Base Load Power Hub (BLPH)

HSSE Action Tracking Register and Close out report

Document Number: 123A90-DDL-SAF-RE-30004

Document Class: 1

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Revision / Change Log

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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.

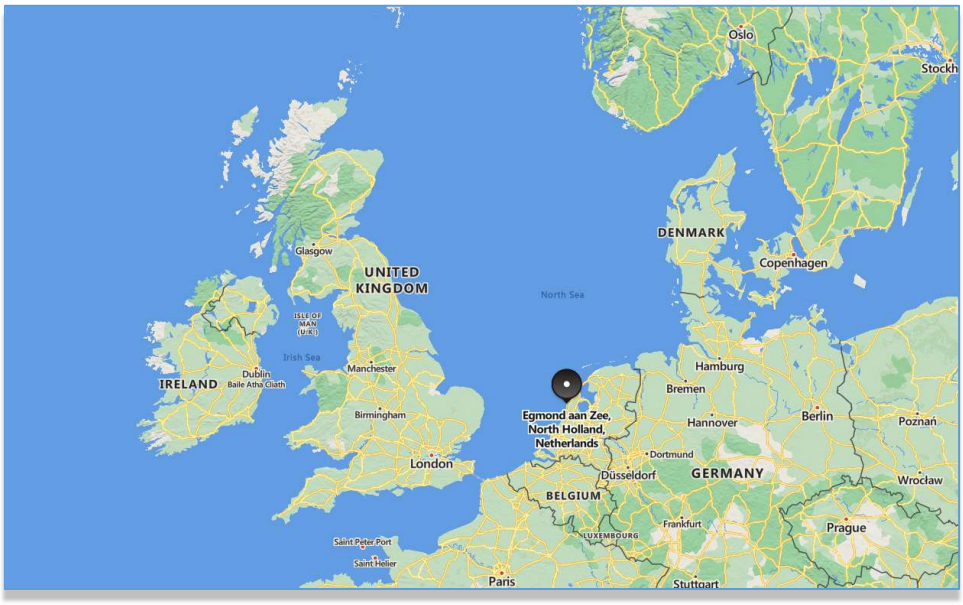


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

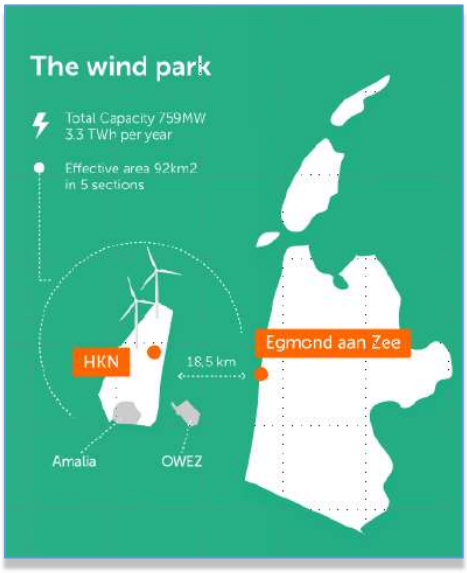


Figure 2 - Wind Park Details

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.

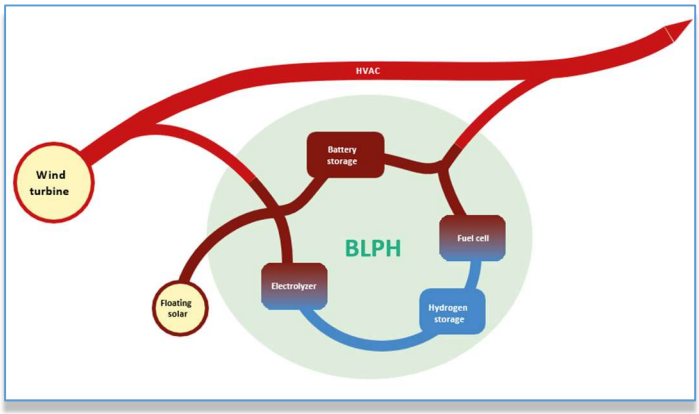


Figure 3 – BLPH Concept

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

The objective of the present document is to provide a formal close out record for all actions that have been responded to and signed-off. This includes both FEED Deferred Actions (i.e., all the actions that cannot be closed out in that Project Phase) and EPC Actions.

The HSSE Action Tracking Register has been implemented on the Project to ensure that all key HSE actions raised from formal workshops such as HAZID, HAZOP and SIMOPS and safety studies are managed and tracked.

Actions raised from other sources are not recorded in this document.

