more conservative standard or code shall be followed.

In all other cases the following order of precedence shall be adhered to:

- Local Regulations and Laws
- Contract Documents
- Codes, Standards, Regulations

It is assumed that the Local Regulations and Laws, and the Codes, Standards, Regulations mentioned in attached specification are known by VENDOR.

If any contract documents referenced or alluded is not provided, the VENDOR shall request it before remitting the offer. The absence of request is tantamount to possession of document.

Only the last edition of all standards, codes and regulations shall be used.

The project shall identify situations where the project standards and specifications listed in this section result in a solution that is more than is required to be fit for purpose. For these cases the project shall seek deviation from the appropriate authority with clear supporting justification.

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY)	CROSSWIND
CONTRACTOR (CTR)	ROSETTI MARINO S.p.A.
PROJECT	HOLLANDSE KUST NOORD WIND PARK Project
VENDOR / SUPPLIER	Individual, firm or manufacturer that provide Materials/Equipment to COMPANY in accordance with this specification and terms of the Purchase Order.
IDS	Inspection Data Sheet
RDDS	Requirement Documentation Design Supply

BLPH	Base Load Power Hub
COG	Center of Gravity
DNV	Det Norske Veritas

EPC	Engineering Procurement Construction
EPIC	Engineering, Procurement, Installation, Commissioning
FTP	Fire Test Procedures
F&G	Fire & Gas
HKN	Hollandse Kust Noord
HSE	Health, Safety and Environmental
HVAC	Heating, Ventilation and Air Conditioning
I&T	Instrument and Telecom
IVB	Independent Verification Body
IMO	International Maritime Organisation
MCT	Multi Cable Transit
NA	Not Applicable
POB	People On Board
SGSI	Shell Global Solutions International
TSO	Transmission System Operator
UDL	Uniform Distributed Load
UPS	Uninterruptible Power Supply
WTG	Wind Turbine Generator
WCR	Weight Control Report
EDG	Electrical Diesel Generator
EGG	Electrical Gas Generator
TC	Temperature Controller
ESD	Emergency Shutdown System
FGS	Fire and Gas System
HMI	Human Machine Interface
HPLC	HVAC PLC
LV	Low Voltage
MV	Medium Voltage

HV	High Voltage
PCS	Process Control System
PDT	Pressure Differential Transmitter
PRD	Pressure Relief Damper
PTC	Positive Temperature Coefficient
T	Temperature
VDU	Visual Display Unit

Table 4 - Definitions and Abbreviations

2.3 UNIT OF MEASUREMENTS

The SI unit of measurements SHALL be used.

2.4 LANGUAGE

The PROJECT language for technical documents SHALL be English.

All signs SHALL be written in English and Dutch.

2.5 DESIGN LIFE

The selection of all enclosure, division and finishing materials SHALL ensure maximum durability with respect to the prevailing environmental conditions and all materials SHALL be new and first-class quality, free from any faults or defects.

3. ENGINEERING CRITERIA

Design construction and supply of components shall meet the standard specification and data sheets enclosed and all technical requirements mentioned in this supply specification.

The SUPPLIER shall be fully responsible for the equipment supplied. He shall recommend any action to be followed, in order to optimize the reliability of the Module.

BLPH shall be operated remotely and is a Normally Unmanned Installation (NUI).

The anticipated planned minimum maintenance interval shall be 6 months and require maximally 8 hours

3.1 SITE & ENGINEERING DATA

3.1.1 Meteorological and oceanographic data

Description	Unit	Value
Ambient Conditions		
Ambient Temperature (min/nom/max) – hourly @ +10m	°C	-8.4 / 10.5 / 25.0
Atmospheric Pressure (nominal) – hourly @ +10m	mbar	1013.7
Specific Humidity (min/nom/max) – hourly @ +10m	x 10^{-3}	4.2/6.5/9.5
Wind Conditions		
Annual average wind speed (at 100 m)	m/s	9.56
Extreme Wind Speed for 1-Year Recurrence Period (at 100 m)	m/s	33.1
Extreme Wind Speed for 50-Year Recurrence Period (at 100 m)	m/s	41.0
Marine Conditions		
Sea Water Temperature (min/max)	°C	1.3 / 20.2
Average Sea Water Density	kg/m^3	1025

Table 5 - Meteorological and Oceanographic Data (source: HKN2018 data @ (1979-2018)

Rain Fall [mm]													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Min	14.1	18.1	9.1	1.2	10.3	17.3	6.2	20.7	27.2	43.0	22.2	28.1	646.6
Mean	75.0	62.5	48.6	39.6	47.4	47.9	58.2	73.0	91.0	102.7	108.5	89.3	843.6
Max	143.2	119.4	106.4	79.8	92.7	117.9	160.7	154.7	178.6	188.7	179.3	138.1	1056.1

Table 6 - Rain Fall (source: SGSI)

3.1.2 Wind Speed Data

Averaging Time	Return Period (years)						
	1	2	5	10	50	100	1000
1 hr	31.8	33.4	35.1	36.4	39.1	40.1	43.4
10 min	33.7	35.5	37.4	38.8	41.7	42.9	46.5
3 s	39.4	41.6	44.1	45.9	49.7	51.1	56.0

Table 7 - Omni-Directional Extreme Values at 125 m MSL

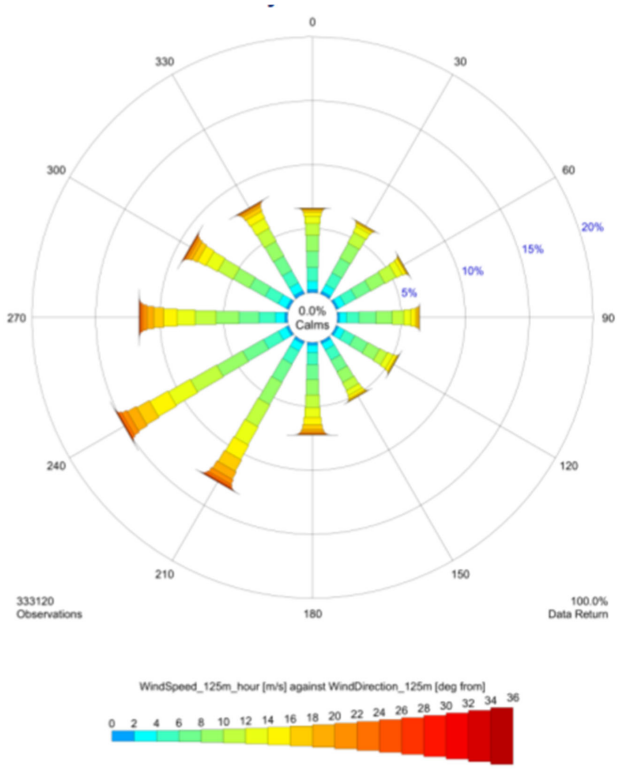


Figure 4 – Mean Hourly Wind Speed Distribution at 125 m MSL

3.1.3 Design Loads

The floor dead load includes the weight of permanent components and accessories including equipment contained therein, or a minimum of 8.0 kN/m^2 whichever is greater.

Live loads on the roof shall be designed for a minimum of 2.5 kN/m^2. Loads are to include any roof-mounted HVAC equipment.

Snow loads according NEN-EN 1991-1-3+A1: 2019 NB:2019 nl Nat. Bijlage.

The exposure coefficient for every site in the Netherlands and Dutch continental shelf is Ce = 1.0.

The characteristic values of the snow load on the ground/platform (sk) shall be taken as sk = 0.7 kN/m^2.

In the Netherlands including its continental shelf no exceptional snow loads need to be considered.

Wind loads are reported in Ref. [12].

Water depth and water levels are reported in Ref. [12].

Transportation loads are reported in Ref. [12].

Module structure shall be designed to tolerate deck deflections provided in Ref. [12], without buckling or door jamming.

4. DOCUMENTS REVISION

Complete material specifications, test certificates; issued by a recognized independent verification body (IVB), data, catalogues or drawings covering the selected items and the related installation works shall be submitted to CONTRACTOR to verify compliance with performance requirements.

CONTRACTOR's comments shall not relieve the VENDOR from its responsibilities to providing the equipment and the relevant documentation according to the good engineering practice, the project specifications and the local and international laws, rules and standards.

The VENDOR shall revise its documents according to CONTRACTOR comments, if any.

Documents parties subject to revision shall be clearly indicated:

- with a revision triangle alongside of a cloudlike shape area for drawings:



- with a revision triangle alongside of a line or a paragraph for all other documents:



Documents without the indication of the revision will not be accepted.

Documents without incorporation of CONTRACTOR comments will not be accepted. In case of VENDOR considers any CONTRACTOR comment not applicable, a reply comments sheet with VENDOR relevant clarifications shall be attached to the new revision of the document.

If VENDOR considers any CONTRACTOR request not included in the scope of supply, it shall issue an official change order request before proceeding, unless no extra price will be recognized.

4.1 CONTRACTOR'S DATA BASE DOCUMENTATION

The project documentation will be stored and managed by the CONTRACTOR's application data base named FUSIONLIVE.

VENDOR shall upload its documentation and download the CONTRACTOR's comments through this application.

4.2 DOCUMENTS ELABORATION SOFTWARE

All drawings shall be prepared by means of AUTOCAD last edition.

All other documents shall be provided with a form compatible with MSWord/Excel, AutoCAD, Adobe Acrobat (last edition).

Documents shall be provided in .pdf searchable form. Native files shall be also provided.

5. BUILDING MATERIALS

The materials described in this specification are intended to establish minimum standards of quality and performance and are not intended to prevent the use of equivalent or superior products. Life cycle costs, embodied carbon, prevailing climate conditions, byelaws, regulations and ease of constructability and maintenance shall be a prime consideration when selecting materials.

All products used in the construction of the Module shall be certified as products with an extensive proven track record of successful offshore use.

All materials shall be suitable for a salt laden, corrosive, offshore atmosphere.

All materials shall be new and first-class quality, free from any faults or defects, including blemishes, dents, imperfections, rust and stains. Damaged materials shall not be incorporated into any work and shall be replaced with new.

Where applicable all materials shall be backed by Manufacturer test reports for all relevant performance criteria.

All materials contributing towards health hazard (such as asbestos) or environmentally damaging materials shall not be used.

All proprietary brand materials shall be delivered to the site in sealed original packages, bearing the trade names of the materials concerned. They shall be stored as directed by Manufacturer.

All accessories including reinforcements, insulation pins, welding electrodes, etc. and other fixings and fastenings necessary for the complete installation of the selected material systems, as well as quality control of materials and workmanship shall comply with relevant reference documents and standards mentioned herein.

Materials selection shall be limited to non-combustible products with low smoke emission qualities and shall meet the requirements of the FTP (Fire Test Procedure) Code. Any materials that exhibit either flame propagation or excessive smoke emission qualities or any that may emit toxic fumes shall be excluded.

Material selection shall ensure the minimum standards of workmanship for installation.

Vendor shall supply full details of spares and maintenance, including approved products for each material, component and system. Operation and Maintenance Manuals shall also include a list of special tools, instructions how to use them and recommended material and instructions.

6. TECHNICAL REQUIREMENTS

The major construction components and materials and their design and installation shall follow the codes, criteria, attachments and standards specified herein.

Alternative forms of construction can be proposed and shall be subject to approval by COMPANY.

6.1 STRUCTURE

The Module structure shall be totally fabricated with steel, in single piece, with all parts of the structure completely welded each other. All joints shall be continuously seam welded to provide a fire rated weather and gas tight construction.

Both the resistance welds and seal welds shall be continuous and perfectly watertight, the welds shall comply with Standards, last edition. For all welding activities, only qualified welders shall be employed.

The structure design shall guarantee that the Module will be able to withstand the design loads, the lifting and the transportation with no structural damage.

All penetrations (MCTs, sleeves, etc.) welded to structure and F&G dampers shall be certified according to the fire rating applicable.

Vendor shall supply the Calculation Report of the Module, drafted according to Standards and Codes listed herein. The Calculation Report shall be complete with indication of C.O.G., foundation loads on topside deck, In-Place, Lifting and Transportation analyses.

The Module structure shall be designed with the use of demountable bolted parts for external equipment supports, in order to allow the Module transport by road, if necessary, without any problems.

Vendor shall provide Weight Control Report

6.1.1 External Walls

All walls of the Module shall be A0 fire rated, according to SOLAS.

All walls shall be built with a profiled steel plate (corrugated steel sheet is preferable) and completed with required insulation to achieve thermal requirements and an interior liner finish.

The thickness of steel plate walls shall not be less than 4 mm.

Walls shall be capable of spanning between structural supports. All joints shall be continuously seam welded to provide a fire rated weather and gas tight construction. Junctions of firewalls shall include fully sealed plate divisions.

Where required, walls shall include sub-frame openings at all door locations. Door frames shall be fixed to door support sub-frames.

All walls shall be fitted with all the accessories that have to be welded to them, such as:

- Door frames, fitted for bolted door assembly;
- Panel support system for steel sheet internal finishing (See 6.2.4);
- Steel pins Ø 3 mm on internal side for thermal insulation fixing;

- Internal plates for possible use of internal seafastening
  (C.S. plates, 80x150 mm, 10 mm thk. with two holes Ø16, at elevation +3000 mm, pitch 2000 mm. approx. - No. 16 estimated pieces)
- Equipment brackets with wall mounting
  (If information is not available, "starters" will in any case be welded onto which subframes will be fixed later).
- Female threaded studs on external side for auxiliary services support
  (Øe 16 - M10 - lg 29mm. - AISI 316L - No. 200 estimated pieces);
- Earthing System, external and internal (AISI316L)
- Steel frames for MCT, model and quantity t.b.d. (brand Roxtec, Brattberg or similar),
  (C.S. or AISI 316L - sealing grommets excluded);
- Sleeves "A0" for inlet/air overpressure.
- Sleeves for "A0" for outlet overpressure.
- Sleeves for Overpressure Air.
- Supports for External Condensing Units.
- Nameplate holder included Nameplate.

6.1.2 Floor System

Floor system of the Module shall be A0 fire rated, according to SOLAS.

The base frame will be constructed entirely of continuously welded, structural steel rolled sections and rigidly braced, steel cross members and it shall be designed to withstand transportation and installation stresses, in addition to dead and live loads.

The floor plate shall be minimum 6mm smooth steel plate, fully welded to the base frame.

A steel bund wall shall be welded to the deck plate, adjacent to the bottom of each wall to prevent water ingress or damage to insulation at the base of the panel on the inside face.

Base frame shall be fitted with a mechanical protection on under-floor insulation (AISI 316L preferred) to ensure absolute sealing against weather/sea conditions and protected the exposed side of insulation material.

The base frame will have attachment points for connection to deck structure (See 6.1.6).

Service penetrations through the floor should be avoided.

Base frame shall be fitted with all the accessories that have to be welded to it, such as:

- Steel pins Ø 3 mm on one side for thermal insulation fixing;
- Subframes for Electric/Instrumental/Telecom switchboards and panels (dimensions/location t.b.d.)
  (If information is not available, "starters" will in any case be welded onto which subframes will be fixed later).

6.1.3 Roof System

Roof system of the Module shall be A0 fire rated, according to SOLAS.

The top frame will be constructed entirely of continuously welded, structural steel rolled sections and rigidly braced, steel cross members and it shall be designed to withstand transportation and installation stresses, in addition to dead and live loads.

The roof plate shall be minimum 6mm steel plate, fully welded to the roof frame.

Service penetrations through the roof should be avoided. Though if unavoidable, a 100mm minimum upstand is to be welded around the opening.

Roof frame shall be fitted with all the accessories that have to be welded to it, such as:

- Steel pins Ø 3 mm on internal side for thermal insulation fixing;
- Threaded Hanger on internal side of beams for auxiliary services support (M10x80/130 mm - AISI 316L - No. 70 estimated pieces);
- Frame/supports for HVAC equipment on external side (if necessary).

6.1.4 Lifting Padeyes

The Module shall be independently movable.

The Module structure shall be supplied with suitable lifting equipment welded on top.

The lifting equipment should be customized padeyes or corner blocks ISO 1161, according to basis data provided. They shall be at least no. 4, one for each upper corner of the Module.

6.1.5 Spreader Bar

If necessary, a spreader bar for lifting shall be foreseen AS OPTION.

6.1.6 Base Frame Fixing

The Module will be installed on topside steel deck and its principal base frame will be bolted to suitable supports (by other).

To allow the fixing operations, is not recommended to use corner blocks for bottom corners of the Module.

The fixing method shall be proposed using suitable bolts / threated bars. Quantity and dimension of bolts / threaded bars shall be calculated according to basis data provided.

6.1.7 Corrosion Protection

See Ref. [12], [27] & [29].

6.1.8 Painting

Vendor shall provide the complete surface treatment cycle (sandblasting/primer/finishing cycle) in accordance with the contractual specifications attached, Ref. [16].

6.2 ARCHITECTURAL COMPONENTS

The architectural elements to be designed are the following:

- Fire rating;
- Fire and Thermal Insulation;
- Internal finishing;
- External doors;
- Flooring;
- Penetrations and Openings;
- Acoustical Requirements;
- Information signs

6.2.1 Architectural Materials

The architectural design solutions shall be functional, economical and appropriate.

All architectural materials shall be non-combustible and shall be certified to the satisfaction of all the project specified requirements for each materials element. They shall comply with the requirements of a company approved relevant code or standard. The materials and method of assembly shall be tested in accordance with current standard procedures.

Architectural material and components selection shall be based upon the following criteria:

- Suitability for use in terms of physical, operational and environmental conditions;
- Compatibility of materials;
- Safety;
- Weight;
- Thermal and acoustic properties;
- Assembly;
- Maintenance;
- Durability;
- Flexibility;
- Finishes and quality.

Only the use of approved architectural materials, in full accordance with the manufacturers' recommendations, shall be used. Standards of workmanship and methods of construction in accordance with the project procedures, quality control and recognized standards and codes of practice shall be applied.

6.2.2 Fire Rating

External walls, roof and floor of the Module shall be A0 fire rated, according to SOLAS.

6.2.3 Fire and Thermal Insulation

External walls, roof and floor of the Module shall be built with a profiled steel plate (external face) and completed with required insulation to achieve thermal requirements.

The U-value required for Roof, External and Internal Walls and Floor is 0,45 W/(m^2K).

Insulation shall be inert, non-combustible, non-capillary dry fix mineral fibre of a suitable density. Insulation shall be properly sealed to prevent fibres from being emitted to the environment.

Fire and thermal insulation may be combined, where appropriate, provided all requirements are met. Thickness and densities of insulating materials shall be as required in each situation.

All insulation must have been tested and certified to prove that it is fire retardant.

Fire insulation material thickness, density and installation methodology will be dependent upon the certified arrangement.

Care shall be taken in the design and construction to avoid the risk of condensation on the internal face of external cladding.

A continuous vapour barrier of reinforced aluminium foil on exposed face of insulation material, taped or otherwise sealed in an approved manner, shall be incorporated into the design.

Option: Sandwich panel with mineral wool internal core is admitted.

6.2.4 Internal Finishing

The side with insulation material of the external walls shall be covered by a liner panels.

The liner panels shall be 0.9mm thick, 2.1 metres high (minimum), Plastisol coated galvanised sheets of standard widths. The liners shall be profiled (overall depth 10mm) to add rigidity.

The liner system shall be supported on rails integral with the liner panel system. All joints of lining panels shall be overlapped or interlocked. A continuous "cap" flashing shall be provided to close off the gap at the top of lining panels and a welded steel kick plate shall be formed at the base, to give a watertight detail.

Colour selections for all interior finishes shall include manufacturer's standard products. Colour Scheme shall be subject to company approval.

Installation of interior finishes shall be in strict accordance with manufacturer's instructions.

Option: Sandwich panel with steel sheet 0.8 mm minimum thickness on view side is admitted.

6.2.5 External Doors

All doors shall be installed to ensure that fire rating of the walls is maintained and to ensure compliance with the door manufacturer instructions.

'A' rated doors shall be fully tested and certified in accordance with the requirements and criteria of SOLAS.

All personnel and equipment doors shall be designed for the operating conditions defined herein, whilst achieving minimum weight without loss in performance or function, during the building design life.

Doors shall achieve, as a minimum, air permeability of $10m^3/m^2$.hr at 50 Pa.

The maximum height between top of floor finish and top of threshold shall not be more than 25 mm, unless otherwise required by applicable regulations. The opening force of normal access doors (including the force to overcome differential air pressure) shall not exceed 65N for side-hinged doors.

Emergency escape doors shall be equipped with panic hardware. The panic bar shall be installed on the active leaf.

Doors and panic bars shall be compatible with access control system, where relevant.

Hardware and Ironmongery:

all door furniture shall be in brushed satin or machine finish stainless steel.

Hinges:

all hinged door leaves shall be hung on a minimum of no. 3 heavy-duty, stainless-steel hinges.

Hinges shall be bolted to the door frame and bolted through additional, internal, reinforcement to the door leaf. Standard hinges shall be of 'lift-off' type. Hinge blades shall be a minimum of 4mm. thk.

Latches and Locks:

all single leaf hinged doors shall be provided with triple action spring latches, capable of being operated simultaneously by a single lever handle.

All latches, bolts, catches and mechanisms shall be heavy duty and shall be capable of withstanding all local environmental conditions and heavy-duty industrial use.

Dead locks shall only be provided where required, as shown on the project approved door schedule.

Closers:

hinged doors shall be fitted with overhead, heavy duty, hydraulic arm door closers. Double doors shall be fitted with a door leaf selector mechanism.

Lever / Pull Handles:

lever / pull handles shall be of strong, functional, ergonomic design without sharp edges and shall not, by virtue of their design, cause a potential hazard to personnel operating them.

"D" shape levers shall be provided to the internal faces of all doors to habitable areas. The finish shall be coordinated with the interior design.

Panic Bars:

all panic bar assemblies shall be of heavy-duty stainless steel, capable of withstanding constant use by personnel and shall be easy to operate.

Panic bar assemblies shall be capable of withstanding all local environmental conditions. They shall be of a sturdy functional design without sharp edges and shall not, by design, cause any hazard to operating personnel.

Door leaves shall be internally stiffened to secure panic bar fittings.

Shoot Bolts:

shoot bolt required for passive leaf of hinged double doors.

Kick Plates:

all hinged doors, having a painted finish, shall be fitted with 200mm high, full width stainless steel, kick plates on both sides of each door leaf.

Signs:

all signs and insignia to be permanently attached to door leaves shall be securely fixed in place with proprietary acrylic foam tape or equal approved.

6.2.6 Flooring

Flooring shall be finished with a seamless, non-slip, anti-static epoxy paint installed over a high hardening screed.

The screed material shall be installed that shall fulfil the requirements of International Maritime Organisation (IMO) Resolution A.653(16) and A.687(17) and shall achieve Class 1 spread of flame to BS 476, Part 7.

Screed shall be applied to 5–15mm per coat thickness (minimum thickness 6mm).

The floor paint shall also be applied to the up-stand plate fitted by the module contractor to support the internal liner.

Option: seamless pvc sheet 2 mm thk, non-slip, anti-static, suitable for heavy duty use is admitted.

6.2.7 Penetrations and Openings

All penetrations and openings (MCTs, sleeves, etc.) welded to structure and F&G dampers shall be certified according to the fire rating applicable.

Penetrations and openings shall be pre-formed, framed apertures, supplied complete with all blanking plates flashing, trims, pins, mesh, fire protection and lining profiles to complete the penetration.

To maximise the pre-installation of penetrations at the manufacturer's works, each wall shall be supplied and installed complete with all penetrations including suitable sized and rated multiple cable transits (MCT).

MCT frames shall be welded to external walls.

6.2.8 Acoustical Requirements

See Ref. [21].

6.2.9 Information Signs

Information signs do not include safety signs, warning signs or fire related signs.

All information signs shall be suitable for use in an offshore installation. Signs shall be of a coordinated range and shall be subject to company approval.

Information signs shall be installed on the doors and / or as shown on the architectural general arrangement drawings.

Information signs shall be supplied and installed in accordance with SOLAS and company requirements.

Signage shall include

- Room Identification Signs,
- Directional Signs (Not Safety)

All signs shall be written in English and Dutch.

6.3 ELECTRICAL COMPONENTS

Each electrical equipment room will be a self-contained unit with fire and gas detection, lighting, small power socket outlets and redundant HVAC systems (with saline air filtration) required to maintain a positive air pressure. Fresh air will be heated and space heaters will be used to maintain the minimum indoor design temperature.

Detailed descriptions of HVAC systems are reported on paragraph 6.5.

Each electrical enclosure shall be located inside a non-hazardous (safe) area and be capable of withstanding a pressurized water washdown.

All equipment located outside shall be suitable for the harsh off-shore marine environment (North Sea) and where necessary have a suitable weather-cap or housing (including all junction boxes, cables, cable ducts, cable glands, etc.). The minimum Ingress Protection ratings shall be as shown below in accordance with IEC 60529 - Ref. [37].

Equipment Type / Outdoor & Naturally Ventilated Locations	Minimum Required IP Rating
Motors	IP56
Cable Glands	IP66
Junction Boxes	IP56
Trace Heating Junction Boxes	IP55
With enclosures open, all live parts shall be shrouded to provide IP2X	

Table 8 - Minimum Ingress Protection ratings

Two suitable earthing lugs shall be provided on the exterior of equipment (typically base frames) ready for bonding connections to be made to the platform structure.

All materials used shall be halogen free and low smoke / flame retardant.

A room that contains battery cells shall include a self-contained, bottled water type, sterile (saline) eye wash station. Each unit shall have dual sterile bottles with the 'Use By' and 'End Of Life' label clearly shown for the installation facility.

During detailed design a calculation shall be prepared to illustrate that air-change rate is sufficient to ensure LEL will not be exceeded based on the peak hydrogen generation rate and voidage in the room. Where the room is too large for this air-change rate to be practical / sensible battery cells shall be housed in a separately ventilated enclosure.

Rooms that contain battery cells shall be maintained at below 25°C (VRLA) and below 45°C (NiCAD) for them to achieve optimal service life.

6.4 ELECTRICAL SYSTEM

The electrical design shall follow the "ELECTRICAL ENGINEERING DESIGN, DEP 33.64.10.10-Gen. - February 2021", Ref. [48], in particular the points: 4.8, 5.1, 5.4, 5.5, 6.2 and Appendix C related to the illumination levels, in case the manufacturer's standard deviate from the specifications of these points, a Technical Query shall be raised prior to proceed with the manufacturing process.

6.5 HVAC SYSTEM

6.5.1 Overview

The purpose of this chapter is to provide all information and descriptions necessary for the development of detailed engineering relating to heating, ventilation and air conditioning (HVAC) systems dedicated to the HV Switchroom B-100 Module (named "module" in the present chapter) belonging to the Base Load Power Hub (BLPH) project; in addition, it reports the responsibility of the SUPPLIER, the limits of the supply, the methods to be applied to present the documents and components, and provide the information necessary to complete the supply.

It is in the scope of SUPPLY therefore to produce all the required and necessary documentation in order to present a high-quality detailed design, to be used both for purchasing equipment and materials, and for the subsequent installation and commissioning of systems (commissioning phase).

The SUPPLIER is required to present the best technical-economic solution, considering the technology on the market, ensuring the required performance and continuity of service, while maintaining the indoor conditions of the project inside the module. The SUPPLIER shall ensure the proper and safe operation of the systems by providing all the necessary devices for safety purposes.

HVAC systems supplied will be designed to comply with project requirements and international standards, and they shall be able to guarantee the internal design conditions taking into account external design conditions and the purpose they are provided for.

All electrical equipment installed shall be suitable and designed for operation without degradation of its performance at 40°C, regardless of their location.

All instruments shall be designed to be capable of operating continuously and efficiently when the ambient temperature reaches 45°C, regardless of their location.

Design activities and items supplied shall be in accordance with the present technical specification and with standards mentioned above.

Inspection and movement of the equipment shall be guaranteed, in order to enable maintenance activities.

As the module is a normally unmanned facility, the design shall evaluate systems able to reduce maintenance activities on the HVAC systems.

At the crossings of fire compartmentation architectural elements, the SUPPLIER shall include in its scope of supply appropriate components (fire and gas dampers, foams, etc.) in order to maintain the continuity and fire rating classification of such structures (See 6.2.2). The opening and closing state of the electro-mechanical components must be monitored by means of limit switch signals, acquired by the HVAC and lighting management and control panel, excluded fire and gas damper that will be controlled and monitored by the fire and gas system.

This specification describes the minimum requirements for the supply and does not relieve the SUPPLIER of full responsibility for the design, reliability and proper operation of all the systems foreseen.

Quantity, typology and feasibility of the HVAC systems will be evaluated by the SUPPLIER.

6.5.2 Capacity configuration

In this document several capacity configurations are mentioned depending on the HVAC equipment.

- 1x100% capacity means: one (1) equipment is sized for full capacity. A down time is acceptable for maintenance or default of the equipment
- 2x100% capacity means: one (1) set of equipment is on duty and one (1) set is on standby (full capacity each). A downgraded mode or down time is not acceptable for maintenance or default of one of those sets.
- - 3x50% capacity means: three (3) sets of equipment are provided, each sized for 50% of the full capacity. Two (2) sets are normally in operation, and one (1) set is on standby. A downgraded mode or downtime is not acceptable in case of maintenance or failure of one of the operating sets.

6.5.3 HVAC Equipments

As far as HVAC is concerned, system is mainly composed of:

- Two air ventilation systems (2x100%).
- Two electric heating coils (1x100% for each air ventilation system).
- Three space heaters (3x50%).
- Fire and gas dampers.
- Inline equipment.
- HVAC instrumentation.
- HVAC and lighting power and control panel (UCP).
- Ductwork and bulk material.
- Supports.

6.5.4 HVAC Systems Description

HVAC systems provided will be designed to comply with project requirements and international standards, and they will be able to guarantee the internal design conditions taking into account external design conditions and the purpose they are provided for.

Due to limited spaces available for the installation of HVAC systems both inside and outside the shelter, the internal design temperature and the overpressure of the shelter respect to outdoor will be maintained by using an air handling unit; this system will be composed by the air ventilation unit, installed outdoor, and the ductwork system needed to provide the service required.

Hence, the main systems provided are:

- Air ventilation system
- Heating system

Design activities and items supplied shall be in accordance with this technical specification and with standards mentioned above. Thus, all HVAC systems provided shall be in compliance with ISO 15138.

As previously specified, all penetrations and openings, thus also F&G dampers, shall be certified in according to the fire rating applicable.

The performance of the air ventilation units must be evaluated considering the environmental conditions in which the units will be installed and must have characteristics able to guarantee the normal ageing of the components.

All equipment, materials and instruments must guarantee their functionality at the minimum and maximum temperatures of the site.

All dampers and equipment must be supplied with a support junction box to which the necessary electrical connections can be made, and to which the connection cables to the local HVAC and lighting power and control panel will be connected.

All HVAC system, except fire dampers, will be feeded and controlled by the HVAC and lighting power and control panel.

All system provided shall comprehend suitable supports for the aim and the environment where they will be installed.

6.5.5 Air Ventilation System

As previously specified, due to limited spaces available both inside and outside the shelter, the air ventilation system will be composed by 2x100% AHUs (Air Handling Units) provided of heating system, and will be mounted on the module roof.

Each ventilation unit will be able to maintain the internal design conditions of the project by means of the temperature difference between indoor air and supply air temperature. In addition, each system will guarantee the airflow rate required to maintain an overpressure against external pressure equal to 50 Pa, and the minimum air changes requested for the module.

AHU units shall be powered directly from the HVAC UCP; also signal cables will be connected with the HVAC and lighting power and control panel. More details are reported on related paragraph.

Each HVAC system will be provided of supply ducts. Inlet openings will be placed on the module walls, in combination of a sleeve; no. 1 fire and gas damper will be provided and flanged to the internal side of each sleeve.

The air shall be exhausted from an opening placed on wall, at a height next to the roof, with the aim to avoid interferences with other components (e.g. cable trays, etc.). No. 1 pressure relief damper and no. 1 fire and gas damper will be provided and flanged to the internal side of the outlet sleeve. The pressure relief damper shall guarantee the overpressure requested inside the module, as previously specified. An outlet duct piece with bird screen wire mesh shall be installed on the external side of the sleeve, designed to avoid rain from entering the module.

The treated air is conveyed into the module through ducts made of stainless steel, according to the above-mentioned prescriptions. Supply air shall be filtered to remove salt, moisture and dust from the airflow, and heated by the electric heating coil if needed; subsequently the air will be supplied by means of a fan. All entering air will be exhausted through the pressure relief damper.

Each AHU unit shall be provided with non-return damper to isolate the relative system when is turned off.

Balancing dampers will be provided where needed.

The heating coil of the HVAC system shall be controlled and managed by means of two (2) temperature probes located inside the module, in different locations. Thus, the air ventilation system will be managed to provide the amount of cooling required into the module, based on temperature detected, through the HVAC UCP control system. All HVAC equipments and instrumentation shall be connected with the HVAC UCP.

The module is equipped with two Pressure Differential Transmitter (PDT) located inside the container in order to monitor the pressurization respect to outdoor as per the value mentioned on project design data paragraph.

The air injected to pressurize the module will be able to avoid unwanted contaminants from entering, such as moisture, salt, and dust which form a corrosive environment that can affect the performance and shorten the life of the components, resulting in higher failure rates and increased unplanned maintenance. In case of a sensitive decrease of overpressure value, or its totally missing, an alarm shall be sent to the PCS system and the stand-by unit shall be switched on automatically.

Each unit shall be equipped with a pressure switch to detect the missing of ventilation. Therefore, once this signal is received by the PLC on the HVAC UCP, the stand-by unit shall be switched on automatically and an alarm signal shall be sent to the PCS system.

Each system will be mainly composed by:

- Air intake grille with bird screen wire mesh (common to both air ventilation systems).
- Filter section to avoid moisture, salt and dust from entering the module.

  At least no. 1 coalescer filter and no. 2 filters shall be provided of G4 and F7 type.
- No. 1x100% electric heating coil.
- No. 1x100% centrifugal fan.
- Non-return dampers.
- Balancing dampers (if needed).
- Pressure relief damper.
- Drain piping.
- Ducts.
- Supports, instrumentation and all accessories according to a good engineering practice.

Both AHU units must be provided of drain piping, which will be installed near to the module, to discharge water collected by the coalescer filter below lower deck walking surface. Pipes used will be made of plastic material suitable for the marine environment and for the scope, fixed to the module structure and connected

by a siphon to each unit. The drain network will be designed to work via gravity to drain off the condensate water into the drainage network.

Drainage system shall be provided of heating cable with anti-freeze function to avoid ice inside the pipes when outside temperature reaches values close to 0°C.

Pipes and cables that will be installed on the roof will be lay down within metal sheets or other protection system to avoid their damage.

6.5.5.1 Centrifugal fans

Centrifugal fans shall be designed and constructed in consideration of all possible operating, start-up and shut-down conditions, under all foreseeable ambient condition, as well as under a further increase of the fan speed by 10% at minimum.

They shall consist of casing, equipped with plugged drain, including an impeller with backward curved blades for high efficiency (statically and dynamically balanced), shaft, block bearings (designed for a theoretical service life of more than 40,000 operating hours).

The electrical motor shall be designed for maximum ambient conditions, maximum power consumption of the fan's characteristic curve, protection degree IP 56 and 10% power reserve at minimum. The motor shall be equipped with safety switch.

Each FAN motor is fitted with:

- One (1) temperature sensor (PTC) for the monitoring of the motor windings.
- One (1) motor anti-condensation space heater.

Furthermore, the FAN section is fitted with:

- One (1) Emergency Stop Push Button connected directly to the HVAC and lighting Panel.
- One (1) Isolator Switch which enables to manually isolate the FAN motor power supply. This isolator switch is fitted with an auxiliary contact sent to HVAC and lighting Control Panel.

Each fan shall be equipped with a pressure switch to detect the missing of ventilation system and thus the pressurization of the module. Therefore, once this signal is received by the PLC on the HVAC UCP, the stand-by fan shall be switched on automatically and an alarm signal shall be sent to the PCS system.

6.5.5.2 Ductwork

All ductworks shall be designed according to international standards, mentioned above, and suitable for marine environment.

The SUPPLIER shall prefabricate all ducting (stainless steel), bends, tee, tapers, branch connections, inspection doors, dampers, special components and provide all necessary accessories for sealing

connections and isolating material from duct to supports. SUPPLIER shall be responsible that every piece shall be adequate sealed to comply with leakage standards.

The SUPPLIER shall provide all necessary material and accessories for the safe and functional operation of the system, including but not limited to:

- flexible connections,
- inspection doors,
- instrument "duct mounted" supports,
- fastenings,
- bolts, nuts, screws, etc.
- gaskets – including anti-galvanic corrosion coupling,
- sealants and glue,

SUPPLIER shall also provide all accessories and tools required for installation.