2.1 REFERENCES

Doc. No.	Description
[1] K559-2254-SE-REP-001	HAZID Report, Rev. 1.
[2] K559-2254-SE-REP-015	HAZOP & LOPA Report, Rev. 1
[3] K559-2254-SE-REP-007	Fire and Explosion Risk Analysis Report, Rev. 1
[4] 123A90-DDL-SAF-RE-30006	HAZOP Report
[5] 123A90-DDL-SAF-RE-30009	HAZID Report
[6] 123A90-DDL-SAF-RE-30038	SIMOP/MOPO report

Table 1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project

Table 2 – Definitions

AIS	Automatic Identification System
ALARP	As low as reasonably practicable
BESS	Battery Energy Storage System
BLPH	Base Load Power Hub
CCS	Central Control System
DCS	Distributed Control System
EPC	Engineering Procurement Construction
ESD	Emergency Shutdown
F&G	Fire and Gas
FEED	Front End Engineering Design
FERA	Fire and Explosion Risk Assessment
HAZID	Hazard Identification Study
HAZOP	Hazard and Operability Study
HKN	Hollandse Kust Noord
HSE	Health, Safety, Environment
ICSS	Integrated Control and Safety System
LOPA	Layers of Protection Analysis
MAH	Major Accident Hazard
MOPO	Matrix Of Permitted Operations
MSDS	Material Safety Datasheets
PCS	Process Control System
PFD	Process Flow Diagram
PFP	Passive Fire Protection
PPE	Personal Protective Equipment
SGSI	Shell Global Solutions International
SHESAMS	Safety, Health, Environment, Security Action Management System
SIMOPS	Simultaneous Operations
SIL	Safety Integrity Level
TSO	Transmission System Operator
UPS	Uninterrupted Power Supply
WTG	Wind Turbine Generator

Table 3 - Abbreviations

3 HSSE ACTION TRACKING REGISTER

3.1 INTRODUCTION

The HSSE Action Tracking Register produced during FEED Project Phase in conformance with FEED Contractor's Safety, Environmental and Health Action Management System (SHEAMS) has been updated adding all the safety actions raised during EPC to the actions that cannot be closed out during FEED (i.e., Deferred Actions).

The HSSE Action Tracking Register is maintained as a "live" repository, allowing actions and responses to be updated at any time.

This document summarises the status of The HSSE Action Tracking Register during EPC.

Actions that were logged within The HSSE Action Tracking Register were taken from the following sources:

- FEED HAZID Report, Ref. [1];
- FEED HAZOP & LOPA Report, Ref. [2];
- FEED Fire and Explosion Risk Analysis Report, Ref. [3];
- EPC HAZOP Report, Ref. [4];
- EPC HAZID Report, Ref. [5];
- EPC SIMOP/MOPO Report, Ref. [6].

The process operating within the HSSE Action Tracking system can be summarised as follows.

- Actions are distributed to the identified responsible parties for completion.
- During the course of works the necessary engineering work as required by the action will be completed and evidence included.
- The responsible party will complete the action response, provide the evidence and sign.
- Once completed, the action is routed through a series of parties to verify the quality and completeness of the action closure, along with confirmation of any required evidence. These parties are:
    - HSE Leader
    - Project Manager
    - Company Approval

The present document will be updated every 2 months, while the HSSE Action Tracking Register will be updated each 2 weeks and presented in the bi-weekly meeting to ensure the actions are follows.

3.2 ACTION STATUS DEFINITION

The action status may be defined as listed below:

- Open – Actions for which any form of response has yet to be submitted.
- For Approval – The proposed response is considered acceptable to Rosetti Marino and the Action is in the approval process with the client.
- Closed – Responses that have been approved as incorporated in the design (or otherwise closed) at EPC. Approval given by the responding discipline, Rosetti Marino Safety, Rosetti Marino Engineering Management and Client. These actions have fully signed response sheets which have been included in Appendix 1.

3.3 ACTION STATUS

The following sections show the status of actions as a total and by Action Source (i.e., study).

3.3.1 Total Action Status

Table 4 - Total Action Status

Status	Totals	%
Open	8	4
For Approval	7	3
Actions closed in Feed HSSE rev01	16	7
Closed	188	86
TOTAL	**219**	**100**

3.3.2 Action Status by Action Source

Table 5 - FEED HAZID Actions

Status	Totals	%
Open RM.	0	0
Open CW	0	0
For Approval RM scope	0	0
For Approval CW scope	1	4
Actions closed in Feed HSSE rev01	2	8
Closed	22	88
TOTAL	**25**	**100**

Table 6 - FEED HAZOP & LOPA Actions

Status	Totals	%
Open RM.	1	1
OPEN CW	0	0
For Approval RM scope	4	4
For Approval CW scope	0	0
Actions closed in Feed HSSE rev01	14	13
Closed	86	82
TOTAL	**105**	**100**

Table 7 - FEED FERA Actions

Status	Totals	%
Open RM.	0	0
Open CW	0	0
For Approval RM scope	2	29
For Approval CW scope	0	0
Closed	5	71
TOTAL	**7**	**100**

Table 8 - EPC HAZID Actions

Status	Totals	%
Open RM.	0	0
Open RM/CW	1	7
Open RM/CW	0	0
For Approval RM scope	0	0
For Approval RM/CW scope	0	0
For Approval CW scope	0	0
Closed	13	93
TOTAL	**14**	**93**

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Table 9 - EPC HAZOP Actions

Status	Totals	%
Open RM.	0	0
Open RM/CW	1	2
Open CW	0	0
For Approval RM	0	0
For Approval RM/CW	0	0
For Approval CW	0	0
Closed	55	98
TOTAL	**56**	**100**

Table 10 - EPC HFE Actions

Status	Totals	%
Open	0	0
For Approval	0	0
Closed	7	100
TOTAL	**7**	**100**

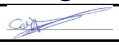
4 HSSE ACTION REGISTER

Tables below details the status of all actions at the issue date of this document.

4.1 FEED FERA RECOMMENDATIONS

BLPH SHEAMS SIGNATURE FORM

Action Title: **Action No:** **Ref. Doc.**	**FERA Study Actions** 1 K559-2254-SE-REP-007
Item No.	1
Cause:	N/A
Consequence:	N/A
Safeguards:	N/A
Actions:	A hydrogen storage vessel fire failure analysis is to be conducted to determine if a 15 minute depressurising time is sufficient to protect the vessels from an explosive rupture.
Assigned Respondent (By)	ROSETTI Technical Safety Engineer
RESPONSE	According with FERA study doc. no. 123A90-DDL-SAF-RE-30020 , scenarios for jet fires are below 10-4 year. No need for additional mitigation measures.
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
E.Carminati	
EPC HSE Lead	**Sign**
C.Caracciolo	**CC**
EPC Project Manager	**Sign**
D.Lo Sterzo	
Client	**Sign**
	Paul van Rossum Digitaal ondertekend door Paul van Rossum Datum: 2024.10.24 12:57:55 +02'00'

2 EXECUTIVE SUMMARY

This document has the purpose of detailing the results of the Fire and Explosion Risk Assessment (FERA) study for the new Base Load Power Hub (BLPH) which will be installed in the framework of HOLLANDSE KUST NOORD WIND PARK Project. The scope of this document is limited to the topsides structure and associated facilities up until connection with the monopile, and include the risk related to CPIs packages. The monopile itself is not within the scope of this document.

Following objectives are included in the scope of the study:

- to identify fire and explosion scenarios from the equipment inside the scope of work;
- to calculate damage distances for fire, explosion and flammable release scenarios to determine potential for escalation;
- to evaluate the fire escalation scenarios in detail and suggest suitable risk reduction measures.

To achieve this objective, a thorough analysis has been made on all hazardous substance and streams within the new equipment part of the project.

Parts count approach has been applied to identify all of the possible sources of loss of containment (lines, flanges, valves, equipment) and consequently to calculate the corresponding leakage frequencies for all the section of the plant with hazardous substances.

The system has been segmented into isolatable sections, for the identification of Loss of containment cases (LOC). Each isolatable section is characterized by one or more LOCs, on the basis of characteristics of the handled fluid.

Three leak size categories have been identified for a wider representation of the risk by different LOCs. The consequence assessment has been performed with the software PHAST from DNV-GL. All the identified scenarios have been located in the plot plan. With application of a dedicated software, it has been possible to combine their contribution to determine the impact of new equipment in the scope of the project in order to evaluate the acceptability of fire and explosion scenarios.

The main findings of the FERA study are reported below.

- Jet Fire.

  there are no areas in the platform in which the thermal radiation threshold contours of 37.5 kW/m^2 from jet fire is equal to or above 1.0E-04 per year. The impact of jet fire scenarios on equipment is lower than target frequency and can be classified as tolerable .

- Explosion

  there are no areas in the platform in which the explosion threshold contours of 0.35, 0.27, 0.15 and 0.07 bar are equal to or above 1.0E-04 per year, thus the risk from VCE is considered tolerable .