Special care shall be paid in the construction of the ducting components to be connected to the other HVAC in-line elements.

SUPPLIER shall supply spare parts for commissioning including but not limited to gasket, sealant, bolts, painting for touch up etc. SUPPLIER shall also quote as an option, 2 years functional spare part list, if applicable to his scope of work.

All air ducts shall be designed with regard to a low pressure drop, a low sound pressure level generated by the air flow, a small surface area and a smooth, streamlined and airtight construction.

All ducts shall be reinforced and stiffened as required or necessary to prevent any damages, vibrations, expansions or contractions and in consideration of the greatest foreseeable stress by air or shockwave pressure.

All ducts shall be joined together by connecting frames or flanges made of welded angle or sheet steel, bolted and sealed air-tightly by sealing strips made of foam-rubber and permanent elastic sealing material made of silicon compound.

Every connection shall be sealed with adequate gasket and special no conductive material shall be installed where dissimilar material joint occurs (e.g. stainless steel duct in conjunction with galvanized steel duct) SUPPLIER is responsible to provide suitable insulation kits. All air ducts shall be equipped with all required or necessary fittings.

The ducting installation will be done by means of wall supports and ceiling supports. SUPPLIER responsibility is to coordinate with other disciplines for supports.

When the duct system is installed and ready for mechanical completion, the entire system should be cleaned in accordance with ISO standard.

6.5.5.3 Inspection Doors

Inspection holes, ports, doors and panels as well as access openings, doors and panels shall be provided wherever necessary for inspection, revision, operation, checking, controlling, access, service, repair,

cleaning, maintenance, etc. at all air ducts and installation shaft or trenches as well as at all suspended ceilings and false floors:

Access panels shall be equipped with quick release fasteners to ensure an easy handling. Doors with hingers and double lever locking devices. Panels and doors with airtight sealing strips.

6.5.5.4 Weather protection louvers

The external weather protection louvers shall be designed for outside installation. The weather protection louver shall comprise a frame with built-in external horizontal blades with an attached rear wire-mesh screen painted steel to secure the air inlet against insects and birds. The air inlet face velocity shall be lower than 2 m/sec.

6.5.5.5 SHUT-OFF Dampers

The SHUT-OFF DAMPERs installed:

- Are controlled (230 VAC) from HVAC and lighting Control Panel.
- Send Open/Closed statuses (position switches) to the HVAC and lighting Panel (two (2) DI).
- Are Normally Closed (i.e. are closed if not powered).

6.5.5.6 Downstream Non-Return Dampers

Non-return dampers are installed to prevent air backflow.

6.5.5.7 Balancing Dampers

If needed by duct layout, balancing dampers are installed to set the project air flow rate.

6.5.5.8 Filtration section

Air filtration section is made of a coalescer filter and two (2) filtration stages (G4 and F7).

Filters shall be designed for marine environment and suitable for the scopes specified; the air inlet face velocity shall be lower than 2.5 m/sec.

They shall be designed for lateral filter removal. All filter cells shall comprise a filter frame, correctly cut for air-tight assembly, including bars, clamping devices with quick release elements, frame and filter sealing.

The filter media shall be washable, cleanable, re-usable, non-rotatable and flame resistant. The filter media shall be made of synthetic fibres material with resilient spun fibre structure, variable density and strengthening against rupture and tearing.

All filters shall be equipped with one differential pressure gauge and differential pressure switch with alarm on the HVAC and lighting panel.

Each filter is fitted with one (1) Differential Pressure Transmitter (PDT).

In case the first threshold ("H") is reached, HPLC triggers a Minor Alarm and maintenance operators will be informed that maintenance on filter will be soon necessary, ventilation is kept running.

In case the second threshold ("HH") is reached, HPLC triggers a Major Alarm. Ventilation is also kept running.

6.5.5.9 Heating section

Each system is fitted with an electric heating coil to increase the supply air temperature.

The heating coil is controlled by means of a temperature probe installed downstream the heater in order to manage its heating load.

- High threshold, for automatic reset.
- High High threshold, for manual reset.

The power supply to the heater shall be interlocked with a flow meter to ensure that air heater will be switched off in case of airflow be lower than a permissible value.

After the fan motor is started, the HVAC PLC (due to airflow) switches on the heating coil.

6.5.5.10 Other Instruments Used for the Control of the Fans

Following instruments are installed downstream fan in order to control the blown air:

- One (1) Temperature Transmitter (TT).
- One (1) Differential Pressure Transmitter (PDT).
- An Emergency Stop Push Button is provided next to each FAN.

6.5.5.11 Start Sequence

Prerequisites for unit start sequence are:

- No "inhibit to start" signal from FGS.
- Related FIRE DAMPERs are confirmed open.
- Available (no fault) signal.

Unit start sequence is controlled by the HVAC PLC:

- HVAC PLC determines duty/standby sequence;
- HVAC PLC opens related SHUT-OFF DAMPERs;
- HVAC PLC starts FAN after confirmation that SHUT-OFF DAMPERs are opened.

6.5.5.12 Stop Sequence

Unit stop sequence is controlled, timed and regulated by the HVAC PLC:

- HVAC PLC stops FAN.
- HVAC PLC closes related SHUT-OFF DAMPERs.

6.5.5.13 SHUT-OFF DAMPER faults

In case of DISCREPANCY between the duty SHUT-OFF DAMPER statuses (e.g. both Open and Closed statuses are sent in the same time) and/or with the power (e.g. the Closed status is sent while the SHUT-OFF DAMPER should be open):

- HPLC sends the stop order to the fan, by opening the power contacts of the contactor that feeds the FAN motor.
- In AUTO Mode, if the stand-by unit is not faulty the HPLC initiates a changeover and triggers a Minor Alarm. Otherwise, no changeover is launched and the HPLC triggers a Major Alarm.
- In HMI-MANUAL Mode, the HPLC triggers a Minor Alarm. If standby FAN is also faulty, the HPLC triggers a Major Alarm.

6.5.5.14 PTC fault

In case the PTC detects overheating:

- HPLC sends the stop order to the fan, by opening the power contacts of the contactor that feeds the FAN motor.
- In AUTO Mode, if the standby FAN is not faulty, HPLC triggers a Minor Alarm and a changeover. Otherwise, no changeover is initiated and the HPLC triggers a Major Alarm.
- In HMI-MANUAL Mode, the HPLC triggers a Minor Alarm. If standby FAN is also faulty, the HPLC triggers a Major Alarm.

6.5.5.15 Isolator switch status

In case of activation of the motor Isolator Switch, the consequences are the same as if the motor PTC signal is received.

6.5.5.16 Isolator Switch status

In case of activation of the motor Isolator Switch:

- HVAC and lighting Panel sends to the contactor FAN motor stop order.
- In AUTO Mode, if the standby FAN is not faulty, HPLC triggers a Minor Alarm and initiates a changeover. Otherwise, no changeover is initiated and the HPLC triggers a Major Alarm.
- In HMI-MANUAL Mode, HPLC triggers a Minor Alarm. If standby FAN is also faulty, the HPLC triggers a Major Alarm.

6.5.6 Heating System

The module shall be provided of 3x50% electrical space heaters, sized to offset the room heat loss and to maintain the winter internal design temperature.

Space heaters shall be activated and managed based on temperature detected by the two (2) temperature probes located inside the module, as per air ventilation system.

6.5.7 FIRE DAMPERs

All F&G final elements (e.g. fire and gas dampers, etc.) connected to the F&G system shall be independently minimum SIL-1 compliant and certified by an approved third-party Company (e.g. TUV, EXIDA, SIRA).

Each Inlet and outlet opening shall be equipped with no. 1 fire and gas damper, motorized. FIRE DAMPERs shall close automatically, in case of fire inside the duct, by fusible (72 °C).

All the FIRE DAMPERs are electrically actuated and powered by 24 Vdc from ESD/FGS:

- 24 Vdc: FIRE DAMPER OPEN
- 0 Vdc: FIRE DAMPER CLOSE (Fail Close mode)

All FIRE DAMPERs are fitted with two (2) "REMOTE / CLOSE" Hand Switches installed at each side of the bulkhead and/or deck.

- "REMOTE" position means "controlled by FGS" and only by FGS.
- "CLOSE" position means that FIRE DAMPER is closed locally regardless FGS order.

The Hand Switches are connected directly on the FIRE DAMPER power Junction Boxes in which they are wired in series to the FIRE DAMPER solenoid valve power supply.

Local Hand Switches on each side of the bulkhead are associated with the FIRE DAMPER(s).

During normal operation (switch on "REMOTE"), the FIRE DAMPER is controlled by the FGS. But it shall be possible to manually put the FIRE DAMPER in it safe position by switching one of the local hand switches:

- On the "CLOSE" position

As soon as at least one (1) FIRE DAMPER Open status is lost, the HPLC is able to stop the HVAC System(s) that could be damaged if the FIRE DAMPER is closed.

6.5.7.1 FIRE DAMPER statuses

The position switches (or proximity sensors) of FIRE DAMPERs consists of a set that has one (1) switch (close limit switch) for monitor the close position that will be wired to FGS, and one (1) switch (open limit switch) to monitor the open position that will be wired to HVAC UCP.

For each fire damper, its open limit switch will be wired as N.O. (Normally Open) to the HVAC UCP (the signal will be closed with the damper in the complete open position).

HVAC control system will send a hardwired signal to FGS (by minimum SIL 1 safety relays installed and powered by HVAC UCP – see previous figure) as cumulative of fire damper open limit switches (signal to 0 if any of the limit switches (LS) is not open). The voltage free contact of the SIL 1 safety relays will be wired to FGS system.

If a fire damper discrepancy is occurred (the HVAC PLC doesn't receive the opening signals from one fire damper open limit switch within the foreseen opening time), the signal "failure of fire damper opening" of the specific fire damper is sent via communication link.

N°	Signal	From / to	Type (from FGS point of view)
1	FIRE DAMPER open position (ZSO)	FIRE DAMPER to the HVAC UCP	DI
2	FIRE DAMPER closed position (ZSC)	FIRE DAMPER to FGS	DI

Table 9 - Fire Damper Statuses

6.5.7.2 FIRE DAMPER control

Fire and gas dampers will be powered and controlled by the FGS.

N°	Signal	From / to	Type (from FGS point of view)
1	FIRE DAMPER open/close order (SOV)	FGS to FIRE DAMPER	DO

Table 10 - Fire Damper Control

6.5.8 HVAC and Lighting Power and Control Panel (HVAC UCP)

The HVAC and lighting power and control panel, hereinafter also called HVAC panel (UCP), shall be installed in the module and it will provide the necessary functionality, access, control and monitoring to maintain operation of system components, with main controls and visual indicators on the front of the panel (HMI, switches, push-button, etc.).

The electrical design and supply activities must follow international standards (IEC standards) and the "ELECTRICAL ENGINEERING DESIGN, DEP 33.64.10.10-Gen. - February 2021".

The HVAC and lighting panel will be feeded by the LV MCC (400 V) panel, whilst all HVAC equipment and instruments shall be directly feeded by the HVAC UCP. As previously stated, only fire and gas dampers will be controlled and managed by the fire and gas system.

It includes the HPLC (HVAC PLC), the HMI and all the I/O cards necessary for:

- The hardwired communication:
  - with the HVAC equipment.
  - with the other systems (ESD/FGS).
- The serial communication devices:
  - with the PCS.

The HVAC and lighting power and control panel will be interfaced with the central control system (PCS) via Modbus TCP/IP serial connection, through which all signals and thus information will be acquired.

The UCP shall be designed to allow the PCS of monitoring and supervising all HVAC systems. The operator will monitor and control the systems through the HMI interface or connecting locally a laptop on the HPLC (not from remote).

However, for main equipment (Air handling units, space heaters) an AUTO-MANUAL selector shall be installed on the front of the HVAC and lighting panel. In case of AUTO selection, the standby units shall be automatically put ON in case of failure of the running unit.

Light indicators shall be provided for each equipment state (available, running, stop, fault) having colors in accordance with international standards. These indicators shall be place below the AUTO-MANUAL selector.

HVAC and lighting power and control panel will receive input signal (hardwired signal) from ESD system (Emergency and Shut-Down System) and F&G system (Fire and Gas System) to shut-down all HVAC systems.

The HVAC and lighting panel must be divided into two sections, one for the power supply and one for the control system (PLC); the latter must be separated from the power section.

6.5.8.1 General Requirements

The HVAC and lighting Panel shall be a single enclosure, composed of two segregated sections: one section shall be dedicated for HVAC system equipment Power distribution, and one for all associated control / interface functions, PLC, HMI, IO cards, etc. The complete panel shall follow the technical requirements of the project specifications defined in the reference list, including all sub referenced documents defined with them and further definitions detailed in the following sections:

- Easy access shall be provided to all equipment and connections in order to facilitate the installation and maintenance with minimum amount of dismantling or removal of equipment.
- Cabinet shall be mounted on combined lifting support base / installation plinth with anti-vibration strips.

Construction of the cabinet and all integrated equipment shall ensure:

- Permanent and clear identification,
- Ease of use and ergonomics for personnel,
- Front only access in line with the technical room layout,
- Minimum 20% installed spare capacity (I/O, terminations etc.), after commissioning,
- Minimum 20% spare space.
- Cables shall be top entry with project specification cable supports and earth bonding methods.
- Design and construction of mechanical assemblies shall be modular.
- The internal layout of the cabinet shall be designed to provide easy access to all electronic modules, power distribution, fuses, System Terminal Boards (STB, mirroring the I/O boards), Field Terminal Blocks (FTB, mirroring the field junction boxes), cable trunks, etc.
- Inter-connection between PLC cards components and PLC back plane/terminal blocks shall be via pre-wired cable sets/connectors by Manufacturer.
- In the case of any ATEX intrinsically safe equipment, then the necessary Hazardous area related material to be provide and segregated / indicated accordingly.

The cabinet general arrangements and layouts shall be reviewed and approved by COMPANY prior to proceeding with the manufacture.

The HVAC and lighting Control panel shall be designed to be placed within the free available space according to the approved technical room layout.

6.5.8.2 HVAC and lighting Panel Construction

The cabinet shall be entirely prefabricated and tested in Manufacturer's factory.

The cabinet shall be arranged to form a single structure with a common busbar (if any) and shall be for floor standing installation.

The cabinet's enclosure shall be made of hot dip galvanised metal sheeting with finishing epoxy-based paint. The metallic parts shall be painted and suitably protected against corrosion using an appropriate treatment. The painting manufacturer's standard shall be used in accordance with the project specified colour code. The entire coating shall be sufficiently resistant to withstand transport, assembly and maintenance operations without damage. The cabinet's surface shall be flat and free of deformation, marks and scratches.

The cabinet assembly and their components shall be of standard type and, similar parts and components shall normally be interchangeable. The number of item type shall be limited.

Switching devices (circuit breakers, contactors, switches, etc.) shall be installed on horizontal DIN rails. These shall be clip-on type for miniature circuits breakers (MCB) or bolted onto steel plates for molded case circuit breakers (MCCB).

The apparatus and circuits in the HVAC cabinet assembly shall be so arranged to facilitate operation and maintenance, and to ensure the necessary degree of safety according to IEC 61439-1 § 8.4.6.2. All components shall be easily accessible.

Cabinet construction shall be as a minimum IP41 and IK08.

Cabinet shall be free standing and braced for shock and vibration normally encountered during transport, construction and plant environment. The equipment shall not come loose or be damaged in any way due to vibration. Support bracing shall not restrict maintenance access to chassis, modules or any Control System components.

The cabinet shall have removable swing-out doors, preferably 180 degrees. All swing-out doors shall be provided with handles and a door stay system to secure the door in the open position. When a locking key system is used, it shall be a double pin 5 mm system. The door shall be provided with a plastic pocket (for wiring drawings). Each door shall be electrically bonded to the main cabinet by a braided earthing strap or green-yellow cable.

Cabinet shall be provided with removable lifting eyebolts at the top, and the support frame base shall be suitable for the proper fastening to the floor to suit framing system of shelter false floor.

Provision shall be made for cabinet lighting by strip LED lightning switched-on by front doors limit switch.

Convenience outlet for maintenance shall be provided with normal 230 VAC, 50Hz, 15 Amp, for utility power. The outlet shall be wired to a separate terminal block.

Anti-condensation heater shall be provided. It shall be supplied from a dedicated source and individually protected by an earth leakage circuit breaker. Its control shall be done automatically by means of a hygrostat.

Should any compartment have internal enclosures, these shall be backed by dust filters and dedicated fans to ensure no risk of overheating. Ventilation fans shall be wired to separate terminal blocks.

Careful attention should be given to module population density, component spacing and cabinet arrangement to ensure that hot spots or thermal gradients do not occur within the cabinet. Cooling fan shall be provided wherever required. It shall be thermostat activated and wired to a separate terminal block. All additional inlet louvers or ventilation slots shall be provided with readily, easily accessible, replaceable filter screens.

Cabinet shall be supplied completely wired, assembled, tested and ready for installation.

All cables entering all cabinets shall be properly clamped with armour earthing. All hardware for the cable clamping shall be provided by the Supplier.

The cabinet layout shall be such as to provide clear access to the internals for maintenance. All unused card locations / slots shall be fitted with cover plates.

All circuit breakers for outgoing circuits shall be equipped with an auxiliary contact for fault signalling. All circuit breakers fault signals shall be grouped to provide a common signal wired on terminal for remote signalling purpose.

All circuit-breakers shall be fitted with padlocking device for safe isolation purposes.

Circuit-breakers for distribution feeders will be operated manually. If a tripping coil is required, it shall be of de- energised to trip type unless otherwise stated and be failsafe.

All circuit breakers shall be multipole switching (including neutral).

At least 20% of the total number of outgoing circuits shall be provided as spare. Spare circuits shall be equipped with circuit-breakers of suitable ratings that match those installed, and wired on terminal blocks.

The PLC modules and components shall be mounted such that they can be quickly replaced in the event of their failure. Module or component mounts, bracing and/or supports shall be designed so that they dampen out the effects of external vibration.

PLC modules that plug into a back-plane, motherboard or rail must utilize a restraining bar or anchoring device to prevent accidental removal or release due to shock or vibration. Components that are not mounted on printed circuit boards or installed individually within modules, motherboards or chassis must be securely fastened to a cabinet support member, rail or bus assembly.

6.5.8.3 Power Section

The HVAC and lighting panel shall be feeded by the LV MCC (400 V) panel, which is not included in the scope of HVAC supply, and shall be equipped with a manual disconnector.

The relevant internal thermal switches shall be equipped with an auxiliary contact to inform to the PLC in case of disarming by fault.

The power and control interface will be the terminals within the panel itself. All HVAC equipment shall be connected to HVAC and lighting panel through these components. For characteristics and specifications related to the electrical components (panel board, cables, etc.), supplier must refer to the relative technical specifications.

6.5.8.4 400 V Power Supply

HVAC and lighting Panel is powered from LV MCC (400 V) by one Normal power supply, with the following characteristics:

- 400 V AC, 50 Hz, 3 phases+N, 4 wires,TN-S.

6.5.8.5 UPS Power Supply

HVAC PLC is powered from the UPS Distribution Board with one power supply with the following characteristics:

- 230 V AC, 50 Hz, 1 phase+N, 2 wires, TN-S.

The HPLC, touch screen (HMI) and the miscellaneous Input / Output / Communication cards are powered from UPS power supply.

Moreover, UPS power is used for instrumentation (instruments measurement/statuses loops and instruments power supplies).

6.5.8.6 Interference

The HVAC cabinet shall meet the Radio Frequency Immunity (RFI) requirements as per IEC 61000-5. As a minimum Type-Test Certificates shall be provided.

6.5.8.7 Control Section

One HVAC PLC must be installed inside control cabinet section. Equipment changeover shall be fully automatic via the HVAC PLC and shall not need human intervention either on equipment or on instruments. By "HVAC PLC", it must be understood power supply cards, CPU card, communication card, segregated inputs and outputs cards (I/O) (for main and back identical HVAC equipment), etc for all HVAC systems automation dealing with all corresponding HVAC equipment, dampers, temperature and pressure control instruments.

PLC shall be provided with the following architecture:

- hot-swappable power supply card
- at least 10% capital spare cards (and minimum 1 off) for all HVAC PLC components and interposing relays (if any)
- at least 25% spare I/O for each type of I/O (AI/AO/DI/DO/DOR), either by spare channels on existing cards, or spare slots
- The I/O capacity to be considered for the HVAC controller will be estimated based on the HVAC systems to be provided, increased with a 25% of installed spare capacity.

There are no SIL requirements for HVAC and lighting UCP panel, with the exception of the interfaces with safety systems (ESD/FGS) which will be performed using minimum SIL1 relays.

6.5.8.8 PLC Controller general requirements

All modules shall be replaceable on-line, without requiring special tools or degrading required performances. Re- initialisation of new components shall be automatic, without specific operator actions.

Failure of any controller card shall generate an alarm to be transmitted to the PCS system.

Loss of the controller shall cause all outputs to be frozen at their last position or driven to predefine fail safe positions, according to all safety requirements. Data processing consequences (non-significant measurement, no longer processed control functions, etc.) shall be indicated to the operator according to HMI requirements. Similar requirement applies in case of card failure.

Controller shall have non-volatile memory and shall be able to perform its own control functions / Watchdog function.

Low battery level alarm shall be included as part of diagnostic alarms.

I/O cards will not be redundant except where availability requirements may determine otherwise.

All components included in the system shall be available over a period of at least 15 years after the SAT. Controller shall be supplied with a minimum set of functionalities to allow the operation of the HVAC system. The following requirements are to be considered as a strict minimum.

6.5.8.9 Control Algorithms

Computational algorithms for math functions such as addition, subtraction, multiplication, division, square root extraction, logarithms shall be included. Other functions as dead time, high/low selection, high/low alarming (for input and output signals and calculated values), time average, and signal selector switch shall also be included.

During operation, switching from auto to manual output mode or switching from local to remote set point shall be performed without bumping.

6.5.8.10 Digital Algorithms

It will be used binary "blocks" allowing inputs and several outputs to be processed to implement: auto/manual processing, on/off control, discrepancy alarming, interlocking and duty/stand-by changeover.

The controller shall support logic functions such as AND, OR, NAND, NOR, XOR, NOT, as well as timers, delays, and counters.

6.5.8.11 Sequence Control

All software tools & associated hardware necessary to implement sequences shall be supplied. This shall include all licences etc.

The interaction between analogue algorithms and sequences is a mandatory requirement. Sequences shall be synchronised with controller scan cycle.

The running of sequences in parallel in a controller is required.

6.5.8.12 Human Machine Interface

The PLC control functions shall be accessible via a dedicate system HMI. The HMI shall be 19" size and shall be 19" size and shall be from the same range as the PLC and be fully compatible with all functions of the system.

6.5.8.13 Time Management

The controller should be synchronized from the PCS system, using the communication signal / interface.

The maximum discrepancy between HVAC controller and PCS controllers will be defined during the detailing phase.

6.5.8.14 Input / Output Requirements

All I/Os shall be powered by 24V DC from the I/O cards or from the System Terminal Boards or for specific loops from the power supply terminal blocks.

All I/O shall be electrically isolated for protection against power supply, field surges and short circuits. Each I/O module shall have LED's on the front face, reporting diagnostic fault, I/O circuit status, etc.

Failure and subsequent replacement of an input or output module shall not affect other components, or initiate a system failure.

I/O modules shall be capable of being replaced without removing the wiring from the termination module. Al least a 20% of empty slots will be considered for future expansions.

6.5.8.15 Analogue Input

Analogue converters (A/D) shall be made at least with 12 bits resolution. The required accuracy shall be 0.2% of full span at the minimum.

Analogue input modules shall include a fault detection circuitry (out-of-range, open loop measure, short circuit, etc.).

Each input channel of card shall be isolated from the others and protected by fast acting fuse. 4-20mA analogue input modules shall be able to power 2-wire field transmitters.

No RTD analogue input cards will be used. All temperature sensors will be converted to 4-20mA signal type by means of local smart transmitters.

The transmitters shall be powered by 24V DC from the HVAC cabinet galvanic isolation. Accidental application of main supply voltage or test voltages shall not damage the modules.

6.5.8.16 Analogue Outputs

Analogue converters (D/A) shall be made at least with 12 bits resolution. The required accuracy shall be 0.2% of full span at the minimum.

Each analogue output shall be a standard 4-20mA DC signal. The output channels shall be isolated, independent and individually protected by fuse.

Analogue output shall be powered by cabinet internal 24V DC supply.

The negative and positive sides of the circuit output shall be wired to independent terminals (common supply or return bus-bar is not allowed).

Each output channel shall be able to source drive an external load up to 750 ohms.

The system shall detect and alarm operator when a discrepancy occurs between the software values generated by controllers and the real electrical value of the output.

6.5.8.17 Digital Inputs

Input channels shall be able to accept inputs from volt-free contact of solid-state switches and perform voltage monitoring.

Digital modules shall be configurable and shall include circuitry to ensure that any "chatter" or "bounce" encountered during contact closures does not initiate an erroneous alarm.

All input shall be powered by the system under 24V DC. Normal status of inputs shall be either normally open or close.

6.5.8.18 Digital Outputs

Each output shall be configurable to allow the following actions, as required by the field device:

- Maintained, latching, pulse contact.
- Normal Open / Normal Closed (fail-safe configurable position for each channel is required).
- Pulsed output (the pulse duration shall be adjustable).

The digital outputs shall be based on solid-state or relay switching. Each channel shall be isolated and independent.

Output modules shall be able to drive loads powered by an external supply or by modules internal source. Two different types of digital output shall be required:

- 24V DC powered outputs,
- Volt-free / ground-free output rate 24V DC powered by other systems.

Output contacts shall be suitably protected against surge current when switching-off inductive DC circuits.

Auxiliary relays, when used, shall be plug-in type with socket, sealed with heavy silver or gold contact according to the voltage.

6.5.8.19 Communication Card(s)

Communication card(s) shall be provided for the required data links between the HVAC and the following equipment:

- PCS network

The communication card(s) shall have integrated LED's showing card and communication port status.

Open communication by a various kind of standard protocols based on Modbus TCP/IP. Physical interfaces is Ethernet (IEEE 802.3).

The HVAC system will be able to continue working in case of failure of the communication link with PCS network.

All information transmitted by the communications link shall be identified in the Project Modbus TCP/IP list and include all alarm conditions.

6.5.8.20 Internal Wiring

All wiring shall conform to international standards. Flexible conductors shall be used.

For component electronic circuit wiring, the Manufacturer's standard shall be used.

Stranded conductors shall have crimped ends for insertion into terminal blocks (only one conductor per terminal and one wire per crimp).

Wiring shall be halogen free. All wiring shall be marked at both end and identification shall refer to the related wiring diagram. All wiring for external connections shall be brought out to individual terminals on a readily accessible terminal block. Wires shall be terminated using compression type lugs or crimp sleeve.

All equipment and termination shall be arranged so as to be readily accessible for fault finding and maintenance. Wiring shall be neatly laced or where practical, laid in rigid plastic trunking, and covered. Separate trunking shall be provided for signal and power wiring runs to avoid cross-talk and all external interference.

No cable trunking shall be filled to more than 70% capacity.

Terminal Blocks shall be of cage clamp interruptible or equivalent terminals, with the necessary polarity distribution, switching and protection, test points and earthing systems.

The terminals shall accept 0.75 to 2.5 mm^2 conductors and shall provide sufficient termination capacity for all permissible field wiring configurations.

Wiring shall be planned and laid such that they flow towards to termination blocks in an orderly manner (no criss-crossing) among/between cable pairs.

6.5.8.21 Earthing

A clean instrument earth bar network to be installed in the HVAC control section and a protective earth network for the power section, to be installed conforming to requirements.

Constructional precautions shall be taken to ensure electrical continuity between the exposed conductive parts of the distribution board and between these parts and the protective circuits of the installation.

The earth busbars shall be provided along the full length of the distribution board assembly (protective earth) and the control section (instrument earth) with terminals for external protective conductors marked according to IEC 60445. Earthing busbar shall be made of hard drawn copper (minimum equivalent cross section 35 mm^2).

All metallic non-current carrying parts of the distribution board assembly including hinged doors shall be connected to the protective earth busbar. When a part of the distribution board is removed from the enclosure, for example for routine maintenance, the protective circuits for the remainder of the assembly shall not be interrupted.

Connecting facilities shall be provided in the vicinity of the conductor terminals, for connection of associated cable armour and screen to the earth bus bar.

Green/yellow strips shall identify protective circuit.

6.5.9 Power Supply FAILURE

6.5.9.1 Power FAILURE of the 230 VAC UPS incomers

In case of power FAILURE of 230 VAC UPS incomer of the HVAC and lighting Panel, HVAC UCP will be de-energized. Moreover:

- As the HPLC will be powered off, all the HVAC equipment controlled from the HVAC UCP are stopped.
- The HVAC instrumentation will be de-energized.
- Unless the SHUT-OFF DAMPERs are manually controlled (physically open/closed by the operator), they will reach their safe position.
- Because HPLC is off (fail safe signal), a Major Alarm will be triggered.

Once power is re-established / available:

- The HPLC will automatically re-boot.
- The HMI will automatically re-boot with the lower access level.
- All the instrumentation will be re-powered:
  - Measurements and statuses will be available anew on the HMI.
- SHUT-OFF DAMPERs will be kept closed by the HPLC.

No HVAC equipment controlled from the HVAC UCP will automatically re-start: a manual acknowledgment shall be first realized by the operator after investigation of the problem in order to reset all the alarms.

6.5.9.2 Power FAILURE of the Normal 400 VAC incomer

In case of 400 VAC power FAILURE, all HVAC equipment will not operate.

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6.5.10 HVAC and Lighting Panel Interfaces

6.5.10.1 Interface with the Fire and Gas System (FGS) and Emergency Shutdown System (ESD)

ESD/FGS can stop HVAC system by sending a "shutdown" signal to the HVAC and lighting Panel. This signal is sent to a minimum SIL 1 safety relays (installed in the HVAC UCP and powered with 24 Vdc by FGS/ESD System – see figure below), and the HVAC PLC will take a voltage free contact from it, to develop its own logics.

The shutdown signal overrides the control sequences and stop the system in any cases.

N°	Signal	From / to	Type (from FGS point of view)	Type (from HPLC point of view)
1	HVAC system shutdown	From ESD/FGS to safety relays on the HVAC UCP	DO	DI

Table 11 - HVAC and lighting Panel Interfaces with FGS and ESD

HVAC system can send a "Critical Fault" signal to ESD/FGS. This signal is sent to a minimum SIL 1 safety relays (installed in the HVAC UCP and powered with 24 Vdc by HVAC System – see figure below), and the ESD/FGS will take a voltage free contact from it, to develop its own logics.

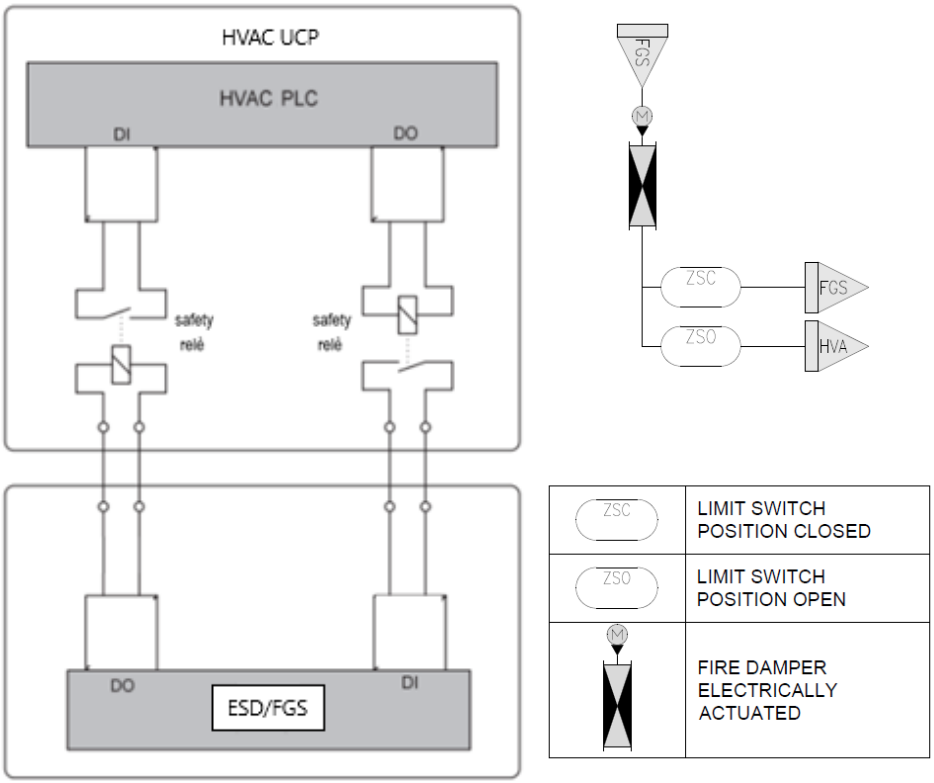


Figure 5 - HVAC UCP Safety relays configuration

6.5.10.2 Interface with the PCS

HVAC system is connected to PCS through a Modbus TCP/IP communication link. The below data are exchanged with PCS. This list is not exhaustive, it shall be detailed by Vendor in the HVAC I/O List document.

Signal	From / to	Type
Major alarm	HVAC PLC to PCS	Communication
Minor alarm	HVAC PLC to PCS	Communication
Equipment statuses (available, run, stop, fault)	HVAC PLC to PCS	Communication
Equipment Emergency stop	HVAC PLC to PCS	Communication
Filters differential pressure transmitter	HVAC PLC to PCS	Communication
Damper control (signal and feedback)	HVAC PLC to PCS	Communication
Module pressure (respect to outside)	HVAC PLC to PCS	Communication
Module temperature	HVAC PLC to PCS	Communication
Permissive to start signal	HVAC PLC to PCS	Communication
Individual status of open limit switches for each fire dampers	HVAC PLC to PCS	Communication
Failure of fire damper opening	HVAC PLC to PCS	Communication

Table 12 - HVAC and lighting Panel Interfaces with PCS

6.5.11 HVAC and lighting Panel Control and Monitoring Devices

This section explains how the HVAC Systems can be monitored and controlled via the HVAC and lighting Panel monitoring and control devices:

- HPLC System.
- Touch screen HMI.
- Emergency Stop Push Buttons and indicating lamps.

6.5.11.1 Voltage Presence Lamp

HVAC and lighting Panel is fitted with one (1) hardwired voltage presence white lamp per feeder.

6.5.11.2 HVAC and lighting Panel Emergency Stop Push Button

An Emergency Stop Push Button is provided in front of the HVAC UCP. In case of activation, all of HVAC System is shutdown. The HPLC, HMI and instrumentation remain available. Once released, a manual acknowledgement is required before any-restart.

6.5.11.3 Filters Clogging

Alarm thresholds are associated with the filters.

Two (2) thresholds are associated to each filter and for the set "Pre-filter + filter":

- In case the first threshold ("H") is reached, the HPLC triggers a Minor Alarm: maintenance operators will be informed that maintenance on filter will be soon necessary.
- In case the second threshold ("HH") is reached, fan keeps running and the HPLC triggers a Major Alarm.

6.5.12 HVAC Control and System Management Logics

All HVAC equipment will be feeded and controlled by the HVAC and lighting power and control panel, except the fire and gas dampers, which will be feeded and controlled by FGS, even though will be part of HVAC supply.

The air ventilation system will always be in operation, constantly maintaining the design parameters within the module, specified in the project design data paragraphs.

Rooftop units will be managed depending on the temperature detected by the sensors inside the module, with the aim of maintaining the internal design conditions of the project.

The fault of an air handling unit shall be reported to the PCS as a generic cumulative fault signal. Major and minor alarm shall be identified by supplier depending on the risks and consequences that an event could lead.

FIRE DAMPER open position (ZSO) signal is received by HVAC PLC to allow ventilation system start-up.

HVAC Systems can run in two (2) different modes, both controlled from the HMI by means of software switches:

- AUTO mode: this fully automatic mode is based on the HPLC providing the functionality and the security of the system, operating in conjunction with the HMI touch screen interface for user access and operation commands.
- HMI-MANUAL mode: this manual mode enables to manually control the HVAC System from the HMI touch screen: the operator can switch on/off each single device that is part of the HVAC System, such as motors, valves or dampers. However, to preserve HVAC equipment, some interlocks are forecasted (Fan start-up if related SHUT OFF DAMPER opened for instance).

6.5.12.1 HPLC System

The control of the HVAC systems is done by the HPLC composed of:

- PLC power supply.
- Central Processing Units.
- Communication cards between I/O racks.
- Communication cards dedicated to PCS.
- Analogue input and output cards.
- Digital input and output cards.
- Watchdog.

HPLC I/O Cards are segregated:

- I/O cards are also segregated for redundant equipment, e.g.:
  - For A/B equipment, the I/O cards corresponding to the "A" equipment are not installed on the same I/O rack as the I/O cards corresponding to the "B" equipment.

The HPLC control system drives the following functions:

- Normal starting / shutdown and control sequence of each system.
- Air ventilation and pressurization system.
- Monitoring of room OVERPRESSURE.
- Safety and critical parameters relative to the system.
- All the equipment statuses conditions.
- Equipment shutdown actions.
- Automatic changeover of duty/standby equipment in case of FAILURE (only in AUTO Mode).
- Trending system to record measurements of the HVAC transmitters.
- Trending system to record HVAC system equipment statuses.
- All alarms (events are time-stamped).
- All the hardwired and serial interfaces with other system and/or sub-systems.

6.5.12.2 HVAC UCP HMI

A touch screen (HMI) is installed in front of HVAC and lighting Panel in order to provide access to all views, functions and operations related to the HVAC equipment.

NOTE: In case of HMI FAILURE, the control of the HVAC Systems will be also available by connecting locally a laptop on the HPLC, without any impact on the programming, and remotely from PCS. The laptop allows same functionalities of control and monitoring as the HMI.

The following level access principle is applied:

- Operator Mode (or read only): no password is required. The technicians can have access to all the views with monitoring access only:
  - All the start/stop/open/close functionalities are de-activated.
  - No parameters such as alarm thresholds and setpoints can be changed.
  - HVAC Systems states, statuses and settings are depicted.
- Maintenance Mode (operating and maintenance): password is required. The technicians can:
  - Start/stop HVAC Systems in AUTO Mode.
  - Have also access to the HMI-MANUAL Mode. The technicians can thus start/stop/open/close each single equipment such as motors, fans, actuators, air ventilation system.
  - Acknowledge alarms.
- Engineer: password is required. This access level, in addition to the Maintenance Mode, enables to:
  - Change the setpoints and calibration parameters.
  - Change the ranges of the instruments.
  - Change the alarms thresholds.

- Change the delays/timers.
- Visualise the parameters and inhibited/override sensors.
- Have access to the Operating System of the HMI.
- Change logins and passwords.

6.5.12.3 Changeover

Each duty / stand-by unit has a user adjustable change over timer set on the HVAC HPLC. A functioning time gap between duty & stand-by unit is forecasted to avoid heavy maintenance at same time on both units.

In HMI-MANUAL Mode, no automatic changeover is possible.

If a fault / trip occurs, the changeover to the stand-by unit will be made. Once the investigation / repair is performed on the duty unit, the control system does not switch over immediately to the duty one. The sequence will continue with the stand-by unit until the end of its process running time.

Then a changeover is applied on the duty one, which will complete the remaining time.

After a controlled stoppage of the HVAC system, the system will start with the same unit that was operating before the stoppage.

6.5.12.4 Acknowledgment

As a general rule, each alarm remains active until it is acknowledged, and the alarm condition has disappeared. In case the alarm condition is still active while acknowledgment is done, the acknowledgment has no effect.

Once a problem is solved by the operator, the operator will have to acknowledge the fault via the HVAC UCP VDU (Visual Display Unit) before being able to re-start.

6.5.12.5 System Monitoring

HVAC and lighting Panel shall allow complete monitoring of HVAC systems without the need to use an external computer. All measured values, equipment and instrument statuses, set points, and alarms shall be accessible through HVAC and lighting Panel.

Following indications are available on HVAC and lighting Panel:

- Power supply indications.
- Status indications for HVAC units (running, stopped, available, tripped, fault...) and alarm indications (electrical fault, overheating…).
- Status indications for automatic DAMPERs (open, closed, position feedback) and alarm indications (actuator fault, discrepancy…).
- Status indications for instruments (measured value, set point…) and alarm indications (instrument fault, high or low value…).

6.5.12.6 Room Pressure Control and Monitoring

The module is fitted with two Pressure Differential Transmitter (PDT) located inside the module itself and connected to HVAC UCP for monitoring. In case of thresholds reached, HPLC triggers a Minor Alarm (High or Low level) or Major Alarm (High-High or Low-Low level).

In general, rooms which have OVERPRESSURE in relation to atmosphere (i.e. indoor to outdoor) are controlled by means of an internal pressure relief damper, which discharges air to OUTDOOR.

6.5.12.7 Instrumentation

From a programming point of view, four (4) thresholds are implemented on HPLC for each analogue measurement:

- Low-Low (LL)
- Low (L)
- High (H)
- High-High (HH)

As a general rule, in case the measurement signal of a transmitter is out of the 4-20 mA range (< 4 mA or >20 mA), an alarm occurs. Depending on the instrument function, the impact of the signal loss will be different.

Type 1: This category refers to the instruments which are not associated with redundant A/B. Example: room Differential Pressure Transmitters.

Type 2: This category refers to the instruments which are associated with redundant A/B equipment. Example: filter clogging Differential Pressure Transmitter.

When the measurement signal of a transmitter is out of the range:

- Type 1: The HPLC triggers a Major alarm.
- Type 2: As this fault occurs on a redundant system, the HPLC does not trigger a Major fault but a Minor Fault (unless the standby equipment is not available). If the system runs in AUTO Mode, the HPLC will launch a changeover. Otherwise, the HPLC triggers a Major Fault.

6.5.12.8 HMI-MANUAL MODE Interlocks

Even if this mode enables to manually control the HVAC System from the HMI touch screen, some interlocks are forecasted to avoid some HVAC equipment damages.

6.5.13 Inspection and Testing

6.5.13.1 General

All equipment covered by this specification (HVAC and lighting panel) shall be subject to inspection and testing by COMPANY at Manufacturer works during manufacture.

Inspection and tests shall be performed in accordance with IEC standards.

Type tests in accordance with the referenced standards shall have been carried out on Manufacturer's similar equipment and the type test certificates shall be provided with the quotation. When appropriate type test certificates do not exist, tests shall be made at the time of manufacture of the equipment to which this specification refers, subject to COMPANY approval.

6.5.13.2 Integrated Factory Acceptance Test (IFAT)

A full integrated Factory acceptance test shall be performed by Manufacturer in the presence of COMPANY representative. The routine tests in accordance with the IEC 61439-1 shall be performed.

The FAT shall correspond to COMPANY requirements, however as a minimum the following tests shall be performed:

- Visual check of the HVAC and lighting panel, including inspection of wiring (aspect, painting, finish, welding, sheet metal, lifting ring, locks, screwed and bolted connection, proper conductors laying, proper devices mounting, conformity to the wiring diagrams, labels)
- Full panel electrical / control operation & function test (remote control and signalling, inter-tripping, automatic sequences if any, etc.) shall be demonstrated to COMPANY by simulation of field devices.
- Dielectric test
- Dimension controls (terminals, busbar and wires, clearances and creepage distances, fixation axis, overall dimensions)
- Quality and quantity check for wearable parts and spare parts according to the specification
- Checking of protective measures and of the electrical continuity of the protective circuits. A test report of the acceptance tests shall be issued.

6.5.13.3 Packing and Preparation for Shipment

Cabinet will be properly packed per the specific construction and technical characteristic to avoid damages during shipment and storing in the warehouse before installation on the plant. Transport packing shall be in accordance to transport methods.

6.5.13.4 Preservation of Control System Equipment

After delivery and identification on site, the cabinet equipment and associated installation equipment shall be stored in a dedicated instrumentation warehouse with adequate environmental conditions including a provisional HVAC as necessary.

Cabinet shall generally be stored in weatherproof packing. The control systems shall be stored and handled with the greatest care.

Special care shall be taken to prevent foreign materials (sand, dust, water, etc.) from entering the Cabinet.

All equipment shall be adequately preserved once permanently installed on site. Any long-term storage preservation requirements to be highlighted commensurate with sea voyage after load out and sail away.

In particular, any electronic equipment shall be protected against humidity, high temperature and dust. Room space shall be considered as air conditioned with temporary AC during installation.

6.5.13.5 Documentation and Drawings

All wiring diagrams and schematics shall be provided, and a dedicated drawing storage pocket shall be installed on the doors of the panel

Legends and signs for commands, caution statements, instructions for assembly / disassembly, etc. attached to equipment, front / back / inside panels, shall be in both Spanish, as the main language (bigger letters) and English.

Maintenance and operation manuals shall be in English.

Maintenance manuals shall include information at minimum of every component, it shall focus also in components and sub-systems assembly / disassembly instructions.

Where equipment and equipment components are manufacturer's standard offering manufacturer's standard documentation which covers the topics of Installation, Commissioning, Operating, Maintenance, Preservation, Programming etc. shall be issued. Where the equipment has been specifically developed or modified for the project specific final documentation shall be supplied.

For equipment that has been programmed or software configured, the supplier shall provide a Configuration Document. The document shall list the configuration applied, at the time of the FAT and shall re-issue at "as built" level after SAT and Commissioning. The configuration document shall be commented to sufficient extent such that an engineer, other than the supplier's programmer can follow the configuration applied.

- The Documentation shall comply with project requirements, but as a minimum will contain:
- Description and functional overview of the panel.
- Cabinet general arrangement and internal assembly with bill of materials,
- Cabinet arrangement and details of cable entry penetrations,
- Cabinet mechanical specifications,
- Details, type of material and arrangement of all gaskets,
- Details of anti-corrosion requirements and painting specification,
- Test results and certification of the degree of protection (IP code) of the cabinets and panels,
- Detail technical data of all individual certified components,
- Copy of IECEx / FM / CSA certifications for all non ATEX certified components,
- Copy of the test reports of all non ATEX certified components,
- Calculation notes of heat dissipation inside the enclosure,
- Maximum surface temperature resulting from the combination of the surface temperature of all individual components,

- Power supply details,
- Power supply distribution details,
- Wiring and cabling arrangement within the enclosure,
- Cable entries arrangement,
- Cable glands details and certification,
- Earthing arrangement and details,
- Labelling and marking
- Operating and maintenance instructions.

6.5.14 Project Design Data

All design data are detailed below. Data not provided shall be determined or evaluated by supplier.

6.5.14.1 Minimum and Maximum Outdoor Conditions

Minimum Outdoor Conditions		Maximum Outdoor Conditions	
Minimum Design Dry Bulb Temperature [K]	Relative Humidity [%]	Maximum Design Dry Bulb Temperature [K]	Relative Humidity [%]
-8,4	100	+25	90

Table 13 - Minimum and Maximum Outdoor Conditions

6.5.14.2 Minimum and Maximum Indoor Conditions

Module	Altitude [m]	Area Classification	Minimum Design Temperature [K]	Maximum Design Temperature [K]	Relative Humidity [%]
HV Switchroom B-100 Module	+30.00	Non-Hazardous	+5	+35	30÷70

Table 14 - Minimum and Maximum Indoor Conditions

6.5.14.3 Overpressure, Air Changes and Noise Limits

				HVAC Noise Limit [db(A)]	
Module	Occupancy [person/mq]	Minimum Air Changes per Hours [-]	Relative Pressure [Pa]	Indoor	Outdoor
HV Switchroom B-100 Module	[-] (unmanned)	6	+50	70	82

Table 15 - Overpressure, Air Changes and Noise Limits

Relative pressure (overpressure) is related to indoor pressure in relation to atmosphere (outdoor).

HVAC systems shall guarantee that noise limits specified are not exceeded during operation and for entire life of the systems. In case of non-compliance with those parameters, supplier is requested to provide equipment (sound attenuator) to meet the project requirements.

6.5.14.4 U-Values

See 6.2.3.

6.5.14.5 Weather Data

See 3.1.1 & 3.1.2

6.5.14.6 Design Safety Factor

During heating and cooling load calculations the following design margins shall be used:

Description	Design Margin
Cooling sensible load	+10%
Heating sensible load	+10%

Table 16 - Design Safety Factor

6.5.14.7 Module Equipment Heat Release

The electrical equipment heat release considered inside the module during the design phase is equal to 5 kW.

The following heat releases shall be evaluated by the supplier:

- HVAC and lighting panel heat dissipation.
- lighting heat dissipation.
- Other electrical devices provided by the supplier that release heat inside the module.

Note

-The real electric equipment heat dissipation given by the electric equipment manufacturers is equal to 3.7 kW, less than the design value. Therefore, the HVAC units will provide the cooling load needed to maintain the internal design conditions.

6.6 SAFETY

Supplier is responsible for the safety of the container. Supplier shall therefore:

1 Execute all applicable safety-related analysis and studies, in order to guarantee that container can be commissioned, operated, maintained and de-commissioned in a safe way by plant operators. Supplier shall revise carefully human factors requirements and safety distances requirements highlighted in reference document, Ref. [20].

2 Implement, at its own care and cost, all necessary safety measures within Supplier's Scope of Work, in order to remove risks or, when it is not possible, to reduce them at an "as low as reasonably practicable" level.

It is highlighted that Purchaser can require to provide space for the accommodation of safety systems/apparatus, in particular related with:

- F&G detectors that will be installed mainly on the roof;
- Portable fire extinguishers;
- Electrical safety kit;
- Safety signs;
- Automatic Gaseous Extinguishing system – [HOLD 2].

Supplier shall be responsible for:

- Providing all necessary drawings/information required during the safety studies, e.g. noise insulation walls data-sheet.
- Using non-hazardous for human and non-combustible materials in construction of the container, asbestos, lead and PBC materials are forbidden, European directive related to the topic shall be applied.
- Providing all safety-related certificates (e.g. fire rating of walls and doors).
- Implementing and giving evidence of all prevention and mitigation measures that fall under its responsibility.

7. CYBER SECURITY

Cyber security scope of supply is to provide a basic list of cyber security activities in according with CPY's requirements and with IT best practices. It involves all equipment with data interfaces such as (but not limited to):

- IT devices such as laptops, workstations, servers and so on
- Networking devices such as hubs, switches, routers and so on
- Industrial devices such as PLCs, CPUs and so on

This paragraph describes the general requirements for cyber security so it could be applicable only partially to the supply. Vendor shall inform CTR of what it is really deliverable as per relevant Scope of supply.

Activities to be carried out can be summarized as it follows:

- Asset inventory: Vendor shall provide all hardware & software specifications to identify, within its supply, all possible equipment which can be exposed to a cyber-attack.

  Activity / Deliverable description: Vendor shall fulfil the table as per *attachment Asset inventory*.

  Deliverable: "IT Asset Inventory list" document (encrypted) *
- Protection of access data / Vendor shall protect access data (not limited to login credentials such as username/password but including all useful access information such as IP addresses, ports, etc.) from unauthorized access. The distribution of these information shall be restricted (E.G. login credentials to data equipment should not be included into user manuals).

  Activity / Deliverable description: Vendor shall extrapolate access data from the standard documentation to provide with its SOW. Vendor shall fulfil the table as per *attachment IP address & Access Credential List*

  Deliverable: "IP address & access credential list" document (encrypted) *
- Patching management & software maintenance methodology / Vendor shall provide, referring to supplied assets, a safe methodology for mentioned activities. This is valid for all provided softwares such as Operating Systems, Server SWs, Client SWs, etc.

  Activity / Deliverable description: Vendor shall provide a document containing this methodology

  Deliverable: "SW patching & maintenance procedure" document (encrypted) *
- Disaster recovery procedure / Vendor shall provide, referring to supplied assets, all information necessary for a restore of the systems starting from the supplied "systems backups".

  Activity / Deliverable description: Vendor shall provide a document containing this procedure

  Deliverable: "SW disaster recovery procedure" document (encrypted) *

- **Backup register** / Vendor shall provide, referring to supplied assets, all information relevant to the supplied SW backups. This is valid for all provided softwares such as Operating Systems, Server SWs, Client SWs, etc.

  Activity / Deliverable description: Vendor shall provide a document containing the backup register. The backup register shall contain (as minimum): project ID, system, equipment, operator name, backup date, description, backup filename

  Deliverable: "SW backup register" document (encrypted) *

- **Systems Backup** / Vendor shall provide, referring to supplied assets, a collection of all SW backups, SW images useful to restore the supplied systems in case of damage. If a SW backup is technically not deliverable, at least a document with images/text of the configuration shall be provided

  Activity / Deliverable description: Vendor shall provide a physical support (USB key or USB HDD depending the size of the backup) containing the collection of the backups. All provided backups shall be listed and detailed into the Backup register (see above) and how to install them shall be explained in the Disaster recovery procedure (see above).

  Note: USB key or USB HDD shall be supplied to CTR encrypted and password for decryption shall be distributed separately

- **Physical hardening** / Vendor shall provide, referring to supplied assets, data equipment where all spare data ports (USB, Ethernet and so on), actually not to be used, are inoperative

  Activity / Deliverable description: Vendor shall disable (at the configuration level if possible) all spare data ports and install data port blockers (its key to unlock them will also be supplied to CTR).
  See examples below:



RJ45 blocker



USB blocker

Figure 6 – Data Port Blockers Examples

***** = these documents shall be part of the supply and included into the relevant document list

8. INSPECTION AND TESTING

8.1 INSPECTION

Any supplied equipment shall be subjected to the factory tests stated in the relevant specifications and applicable standards. The COMPANY or CONTRACTOR, or his appointed representative, may, at his discretion, witness all or part of the factory tests. The tests results shall in any case be made available to the COMPANY.

The Manufacturer shall allow the free access of inspectors to his manufacturing shop, shall give all information required and shall make available all copies of internal orders to other sub-suppliers.

8.2 TEST PROCEDURE

Tests shall be carried out in Manufacturer's workshop at his care and expense.

The Vendor/Contractor shall submit his test procedures in writing to the CONTRACTOR for approval, prior to the start of the testing program.

The tests shall be carried out in the presence of Inspector(s) from the CONTRACTOR's Inspection Authority.

8.3 INSPECTION AND TEST PLAN

ITP(s) shall be provided by VENDOR for CONTRACTOR approval.

The ITP(s) shall be issued by VENDOR in compliance with the Inspection and Test requirement listed in the IDS and to any additional inspections not specifically mentioned in those documents but considered necessary as standard by VENDOR.

Prior to start any fabrication activities a Pre-Inspection Meeting (PIM) shall be performed at VENDOR workshop in order to discuss and fix all quality control related issues. VENDOR shall provide access in their shops and sub-VENDORs shops to COMPANY/CONTRACTOR representatives at any time during the manufacture of the equipment.

When components are obtained from sub-VENDORs, COMPANY reserves the right to inspect these items at the point of manufacture. It is VENDOR's responsibility to advise inspection and notification requirements in all sub-orders.

All non-conformances shall be recorded using the "concession request" procedure.

During manufacturing all equipment shall be subject to inspection, non-destructive examination and testing.

A CA (Certifying Autorithy) shall be involved as per applicable Contract Requirements. intervention points to be set and established in the relevant ITP.

All items installed atex certified (if any), shall be inspected following IEC 600079-17 with relative form and personnel qualification. Those items shall be issued with the proper ATEX or IECEx certificate.

The ITP(s) shall be structured in a sequential manner, including the following requirements against each activity to be carried out:

- Applicable procedure.

- Applicable Codes & Standards or Specifications.
- Acceptance criteria.
- Records to be issued.
- Definition of Quality Surveillance Points (as defined below) of the involved CONTRACTOR's and COMPANY's representatives.

Following the first issue, CONTRACTOR will review the ITP(s) with H/W/M/C points to inform VENDOR on the requested quality Surveillance during equipment manufacturing and following inspection / testing activities.

8.4 FACTORY ACCEPTANCE TEST

Factory Acceptance Test (FAT) shall be performed for each Panel Board supplied following international standards and verifying all control management logics.

8.5 SPECIAL TOOLS

VENDOR shall provide a detailed special tools list for CONTRACTOR review and reference.

All special tools required for erection, pre-commissioning, commissioning and start-up, operation and maintenance activities shall be provided by VENDOR as part of the supply.

Any package lifting kit required for transportation and site erection of the equipment shall be provided by VENDOR.

Any equipment necessary to perform the Pre-Commissioning and Commissioning activities shall be provided by the VENDOR as part of the supply and shall not be returnable.

9. SPARE PARTS

As applicable VENDOR shall include in its quotation a priced list of spare parts suggested for the period of commissioning, start-up and final performance / acceptance test.

Supply of the suggested spare parts for commissioning, start-up and final performance/ acceptance test shall be included in the base VENDOR scope of work.

If additional spares are required during this period, VENDOR shall supply them on his account released by CONTRACTOR satisfaction.

Typology and quantity of the suggested spare parts shall be based on the VENDOR experience and is subject for CONTRACTOR's approval.

VENDOR shall ensure spare availability for at least 2 years form final acceptance certificates released by CONTRACTOR.

The spare parts offered shall be new and original supply from the same equipment Manufacturer.

VENDOR shall submit also a recommended priced spare part list for two (2) years operation.

VENDOR shall analyse the life expectancy of the components of equipment, based on Manufacturer Maintenance Manual; and shall evaluate carefully the required spare parts and quantity. COMPANY will purchase such spares separately.

10. VENDOR DOCUMENTATION

The supply shall include the preparation of any required documentation, with its approval cycle, as stated in the Annex III.

This section covers the documentation required for the design, fabrication, inspection, selection, fabrication and testing for the supplied equipment including any device and accessory.

10.1.1 Vendor Documentation Requirements Schedule (SDRS)

VENDOR shall supply with his Bid, all documents identified as "Bid" documents in the VENDOR Document Requirements Schedule (SDRS).

VENDOR shall review other documents listed in SDRS and may propose to combine certain documents or to submit certain information in an alternative way. At the time of contract award, VENDOR and COMPANY shall agree a final SDRS, including format and submission dates.

10.1.2 Electronic Model

If an electronic model is produced as part of VENDOR's design process a copy of this electronic model (without intelligent files) shall be issued to CONTRACTOR or COMPANY at various stages of the design process. VENDOR shall participate in any formal design reviews that may be performed by CONTRACTOR or COMPANY.

11. WARRANTY

Vendor shall guarantee the equipment in term of design, materials and workmanship for two (2) years after being placed in service. The equipment shall be guaranteed to operate satisfactorily at rated conditions and all other conditions within the specified range as indicated in the relevant data sheet and applicable codes/specifications referenced at clause 4.

All equipment and materials within Vendor scope of work shall be designed for a 2 years Design Life.

11.1 Make Good

In case of any equipment and/or components are to demonstrate do not meet the required performance guarantees at the operating/design conditions, VENDOR shall provide at its care and cost any necessary corrective action to comply with the required performance values.

12. PACKING AND SHIPMENT

The following minimum requirements for packing and shipment shall be met.

12.1 PACKING

This section describes the minimum requirement for the preservation and protection of equipment during sea and land transportation and storage.

All materials shall be packed and protect for transport and storage at site conditions.

Seaworthy packing is required.

The packaging must take into account the great distance the units will be transported over and the fact that the last 100 Km will be on corrugated graded road. Any special requirement for travelling on the graded road should be specified by the VENDOR.

Packing of the equipment and materials shall be provided by VENDOR in accordance to General Specification for packing referenced in the Contract Specifications.

VENDOR shall advise any requirements for preservation of equipment and materials for long term storage after delivery.

The probable storage period will be specified in the Purchase Order/Contract and will extend from the time of dispatch to the time of unpacking at site. If the storage period is not stated, a minimum period of 24 months shall be assumed.

All loose materials shall be delivered with plastic labels indicating (indelible painted) the tags of the items and the relevant erection drawing numbers.

In case of any oversize/overweight packages, VENDOR shall guarantee the possibility to transport these packages from relevant workshop to the nearest main commercial port.

All equipment shall be securely packaged and protected against external damage; each internal component shall be securely fixed but, as necessary, temporary additional supports must be provided to avoid any equipment detach or break during transportation.

For ease of packing it is acceptable to disassemble parts of the panels provided the following:

- Dismount only after the FAT
- Ease of reinstallation at site
- CONTRACTOR 's approval

12.2 SHIPPING

The Module and the relevant equipment and accessories shall not leave the VENDOR's workshop for shipment until the release has been signed by the CONTRACTOR's Inspector.

13. QUALITY ASSURANCE

VENDOR shall plan and implement for execution of the scope of work an effective Quality System according to latest edition of ISO 9001. VENDOR shall define the QA/QC activities, including the identification of critical materials that will require specific Inspection and testing.

VENDOR shall submit a Project Quality Plan for CONTRACTOR review and approval.

13.1 QUALITY CONTROL

The Quality Control activities shall be detailed in sequence on one or more Quality Control Plan(s) as necessary to demonstrate the various "design and development", "purchasing" and "production and service provision" processes. Quality Control Plans shall be submitted to COMPANY.

14. ANNEXES

14.1 ANNEX 1: INSPECTION AND TESTS (IDS)

VENDOR shall perform inspection and test at his shop during construction and before shipment.

The inspections and tests shall be carried out in accordance with applicable documents (Project Specifications, Codes, COMPANY Specifications, etc.).

The minimum activities required are reported on the Attachment 1: IDS.

They shall be used for the preparation of the Vendor ITP (Inspection Test Plan).

14.2 ANNEX 2: REQUIREMENT DOCUMENTATION DESIGN SUPPLY (RDDS)

The attachment is not exhaustive in regard of necessary documentation which shall be produced by the Vendor to comply with the SUPPLY CONTRACT applicable documentation. The Vendor is requested to issue all the necessary documentation accordingly.

The Vendor shall provide within the offer the Supplier Master Index Register (SMIR Form - Attachment 3) (by finalizing the draft attached) listing the documents which will be issued and indicating the date of first issue as per RDDS attached.

14.3 ANNEX 3: SUPPLIER MASTER INDEX REGISTER (SMIR) FORM

General notes:

1) The editable file is attached and, in case of order, Supplier shall issue it as a separate document
2) All documents must be issue in PDF file created from native file.
3) The Supplier shall re-issue the documents including Contractor and/or Company comments within 2 weeks from the relevant transmittal.
4) All documents necessary for the tests, must be issued for Construction and approved by Rosetti Marino.
5) If necessary, Supplier can issue Technical Clarification / Deviation Request before to proceed with activities in order to receive approval.
6) Manufacturer Record Book must be sent in PDF files with bookmarks, also native file of all documents (final copy approved) must be supplied.

15. ATTACHMENTS LIST

Attachment 1	IDS – Inspection Data Sheet
Attachment 2	RDDS - Requirement Documentation Design Supply
Attachment 3	SMIR Form
Attachment 4	Supplier Deviation Request Form

Base Load Power Hub (BLPH)

INSPECTION DATA SHEET

for HV (66kV-6.6kV) Switchroom B-100

Document Number:

123A90-DDL-AR-SP-10000 – Annex 1

02	16/06/2025	Accepted for Construction (AFC)	R. Bossi	M. Gatti	D. Lo Sterzo
01	22/04/2024	Accepted for Construction (AFC)	R. Bossi	M. Gatti	D. Lo Sterzo
00	27/10/2023	Issue for Review (IFR)	R. Bossi	M. Gatti	D. Lo Sterzo
Rev.	Date	Description	Prepared	Reviewed	Approved
STILOG					

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1 DOCUMENT SCOPE

The purpose of this Inspection Data Sheet (IDS) is to specify the Inspection, Test and Quality intervention activities for the procurement of HV (66kV-6.6kV) Switchroom B-100 Module in accordance with Supply Specification (Doc. 123A90-DDL-AR-SP-10000).

Purchaser intervention activities are identified through the selection of one of four conformity assessment system (CAS) levels based on a risk and criticality assessment. The applicable CAS level is specified by the purchaser in the procurement data sheet or purchase order.

This document is based on the IOGP Specification for Quality Requirements and adapted to the requirements of HV (66kV-6.6kV) Switchroom B-100 Module needed for the project "HOLLANDSE KUST NOORD WIND PARK Project".

To specify Inspection and Quality requirements for the supply of HV (66kV-6.6kV) Switchroom B-100 Module including:

a) Supplier quality management system requirements.

b) Purchaser conformity assessment (surveillance and inspection) activities.

c) Traceability requirements.

1.1 NORMATIVE REFERENCES

For the purpose of this document, the documents referenced in Supply Specification for HV (66kV-6.6kV) Switchroom B-100 Module (Doc. 123A90-DDL- AR-SP-10000) and those listed below, in whole or in part, are normatively referenced in this document and are indispensable for its application. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Specification Q1, *Specification for Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry*

ISO 9001, *Quality management systems – Requirements*

ISO 29001, *Petroleum, petrochemical and natural gas industries – Sector-specific quality management systems – Requirements for product and service supply organizations*

2 TERMS, DEFINITIONS AND ABBREVIATIONS

For the purpose of this document, the terms and definitions given in Supply Specification, HV (66kV-6.6kV) Switchroom B-100 Module (Doc. 123A90-DDL- AR-SP-10000) and ISO 9000 (normative to ISO 9001), and the following shall apply.

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project
VENDOR:	Individual, firm or manufacturer that provide Materials/Equipment in accordance with this specification and terms of the Purchase Order.
CAS	CAS Conformity assessment system
QMS	Quality management system
QRS	Quality requirements specification (this document)

Table 1 - Definitions and Abbreviations

2.1 CONFORMITY ASSESSMENT

Demonstration that specified requirements are fulfilled.

Note 1 to entry: Conformity assessment (or assessment) includes but is not limited to review, inspection, verification and validation activities.

Note 2 to entry: Assessment activities may be undertaken at a supplier/sub-supplier's premises, virtually by video link, desktop sharing, etc. or by review of information.

2.2 CONFORMITY ASSESSMENT SYSTEM CAS

System that provides different levels of purchaser interventions to assess and verify supplier conformance to specified requirements.

Note 1 to entry: CAS A applies to the highest risk and associated extent of verification. CAS D is the lowest.

2.3 HOLD POINT - H

Point in the chain of activities beyond which an activity shall not proceed without the approval of the purchaser or purchaser's representative.

2.4 WITNESS POINT - W

Point in the chain of activities that the supplier shall notify the purchaser or purchaser's representative before proceeding.

Note 1 to entry: The operation or process may proceed without witness if the purchaser does not attend after the agreed notice period.

2.5 SURVEILLANCE - S

Observation, monitoring or review by the purchaser or purchaser's representative of an activity, operation, process, product or associated information.

2.6 REVIEW - R

Review of the supplier's information to verify conformance to requirements.

3 QUALITY REQUIREMENTS

3.1 QUALITY MANAGEMENT SYSTEM

The manufacturer shall operate and maintain a quality management system (QMS) that conforms with ISO 9001, ISO 29001, API Specification Q1 or an equivalent quality management system standard.

3.2 CONFORMITY ASSESSMENT SYSTEM (CAS)

3.2.1

The conformity assessment system (CAS) provides different levels of assessment of the supplier control activities. The CAS level is defined by the purchaser, using a risk-based approach, and included in the purchase order/contract. The defined CAS level may be adjusted by the purchaser during manufacture based on supplier performance and re-assessment of risk.

NOTE For industrial proven solutions, CAS level D is specified unless risk assessment indicates that a more stringent CAS level is required.

3.2.2

Quality plans and inspection and test plans shall include provision for purchaser intervention activities based on the CAS level selected in the procurement data sheet or purchase order. See Annex A.

3.2.3

Supplier performance in meeting the requirements may be routinely assessed during execution of the scope and where appropriate, corrective action requested and conformity assessment activities increased or decreased consistent with criticality and risk.

4 CERTIFICATION AND TRACEABILITY

The manufacturer shall maintain traceability of sub-assembly components to the original component manufacturer tag / serial number and where applicable, associated certification.

5 EVIDENCE – CONFORMANCE RECORDS

Documents and information shall be provided for in accordance with the associated DDS.

6 ANNEX A - (NORMATIVE)

Purchaser conformity assessment requirements

This annex defines four conformity assessment systems (CAS) or levels of purchaser assessment.

	PURCHASER ASSESSMENT ACTIVITIES	CAS			
		A	B	C	D
1	Operational planning and control activities				
1.1	Quality planning	H	W	S	-
1.2	Inspection and test planning	H	H	W	R
1.3	Pre-assessment/inspection planning	H	W	W	-
2	Design and development activities				
2.1	Type testing (if type test certificates are not available)	H	H	H	H
3	Control of external supply				
3.1	External supply scope, risk assessment and controls	H	W	S	-
3.2	Nominated sub-suppliers of HV (66kV-6.6kV) Switchroom B-100 Module	H	W	-	-
4	Production and service provision				
4.1	Materials verification				
4.1.1	Input material and components identification, traceability and certification	S	S	S	-
4.2	Assembly routine tests				
4.2.1	Test on auxiliary circuits	S	S	S	S
4.2.2	Rated resistance measurement	S	S	S	S
4.2.3	Power frequency withstand voltage test	H	W	S	S
4.2.4	Insulation resistance	H	W	S	S
4.2.5	Tightness test (applicable to gas/liquid-filled assemblies only)	W	W	S	S
4.2.6	Design and visual checks	H	W	S	S
4.2.7	Visual inspection and dimensional verification	H	W	S	S
4.3	Temperature rise tests				
4.3.1	Continuous current duty	H	W	S	S

	PURCHASER ASSESSMENT ACTIVITIES	CAS			
		A	B	C	D
4.3.2	Rated time duty	H	W	S	S
4.4	Special tests				
4.4.1	Inductance measurement	H	W	S	S
4.4.2	Lightning impulse test	H	W	S	S
4.4.3	Mechanical design verification	H	W	S	S
4.4.4	Protection degree of enclosure	H	W	S	S
5	Release of product or service				
5.1	Verify conformance to purchase order including as applicable				
5.1.1	Inspection of loose ship item, spares special tools as applicable	W	W	S	-
5.1.2	Handling, preservation and packaging	W	W	S	-
5.2	Release equipment	H	H	H	H

Key

H: Hold point

W: Witness point

R: Review

S: Surveillance

7 IDS (INSPECTION DATA SHEETS)

7.1 HVAC

7.1.1 Fan-Coil Units IDS

FAN-COILS UNIT
Inspection Data Sheet (IDS)

MATERIAL:

TAG:

CONCERNED COMPANIES:

[C] COMPANY [B] EPC CONTRACTOR [T] CERTIFYING AUTHORITY [S] SUPPLIER

CERTIFYING AUTHORITIES:

OTHER: OFFICIAL AUTHORITY:

TYPE OF INTERVENTION:

H BINDING PRESENCE. The cycle continuationis bound to the presence
P BINDING PRESENCE FOR THE % INDICATED IN THE NOTES
W NOT BINDING PRESENCE. In case of unwitnessed test the Supplier is authorized to continues the production cycle supplying the appropriate documents.
R CHECK OF THE CERTIFICATES AND/OR DOCUMENTS.
C CHECK CARRIED OUT WITH RELEASE OF CERTIFICATE.
N CHECK CARRIED OUT WITHOUT RELEASE OF CERTIFICATE.
D SIMPLE DOCUMENTATION.

SPECIFICATIONS / DRAWINGS / REFERENCE STD:

1)
2)
3)
4)
5)

INTERNATIONAL CODE AND STD:

1) ASHRAE
2) SMACMA
3) IEC
4) EN ISO 15138
5)

FAN-COILS UNIT
Inspection Data Sheet (IDS)

MATERIAL:

TAG:

ITEM	DESCRIPTION OF CHECKS AND TESTS	CODE OF INTERVENTION				REFERENCE
		C	B	T	S	
1	Drawings, Data Sheets & Calculations approval check	R	R		D	
2	Review of components cerification					
	Fan	R	R		R	
	Heating/Cooling coils	R	R		R	
	Air Filter	R	R		R	
	Motor	R	R		R	
	Electrical connections	R	R		R	
3	Visual & Dimensional check Check of assembly, Components placing, seals and completeness	W	W		C	
4	Components check					
	Check of Electrical Connections arrangement of controls (their operability and assembly)	W	W		C	
	Check of Electrical Connections wiring	W	W		C	
5	Check of baseplate, supports, assembly and lifting eyebolts	W	W		N	
6	Check of thermal insulation and protective finishes	W	W		N	
7	Painting inspection (type, colour, surface preparation, primer, final, dry film thickness and certifications)	W	W		C	Painting Spec
8	Check of components accessibility for maintenance and removal	W	W		N	

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FAN-COILS UNIT
Inspection Data Sheet (IDS)

MATERIAL:

TAG:

ITEM	DESCRIPTION OF CHECKS AND TESTS	CODE OF INTERVENTION				REFERENCE
		C	B	T	S	
9	Nameplates check	W	W		D	
10	Hydrostatic test of pressurized parts	R	R		R	
11	Performance test					
	Check of control and safety logics	R	R		R	
	Check of thermal output at operating conditions	R	R		R	
	Pressure check at operating conditions	R	R		R	
	Check of electric power absorbed at operating conditions	R	R		R	
	Check of service media consumption at operating conditions	R	R		R	
	Check of noise level at operating conditions	R	R		R	
12	Completeness supply check according to the purchase order	H	H		N	
13	Spare parts check (type, quantity and labelling)	W	W		C	
14	Packing inspection, marking and packing list check	W	W		N	
15	Final documentation review (Data Book)	H	H		C	Supply Spec.

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FAN-COILS UNIT
Inspection Data Sheet (IDS)

NOTES:

1) The Fan-coils unit has to be preassembled at the Manufacturer workshop

7.1.2 Fans IDS

FANS
Inspection Data Sheet (IDS)

MATERIAL:

TAG:

CONCERNED COMPANIES:

[C] COMPANY [B] EPC CONTRACTOR [T] CERTIFYING AUTHOR [S] SUPPLIER

CERTIFYING AUTHORITIES:

OTHER: OFFICIAL AUTHORITY:

TYPE OF INTERVENTION:

H BINDING PRESENCE. The cycle continuationis bound to the presence
P BINDING PRESENCE FOR THE % INDICATED IN THE NOTES
W NOT BINDING PRESENCE. In case of unwitnessed test the Supplier is authorized to continues the production cycle supplying the appropriate documents.
R CHECK OF THE CERTIFICATES AND/OR DOCUMENTS.
C CHECK CARRIED OUT WITH RELEASE OF CERTIFICATE.
N CHECK CARRIED OUT WITHOUT RELEASE OF CERTIFICATE.
D SIMPLE DOCUMENTATION.

SPECIFICATIONS / DRAWINGS / REFERENCE STD:

1)
2)
3)
4)
5)

INTERNATIONAL CODE AND STD:

1) ASHRAE
2) SMACMA
3) IEC
4) EN ISO 15138
5)

FANS
Inspection Data Sheet (IDS)

MATERIAL:

TAG:

ITEM	DESCRIPTION OF CHECKS AND TESTS	CODE OF INTERVENTION				REFERENCE
		C	B	T	S	
1	Fan types:					
	Centrifugal fan ☐					
	Axial flow fan ☐					
	Ducted Axial fan ☐					
2	Drawings, Data Sheets & Calculations approval check	R	R		D	
3	Review of components cerification					
	Frame and walls	R	R		R	
	Ventilation Fan & el. Motor	R	R		R	
4	NDT (in accordance with the Codes of the materials utilized)	R	R		R	Applicable Codes
5	Visual & Dimensional check Check of assembly, Components placing, seals and completeness	W	W		C	
6	Components check					
	Check of rating plate of fan motor	W	W		C	
	Check of coupling motor-fan	W	W		C	
7	Check of baseplate, supports, assembly and lifting eyebolts	W	W		N	
8	Check of thermal insulation and protective finishes	W	W		N	

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FANS
Inspection Data Sheet (IDS)

MATERIAL:

TAG:

ITEM	DESCRIPTION OF CHECKS AND TESTS	CODE OF INTERVENTION				REFERENCE
		C	B	T	S	
9	Painting inspection (type, colour, surface preparation, primer, final, dry film thickness and certifications)	W	W		C	Painting Spec
10	Check of components accessibility for maintenance and removal	W	W		N	
11	Hydrostatic test of pressurized parts	W	W		C	
12	Performance test					
	Check of air flowrate logic at operating conditions	R	R		R	
	Pressure check at operating conditions	R	R		R	
	Check of electric power absorber at operating conditions	R	R		R	
	Check of niose level at operating conditions	R	R		R	
13	Completeness supply check according to the purchase order	H	H		N	
14	Spare parts check (type, quantity and labelling)	W	W		C	
15	Packing inspection, marking and packing list check	W	W		N	
16	Final documentation review (Data Book)	H	H		C	Supply Spec.

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

FANS
Inspection Data Sheet (IDS)

NOTES:

1) The FAN has to be preassembled at the Manufacturer workshop

7.1.3 Fire and Gas Dampers IDS

FIRE DAMPERS AND GAS TIGHT DAMPERS
Inspection Data Sheet (IDS)

MATERIAL:

TAG:

CONCERNED COMPANIES:

[C] COMPANY [B] EPC CONTRACTOR [T] CERTIFYING AUTHOR [S] SUPPLIER

CERTIFYING AUTHORITIES:

OTHER: OFFICIAL AUTHORITY:

TYPE OF INTERVENTION:

H BINDING PRESENCE. The cycle continuationis bound to the presence
P BINDING PRESENCE FOR THE % INDICATED IN THE NOTES
W NOT BINDING PRESENCE. In case of unwitnessed test the Supplier is authorized to continues the production cycle supplying the appropriate documents.
R CHECK OF THE CERTIFICATES AND/OR DOCUMENTS.
C CHECK CARRIED OUT WITH RELEASE OF CERTIFICATE.
N CHECK CARRIED OUT WITHOUT RELEASE OF CERTIFICATE.
D SIMPLE DOCUMENTATION.

SPECIFICATIONS / DRAWINGS / REFERENCE STD:

1)
2)
3)
4)
5)

INTERNATIONAL CODE AND STD:

1) ASHRAE
2) SMACMA
3) IEC
4) EN ISO 15138
5)

FIRE DAMPERS AND GAS TIGHT DAMPERS
Inspection Data Sheet (IDS)

MATERIAL:

TAG:

ITEM	DESCRIPTION OF CHECKS AND TESTS	CODE OF INTERVENTION				REFERENCE
		C	B	T	S	
1	Drawings, Data Sheets & approval check	R	R		N	
2	Review of unrefined materials certificates (chemical analysis & mechanical properties)	R	R		C	
3	Welding procedures and welders qualification (WPS+WQP+PQR), approval check	R	R		C	
4	Review of components cerification					
	Frame and walls	R	R		C	
	Fusible	R	R		C	
	Actuator	R	R		C	
	Electric/Pneumatic valve	R	R		C	
	micro switches	R	R		C	
5	NDT (in accordance with the Codes of the materials utilized)	R	R		C	Applicable Codes
6	Visual & Dimensional check Check of assembly, Components placing, seals and completeness	W	W		N	
7	Components check					
	Check fusible	W	W		C	
	Check actuator	W	W		C	
	Check micro switches	W	W		C	
	Check of electrical/pneumatic connections	W	W		C	
8	Check of thermal insulation and protective finishes	W	W		N	

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FIRE DAMPERS AND GAS TIGHT DAMPERS
Inspection Data Sheet (IDS)

MATERIAL:

TAG:

ITEM	DESCRIPTION OF CHECKS AND TESTS	CODE OF INTERVENTION				REFERENCE
		C	B	T	S	
9	Painting inspection (type, colour, surface preparation, primer, final, dry film thickness and certifications)	W	W		C	Painting Spec
10	Check of components accessibility for maintenance and removal	W	W		N	
11	Nameplates check	W	W		N	
12	Performance test					
	Check of fusible at operating conditions	H	H		C	
	Check of actuator at operating conditions	H	H		C	
	Check of micro switches at operating conditions	H	H		C	
13	Completeness supply check according to the purchase order	H	H		N	
14	Spare parts check (type, quantity and labelling)	W	W		C	
15	Packing inspection, marking and packing list check	W	W		N	
16	Final documentation review (Data Book)	H	H		C	Supply Spec.

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FIRE DAMPERS AND GAS TIGHT DAMPERS
Inspection Data Sheet (IDS)

NOTES:

1) Fire and Gas Dampers shall comply with international standards and suitable for marine environment

7.1.4 HVAC Power and Control Panel IDS

HVAC POWER AND CONTROL PANEL
Inspection Data Sheet (IDS)

MATERIAL:

TAG:

CONCERNED COMPANIES:

[C] COMPANY [B] EPC CONTRACTOR [T] CERTIFYING AUTHOR [S] SUPPLIER

CERTIFYING AUTHORITIES:

OTHER: OFFICIAL AUTHORITY:

TYPE OF INTERVENTION:

H BINDING PRESENCE. The cycle continuationis bound to the presence
P BINDING PRESENCE FOR THE % INDICATED IN THE NOTES
W NOT BINDING PRESENCE. In case of unwitnessed test the Supplier is authorized to continues the production cycle supplying the appropriate documents.
R CHECK OF THE CERTIFICATES AND/OR DOCUMENTS.
C CHECK CARRIED OUT WITH RELEASE OF CERTIFICATE.
N CHECK CARRIED OUT WITHOUT RELEASE OF CERTIFICATE.
D SIMPLE DOCUMENTATION.

SPECIFICATIONS / DRAWINGS / REFERENCE STD:

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4)
5)

INTERNATIONAL CODE AND STD:

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2) SMACMA
3) IEC
4) EN ISO 15138
5)

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HVAC POWER AND CONTROL PANEL
Inspection Data Sheet (IDS)

MATERIAL:

TAG:

ITEM	DESCRIPTION OF CHECKS AND TESTS	CODE OF INTERVENTION				REFERENCE
		C	B	T	S	
1	Review of cerifications required by international standards (CE, IEC, etc.)	R	R		C	
2	Drawings, Data Sheets & Calculations approval check	R	R		D	
3	Visual & Dimensional check Check of assembly, Components placing, seals and completeness	W	W		C	
4	Components check according to international standards					
	Wiring Check	W	W		C	
	Power frequency withstand voltage test	W	W		C	
	Insulation resistance	W	W		C	
	Test on auxiliary circuits	W	W		C	
	Protection degree of enclosure	W	W		C	
5	Check of baseplate, supports, assembly and lifting eyebolts	W	W		N	
6	Dielectric Insulation Test	W	W		C	
7	Project Panel Data Check (Plate on panel)	W	W		N	

HVAC POWER AND CONTROL PANEL
Inspection Data Sheet (IDS)

MATERIAL:

TAG:

ITEM	DESCRIPTION OF CHECKS AND TESTS	CODE OF INTERVENTION				REFERENCE
		C	B	T	S	
8	Painting inspection (type, colour, surface preparation, primer, final, dry film thickness and certifications)	W	W		C	Painting Spec
9	Check of components accessibility for maintenance and removal	W	W		N	
10	Hydrostatic test of pressurized parts	W	W		C	
11	Performance test					Design Spec.
	Check logic (AUTO-MANUAL mode)	R	R		C	
	Functional Tests (PLC, HMI, Push-button, Switch, etc.)	R	R		R	
12	Completeness supply check according to the purchase order	H	H		N	
13	Spare parts check (type, quantity and labelling)	W	W		C	
14	Packing inspection, marking and packing list check	W	W		N	
15	Final documentation review (Data Book)	H	H		C	Supply Spec.

HVAC POWER AND CONTROL PANEL
Inspection Data Sheet (IDS)

NOTES:

1) The HVAC panel has to be preassembled at the Manufacturer workshop

ROSETTI MARINO

PROJECT

BASE LOAD POWER HUB

RDDS for:

HV (66kV-6.6kV) Switchroom B-100

STRUCTURAL/ARCHITECTURAL/LIGHTING & HVAC

Rev.	Status	Description	Prepared	Checked	Approved	Date
02	AFC	ACCEPTED FOR CONSTRUCTION	R. BO	M. GA	D. LO	16/06/2025
01	AFC	ACCEPTED FOR CONSTRUCTION	R. BO	M. GA	D. LO	22/04/2024
00	IFR	ISSUE FOR REVIEW	R. BO	M. GA	D. LO	27/10/2023

This document undergoes an issuance cycle within EDMS "I-DOC". Its distribution is electronically controlled. Printing not reporting the name of the destine, shall be considered as “NOT CONTROLLED” copy

ROSETTI MARINO

GENERAL NOTES:

1) Reserve the right to consider this quotation incomplete and therefore will not be evaluated.
2) KEY DOC. : Documents Subjected to Penalty for Delayed Delivery.
3) All documents must be issue in PDF file created from native file.
4) The Supplier shall re-issue the documents including Contractor and/or Company comments within 2 weeks from the relevant transmittal.
5) The Supplier shall re-issue the documents within 2 weeks after the FAT.
6) All documents necessary for the tests, must be issued for Contruction and approved by Rosetti Marino.
7) The final copies of each manual must be sent with delivery of material (PDF files and Native Files).
8) If necessary, Vendor issue TQ; DR before proceed with activities in order to receive approval.
9) Final data book must be send in PDF files with bookmarks, also native file of all documents (final copy approved) must be supplied.
10) The Suplier shall define SMIR list starting from RDDS document list. Supplier could group documents that comprehend more details and cover more of the topics listed on RDDS list; however, all informations reported on RDDS list have to be provided.

This document undergoes an issuance cycle within EDMS "I-DOC". Its distribution is electronically controlled. Printing not reporting the name of the destine, shall be considered as “NOT CONTROLLED” copy

COMPANY :	CROSSWIND	JOB	Revision	
COUNTRY :	NETHERLAND		00 01 2	
AREA :	HOLLANDESE KUST NOORD WIND PARK Project	Doc. N.	123A90-DDL-AR-SP-10000	
PLANT :	BASE LOAD POWER HUB		ANNEX 2	
RDDS HV (66kV-6.6kV) Switchroom B-100 - STRUCTURAL/ARCHITECTURAL/LIGHTING & HVAC		Contractor Doc. N.:		
		Sheet / of 101-102-103 / 109	Date 16/06/25	

ROSETTI MARINO

REQUIREMENT DOCUMENTATION DESIGN SUPPLY

POS.	DESCRIPTION OF DOCUMENTATION	Delivery in Bid	Delivery after Order (revision issued for……)								KEY DOC.	Documents subject to liquidated damages
			IFI (Information)		IFA (Approval)		IFC (construction)		ASB (as-built)			
		Number of copies	Required / Within weeks after order	Note	Required / Within weeks after order	Note	Required / Within weeks after order	Note	Required / Within weeks after order	Note	YES NO	
	CONTROL DOCUMENTS											
1	SUPPLIER MASTER INDEX REGISTER (SMIR)	Y					Y				Y	
2	SUB-SUPPLIER LIST	Y			Y / 2							
3	FABRICATION / PRODUCTION SCHEDULE (Bar Chart [A3 max.])				Y / 2			(4)				X
	MANAGEMENT DOCUMENTS											
4	TQ - TECHNICAL QUERY (A4 document)				Y	(7)						
5	DR - DEVIATION REQUEST (A4 document)				Y	(7)						
6	CR - CONCESSION REQUEST (A4 document)				Y	(7)						
	QUALITY DOCUMENTS											
7	QUALITY CONTROL PLAN or INSPECTION AND TEST PLAN (A4 sheets)	Y			Y / 3	(2)	Y / 5	(2)				X
8	HVAC QUALITY CONTROL PLAN or INSPECTION AND TEST PLAN (A4 sheets)	Y			Y / 3	(2)	Y / 5	(2)				X
	ENGINEERING DOCUMENTS											
	CA - CALCULATIONS											
9	STRUCTURAL CALCULATION REPORT	Y			Y / 2		Y / 6				Y	Y
10	LOADS ON FOUNDATIONS	Y			Y / 2		Y / 6				Y	Y
11	LIGHTING CALCULATION	Y			Y / 2		Y / 6				Y	Y
12	HVAC CALCULATION OF HEAT BALANCE, EQUIPMENT SIZING, AIR AND LIQUID FLOW REQUIREMENTS	Y			Y / 2		Y / 6				Y	Y
13	HVAC SUPPORTING DESIGN				Y / 3		Y / 6				Y	Y
14	HVAC DUCTS PRESSURE LOSSES CALCULATION				Y / 2		Y / 6				Y	Y
15	HVAC SYSTEMS NOISE CALCULATION				Y / 3		Y / 6				Y	Y
	DA - GENERAL ARRANGEMENT											
16	STRUCTURAL GENERAL ARRANGEMENTS (Maximum size A1. drawing scale)	Y			Y / 2		Y / 6		Y		Y	Y
17	ARCHITECTURAL GENERAL ARRANGEMENTS (Maximum size A1. drawing scale)	Y			Y / 2		Y / 6		Y		Y	Y
18	LIGHTING GENERAL ARRANGEMENTS (Maximum size A1. drawing scale)	Y			Y / 2		Y / 6		Y		Y	Y
19	HVAC 3D MODELLING				Y / 3		Y / 6		Y		Y	Y
	DD - DETAIL DRAWING											
20	STRUCTURAL DETAIL DRAWINGS (Scale drawing)				Y / 2		Y / 6		Y		Y	Y
21	ARCHITECTURAL DETAIL DRAWINGS (Scale drawing)				Y / 2		Y / 6		Y		Y	Y
22	ELECTRICAL SINGLE LINE DIAGRAM FOR EACH DISTRIBUTION BOARD	Y			Y / 2		Y / 6		Y		Y	Y
23	ALL NEEDED ELECTRICAL SCHEMATICS	Y			Y / 2		Y / 6		Y		Y	Y
24	ELECTRICAL EARTHING DIAGRAMS	Y			Y / 2		Y / 6		Y		Y	Y
25	LIGHTING DETAIL DRAWINGS (Scale drawing)				Y / 2		Y / 6		Y		Y	Y
26	HVAC SUPPORTING DRAWINGS				Y / 3		Y / 6		Y			Y
27	HVAC LAYOUT & SECTIONAL DRAWINGS, INCLUDING POSITION OF EQUIPMENT, LOCAL CONTROL PANEL, JUNCTION BOXES				Y / 3		Y / 6		Y		Y	Y
28	HVAC MODULE PENETRATION DETAIL DRAWINGS	Y			Y / 2		Y / 6		Y		Y	Y
29	HVAC CABLE ROUTING				Y / 3		Y / 6		Y		Y	Y
30	HVAC MECHANICAL EQUIPMENT DRAWINGS	Y			Y / 3		Y / 6		Y			Y
31	HVAC INSTALLATON DRAWINGS				Y / 3		Y / 6		Y		Y	Y
	DS – DATA SHEET											
32	ACCESSORIES DATA SHEETS (Purchaser's A4 sheets completed by Supplier)	1			Y / 2		Y / 6		Y		Y	Y
33	HVAC MECHANICAL AND ELECTRICAL EQUIPMENT DATA-SHEET	Y			Y / 2		Y / 6		Y		Y	Y
34	HVAC ELECTRICAL AND I&C CABLES DATA-SHEET	Y			Y / 2		Y / 6		Y		Y	Y
35	HVAC INSTRUMENTATION DATA-SHEET	Y			Y / 2		Y / 6		Y		Y	Y

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COMPANY :	CROSSWIND	JOB	Revision	
COUNTRY :	NETHERLAND		00 01 2	
AREA :	HOLLANDESE KUST NOORD WIND PARK Project	Doc. N.	123A90-DDL-AR-SP-10000	
PLANT :	BASE LOAD POWER HUB		ANNEX 2	
RDDS HV (66kV-6.6kV) Switchroom B-100 - STRUCTURAL/ARCHITECTURAL/LIGHTING & HVAC		Contractor Doc. N.:		
		Sheet / of 101-102-103 / 109	Date 16/06/25	

ROSETTI MARINO

REQUIREMENT DOCUMENTATION DESIGN SUPPLY

POS.	DESCRIPTION OF DOCUMENTATION	Delivery in Bid	Delivery after Order (revision issued for……)								KEY DOC.	Documents subject to liquidated damages
			IFI (Information)		IFA (Approval)		IFC (construction)		ASB (as-built)			
		Number of copies	Required / Within weeks after order	Note	Required / Within weeks after order	Note	Required / Within weeks after order	Note	Required / Within weeks after order	Note	YES NO	
	SP – SPECIFICATION											
36	SURFACE PREPARATION AND PAINTING SPECIFICATION (A4) * COATING PROCEDUE (if applicable)				Y / 6	(2)	Y / 10					
37	HVAC ELECTRICAL LOAD LIST	Y			Y / 2				Y		Y	Y
38	HVAC DESIGN AND CONTROL PHILOSOPHY	Y			Y / 2		Y / 6		Y		Y	Y
39	HVAC SYSTEM TECHNICAL SPECIFICATION, INCLUDING EQUIPMENT SPECIFICATIONS	Y			Y / 2		Y / 6		Y		Y	Y
40	HVAC EQUIPMENT LIST	Y			Y / 2				Y		Y	Y
41	HVAC INSTRUMENTATION LIST	Y			Y / 2				Y		Y	Y
42	HVAC P&ID	Y			Y / 2		Y / 6		Y		Y	Y
43	HVAC MTO				Y / 4		Y / 6		Y		Y	Y
44	HVAC SET-POINT LIST, I/O LIST, ALARMS & TRIPS LIST, PROFINET LIST				Y / 4				Y		Y	Y
45	HVAC SPECIFICATION FOR ERECTION, MECHANICAL COMPLETION AND COMMISSIONING				Y / 4		Y / 6		Y		Y	Y
46	HVAC POWER AND CONTROL PANEL LAYOUT DIAGRAMS				Y / 4				Y		Y	Y
47	HVAC INTERCONNECTION LAYOUT DIAGRAMS				Y / 4				Y		Y	Y
	PRO – PROCEDURES											
48	FACTORY ACCEPTANCE TEST PROCEDURE (if applicable)		Y / 10	10								
49	HVAC REFRIGERATION PIPING / TUBING PRESSURE TEST PROCEDURE				Y / 4						Y	Y
50	HVAC DUCT LEAKAGE TEST PROCEDURE				Y / 4						Y	Y
51	HVAC INSPECTION TEST PLAN	Y			Y / 2						Y	Y
52	HVAC FAT PROCEDURE	Y			Y / 4						Y	Y
53	HVAC SAT PROCEDURE	Y			Y / 4						Y	Y
54	HVAC INSTALLATION MANUAL				Y / 4		Y / 6				Y	Y
55	HVAC OPERATIONAL AND MAINTENANCE MANUAL				Y / 5		Y / 6		Y		Y	Y
56	HVAC ADJUSTING AND BALANCING TEST PROCEDURE				Y / 4		Y / 6				Y	Y
57	HVAC COMMISSIONING PROCEDURE	Y			Y / 5		Y / 6				Y	Y
58	HVAC COMMISSIONING REPORT										Y	Y
	CERTIFICATES											
59	MATERIAL CERTIFICATE - OTHER		Y			(1)						
60	SUPPLIER CERTIFICATE OF COMPLIANCE (A4 document)		Y			(1)						
61	PAINTING / INSULATION COMPLIANCE CERTIFICATE (if applicable)		Y			(1)						
62	EQUIPMENT MANUFACTURERS RECORD BOOK – COMPLETE (A4 bound volume(s) to Purchaser specifications)				Y	(6) After FAT	Y	After IFR				
63	EQUIPMENT MANUFACTURERS RECORD BOOK (FINAL DOSSIER) - INDEX				Y / 8		Y / 10					
64	HVAC EQUIPMENT MANUFACTURERS RECORD BOOK (FINAL DOSSIER) - INDEX				Y / 8		Y / 10				Y	
65	CERTIFICATION DOSSIER				Y / 8		Y / 10					
66	ELECTRONIC COPY OF EQUIPMENT MANUFACTURERS RECORD BOOK (FINAL DOSSIER)				Y	(6)						
67	PURCHASER's RELEASE NOTE (Issued by Purchaser)		Y	(3)								
68	CERTIFYING AUTHORITY RELEASE NOTES / WAIVERS		Y	(3)								
69	CERTIFICATION MATRIX (ANY OTHER CERTIFICATION REQUIRED BY THE STATUTORY DIRECTIVES)				Y / 4		Y / 12	(3)				
	SPARES & MAINTENANCE DATA											
70	TECHNICAL OPERATING AND MAINTENANCE MANUAL – COMPLETE (A4 bound volumes to Purchaser's specification)		Y / 6									
71	TECHNICAL OPERATING AND MAINTENANCE MANUAL – INDEX		Y / 2									
72	CAPITAL SPARE PARTS		Y / 10									
73	HVAC SPARE PARTS LIST (2 years)		Y / 5									
74	HVAC SPARE PARTS LIST FOR COMMISSIONING		Y / 5									
	HANDLING, SHIPPING & SITE INSTALLATION											
75	PREPARATION FOR SHIPPING WITH HANDLING AND STORAGE PROCEDURES (A4 procedure)		Y	(3)								

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	COMPANY :	**CROSSWIND**	**JOB**	**Revision** 00 01 2
	COUNTRY :	**NETHERLAND**		
	AREA :	**HOLLANDESE KUST NOORD WIND PARK Project**	**Doc. N.**	**123A90-DDL-AR-SP-10000**
	PLANT :	**BASE LOAD POWER HUB**		**ANNEX 2**
	RDDS **HV (66kV-6.6kV) Switchroom B-100 - STRUCTURAL/ARCHITECTURAL/LIGHTING & HVAC**		**Contractor Doc. N.:**	
			Sheet / of **101-102-103** / **109**	Date **16/06/25**

ROSETTI MARINO

REQUIREMENT DOCUMENTATION DESIGN SUPPLY

POS.	DESCRIPTION OF DOCUMENTATION	Delivery in Bid	Delivery after Order (revision issued for……)								KEY DOC.	Documents subject to liquidated damages
			IFI (Information)		IFA (Approval)		IFC (construction)		ASB (as-built)			
		Number of copies	Required / Within weeks after order	Note	Required / Within weeks after order	Note	Required / Within weeks after order	Note	Required / Within weeks after order	Note	YES NO	

Notes (ref. to brackets above):

(1) - The list of the certificates shall be comprehensive of all the certificates required according to contract and to applicable Codes / Standard / compliance (e.g: ASME STAMP, PED compliance and technical dossier). The certificates shall be collected and submitted as part of the Manufacturer Record Book. All the certificates shall be made available by the Supplier in due time during the manufacturing activities.

(2) - The delivery due date is within the indicated number of weeks after the PO or at least 4 weeks in advance prior the start of the first activity/test covered by the procedure.

(3) - To submit before the shipping of the supply.

(4) - To be updated every 2 weeks.

(5) - To be submitted as soon as the FAT is completed and signatures of the involved party taken

(6) - MRB - complete - to be delivered in the due time as specificed in the PO and, in any case, not later than 30 days of the delivery date of the manufactured item

(7) - If necessary, Vendor issue TQ; DR before proceed with activities in order to receive approval

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PROJECT

BASE LOAD POWER HUB

SMIR Form for:

HV (66kV-6.6kV) Switchroom B-100

STRUCTURAL/ARCHITECTURAL/LIGHTING & HVAC

Rev.	Status	Description	Prepared	Checked	Approved	Date
01	AFC	ACCEPTED FOR CONSTRUCTION	R. BO	M. GA	D. LO	22/04/2024
00	IFR	ISSUE FOR REVIEW	R. BO	M. GA	D. LO	27/10/2023

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SMIR - REGISTRO DOCUMENTI / *SMIR (SUPPLIER MASTER INFORMATION REGISTER) FORM*

Ordine n°/*order nr.*			Fornitore/*Supplier* :		
data / *dated:*			Codice F./ *S. Code:*		
Commessa / *Job:*			Indirizzo/ *address* :		
Descrizione / *Description*	HV (66kV-6.6kV) Switchroom B-100		Persona di riferim./ *contact person:*		
Macrofase / *Phase*					

Pos.	Document nr. Client (1)	Doc Client Rev. (1)	Document nr. Internal	Document nr. Internal Rev. (2)	Document nr. Supplier (3)	Doc Supplier Rev. (3)	Titolo Documento / Document title HV-MV (66kV-6.6kV) Switchroom B-100	Disciplina / *Discipline*	Blocco Classe / *Class Block*	Docum. Format (7)	first issue date (8)	Third Party Approval (I/A)	Design KEY Document	Document subject to Liquidated Damages	Document Approval (I/A)
							CONTROL DOCUMENTS								
1							SUPPLIER MASTER INDEX REGISTER (SMIR)	Eng-Mechanical					X		A
2							SUB-SUPPLIER LIST	EXP							A
3							FABRICATION / PRODUCTION SCHEDULE (Bar Chart [A3 max.]) / PROGRESS REPORT	EXP						X	I/A
							QUALITY DOCUMENTS								
4							QUALITY CONTROL PLAN or INSPECTION AND TEST PLAN	QUA		A4				X	A
							ENGINEERING DOCUMENTS								
5							STRUCTURE CALCULATION	Structure		A4					I
6							WEIGHT CONTROL REPORT WITH C.O.G., LOADS ON FOUNDATION and LIFTING SCHEME	Structure		A4					
7							DRAWINGS OF PRIMARY STRUCTURE	Structure		A1					
8							DRAWINGS OF SECONDARY STRUCTURE	Structure		A1					
9							DRAWINGS OF THREADED HANGER ON ROOF, STUDS ON EXTERNAL WALLS and SEAFASTENING PALTES, EARTHING SYSTEM, INFORMATION SIGNS and SUPPORTS	Structure		A1					
10							DRAWINGS OF LINING SUPPORT SYSTEM, ASSEMBLY and DETAILS	Structure/Architectural		A1					
11							DRAWINGS OF EQUIPMENT BASEFRAME AT FLOOR and WALL, ASSEMBLY and DETAILS	Structure/Architectural		A1					
12							DRAWINGS OF WALLS & ROOF PENETRATIONS, ASSEMBLY and DETAILS	Structure/Architectural		A1					
13							DRAWIN OF NAMEPLATE HOLDER and MANEPLATE DRAWING	Structure/Architectural		A1					
14							DATA SHEETS COLLECTION (THERMAL INSULATION, FLOOR FINISHING, DOORS INCLUDED ALL ACCESORIES, LAMPS, SWITCHES, SOCKETS, CABLE TRAYS, CABLES, HVAC MOTOCONDENSING UNIT, HVAC FANS, HVAC EXCTRACTOR, HVAC FIRE DAMPER ecc.)	Architectural/Electrical/HVAC/Instrumental		A1					
15							DRAWINGS OF THERMAL INSULATION, ASSEMBLY and DETAILS	Architectural		A1					
16							DRAWINGS OF MECHANICAL PROTECTION OF THERMAL INSULATION UNDER FLOOR PLATE, ASSEMBLY and DETAILS	Architectural		A1					
17							DRAWINGS OF FLOOR FINISHING, ASSEMBLY and DETAILS	Architectural		A1					
18							DRAWINGS OF DOORS ERECTION	Architectural		A1					
19							DRAWINGS OF HVAC SLEVEES	Structure/HVAC		A1					
20							DRAWINGS OF HVAC EXTERNAL UNIT SUPPORTS (MOTOCONDENSING UNITS, FANS & EXCTRACTORS)	Structure/HVAC		A1					
21							HVAC CONTROL PANEL GENERAL ARRANGEMENT	HVAC		A3					
22							HVAC SYSTEM CALCULATION	HVAC		A4					
23							HVAC D&ID	HVAC		A1					
24							LAYOUT OF NORMAL/EMERGENCY LIGHTING SYSTEM	Electrical		A1					
25							NORMAL/EMERGENCY LIGHTING CONTROL PANEL GENERAL ARRANGEMENT	Electrical		A3					
							PROCEDURES								
26							NON-DESTRUCTIVE EXAMINATIONS PROCEDURES (NDE) (Supplier's procedure)	QUA							A
27							NDE OPERATORS LIST AND QUALIFICATIONS	QUA							A
28							WEIGHT CONTROL / WEIGHING PROCEDURE	QUA							I
29							FACTORY ACCEPTANCE TEST (FAT) PROCEDURE	Eng-Mechanical							A
30							WELD LOCATION PLAN (Detail drawings to scale)	QUA							I
31							WELD PROCEDURE SPECIFICATION (WPS) AND QUALIFICATIONS (PQR) RECORDS (Supplier's standard forms in accordance with purchaser's requirements)	WEL							A
32							WELD OPERATORS LIST and WELDER QUALIFICATIONS RECORDS (WPQ)	WEL							A
33							PRE-COMMISSIONING / COMMISSIONING PROCEDURES	COM							A
34							EQUIPMENT MANUFACTURERS RECORD BOOK (FINAL DOSSIER) - INDEX	QUA							A
							CERTIFICATES (ref. to notes in the RDDS)								
35							FACTORY ACCEPTANCE TEST (FAT) REPORT	QUA							I
36							WELDING REGISTER	QUA							A
37							EQUIPMENT MANUFACTURERS RECORD BOOK – COMPLETE (A4 bound volume(s) to Purchaser specifications)	CERT						X	A
38							PURCHASER's RELEASE NOTE (Issued by Purchaser)	EXP							I
39							FIRE DAMPER & INSULATION FIRE CERTIFICATE (including technical annexes and details)	QUA							
40							CERTIFICATION DOSSIER *(INCLUDING TESTS CERTIFICATES)*	QUA							
41							DECLARATION OF CONFORMITY	QUA							
42							CERTIFYING AUTHORITY RELEASE NOTES / WAIVERS	QUA							I
							SPARES AND MAINTENANCE DATA								
43							SPARE PART INDEX REGISTER (COMMISSIONING, OPERATION AND INSURANCE)	COM							I
44							TECHNICAL OPERATING AND MAINTENANCE MANUAL – COMPLETE (A4 bound volumes to Purchaser's specification)	Eng-Mechanical						X	I
45							TECHNICAL OPERATING AND MAINTENANCE MANUAL – INDEX	Eng-Mechanical							I
							HANDLING, SHIPPING & SITE INSTALLATION								
46							PREPARATION FOR ROAD (by TRUCK) TRANSPORT PROCEDURES	LOG							I
															I

Notes:

(1) Numero documento Cliente
Document number assigned by final Client

(2) Numero documento interno
Document number internal

(3) Numero documento Fornitore (assegnato dal Fornitore)
Document number assigned by Supplier

(4) Assegnare il Titolo del documento (assegnato dal Fornitore)
Fill in the document title (to be assigned by Vendor)

(5) Specific are la disciplina (compilato da Rosetti)
Process, Piping; Electrical, Expediting, Inspection, Commissioning, Quality, ecc (to be filled by Rosetti)

(6) Blocco Classe: Specifica, Disegno, Report, Data Sheet, etc. (compilato da Rosetti)
Procedure, list, drawing, data sheet, etc. (to be filled by Rosetti)

(7) A4, A3, A1 (compilato dal Fornitore)
A4, A3, A1 (Supplier)

(8) Data prevista per l'emissione del documento (compilato dal Fornitore)
Foreseen date for the first issue (Supplier)

Base Load Power Hub (BLPH)

SUPPLIER DEVIATION REQUEST FORM
for HV (66kV-6.6kV) Switchroom B-100

Document Number:
123A90-DDL-AR-SP-10000 – Annex 4

02	16/06/2025	Accepted for Construction (AFC)	R. Bossi	M. Gatti	D. Lo Sterzo
01	22/04/2024	Accepted for Construction (AFC)	R. Bossi	M. Gatti	D. Lo Sterzo
00	27/10/2023	Issue for Review (IFR)	R. Bossi	M. Gatti	D. Lo Sterzo
Rev.	Date	Description	Prepared	Reviewed	Approved
STILOG					

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Annex 4: SUPPLIER Deviation Request Form

STATEMENT OF COMPLIANCE	

List of proposed deviations

All deviations shall be clearly stated on this sheet, with reference to VENDOR's quotation. Each proposed deviation shall be supported by a Deviation Request Form.

A proposed deviation is accepted if the related Deviation Request Form has been reviewed by Purchaser and APPROVED by COMPANY before the Purchase Order placement.

No deviations shall be accepted after the Purchase Order has been sent to VENDOR.

Item #	Subject	Proposed deviation description + reference to the section of the Requisition and SPECIFICATIONS concerned by the deviation

Remarks :

Date : Signature :

Name : Function :

Purchaser	**XXX**	**Requisition no**	**XXX**
PO number	**XXX**	**Sheet**	**1 of 1**
Project: HOLLANDSE KUST NOORD WIND PARK Project		**Rev.**	**XX**

TO BE COMPLETED BY SUPPLIER	
SUPPLIER NAME: PURCHASE ORDER NO: DESCRIPTION:	Drawing/Spec.No. : Material Requisition No.: Equipment Tag No.:
DESCRIPTION OF DEVIATION:	
LIST ATTACHMENT TO SUPPORT REQUEST	
SUPPLIER REPRESENTATIVE (SIGN/DATE)	
TO BE COMPLETED BY PURCHASER	
TECHNICAL RESPONSE	**Factors Affected:** ☐ Code Compliance ☐ Cost ☐ Design ☐ Inter-changeability ☐ Life of Item ☐ Maintenance ☐ Material ☐ Operation
APPROVAL STATUS: ☐ ACCEPTED ☐ REJECTED ☐ ACCEPTED WITH COMMENTS ☐ BACK CHARGEABLE TO SUPPLIER	

REVIEWED BY	**PURCHASER REPRESENTATIVE (SIGN/DATE)**	**COMPANY REPRESENTATIVE**
LEAD ENGINEER		
QA ENGINEER		
APPROVED BY COMPANY PACKAGE MANAGER **(SIGN/DATE)**:		

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IMPORTANT NOTE TO SUPPLIER:

This form is intended to control post-order deviations and/or post-approval revisions and/or to request concessions.

Specifications issued with P.O. and approved KEY SUPPLIER Data are treated as "FINALIZED" by both parties, SUPPLIER and PURCHASER. ☐

POST-ORDER DEVIATIONS OR POST-APPROVAL REVISIONS INITIATED BY SUPPLIER, NEED SPECIFIC APPROVAL.

Under no circumstances SUPPLIER shall revise finalized documents/drawings without receipt of prior approval on this form.

Please Tick (☐) in Appropriate box