Following actions are recommended:

- In order to reduce the escalation risk from section 2 (storage section) it is suggest to reduce the total hold up involved in the hazardous scenarios. At the present, all vessels are considered aligned, and

in case of release, about 1200 kg are potentially involved in the release. It is recommended to define the logics of line-up and closure of each vessel automatically during normal operation.

This action will significantly reduce the total amount of H_2 involved in a critical scenario, leading to the decrease of scenario duration and the risk of escalation.

BLPH SHEAMS SIGNATURE FORM

Action Title: **Action No:** **Ref. Doc.**	**FERA Study Actions** 3 K559-2254-SE-REP-007
Item No.	3
Cause:	N/A
Consequence:	N/A
Safeguards:	N/A
Actions:	Conduct an assessment of oxygen vent design in terms of adequate dispersion and prevention of any interaction with hydrogen vent plume once vendor data is available.
Assigned Respondent (By)	CROSSWIND Technical Safety Engineer
RESPONSE	Oxygen vent dispersion has been performed by Electrolyser vendor. This showed no interaction with the hydrogen vent, mainly due to the rising H2 plume and the O2 plume not rising to the height of the H2 vent.
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements

Company Discipline Lead	**Sign**
	Hamant Patel Digitally signed by Hamant Patel Date: 2024.10.08 11:03:40 +01'00'
Company HSE Lead	**Sign**
	Paul van Rossum Digitaal ondertekend door Paul van Rossum Datum: 2024.10.08 10:04:04 +02'00'
Company Project Manager	**Sign**
	Dominik Sznajder Digitally signed by Dominik Sznajder Date: 2024.10.09 09:16:22 +02'00'
Contractor received for information. Not independently verified. Information implemented	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Action No:** **Ref. Doc.**	**FERA Study Actions** 4 K559-2254-SE-REP-007
Item No.	4
Cause:	N/A
Consequence:	N/A
Safeguards:	N/A
Actions:	Conduct an assessment of internal Electrolyser explosions and determine any possible required additional mitigation measures.
Assigned Respondent (By)	CROSSWIND Technical Safety Engineer
RESPONSE	An internal explosion of the electrolyser has been conducted and the result has been added in the main FERA report doc. no. 123A90-DDL-SAF-RE-30020 No additional mitigation measures are required based on the FERA.
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements

Company Discipline Lead	**Sign**
	Hamant Patel Digitally signed by Hamant Patel Date: 2024.10.08 11:02:42 +01'00'
Company HSE Lead	**Sign**
	Paul van Rossum Digitaal ondertekend door Paul van Rossum Datum: 2024.10.08 10:04:49 +02'00'
Company Project Manager	**Sign**
	Dominik Sznajder Digitally signed by Dominik Sznajder Date: 2024.10.09 09:16:55 +02'00'
Contractor received for information. Not independently verified. Information implemented	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Action No:** **Ref. Doc.**	**FERA Study Actions** 5 K559-2254-SE-REP-007
Item No.	5
Cause:	N/A
Consequence:	N/A
Safeguards:	N/A
Actions:	Company to determine whether PFP protection for main structural elements holding up hydrogen storage area is required for asset protection purposes.
Assigned Respondent (By)	ROSETTI Technical Safety Engineer
RESPONSE	According with latest FERA report 123A90-DDL-SAF-LIS-30020, there is no need for PFP for main structural elements holding up hydrogen storage area.
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
E.Carminati	
EPC HSE Lead	**Sign**
C.Caracciolo	CC
EPC Project Manager	**Sign**
D. Lo Sterzo	
Client	**Sign**
	Paul van Rossum Digitaal ondertekend door Paul van Rossum Datum: 2024.10.24 13:01:45 +02'00'

2 EXECUTIVE SUMMARY

This document has the purpose of detailing the results of the Fire and Explosion Risk Assessment (FERA) study for the new Base Load Power Hub (BLPH) which will be installed in the framework of HOLLANDSE KUST NOORD WIND PARK Project. The scope of this document is limited to the topsides structure and associated facilities up until connection with the monopile, and include the risk related to CPIs packages. The monopile itself is not within the scope of this document.

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The system has been segmented into isolatable sections, for the identification of Loss of containment cases (LOC). Each isolatable section is characterized by one or more LOCs, on the basis of characteristics of the handled fluid.

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The main findings of the FERA study are reported below.

- Jet Fire.

  there are no areas in the platform in which the thermal radiation threshold contours of 37.5 kW/m^2 from jet fire is equal to or above 1.0E-04 per year. The impact of jet fire scenarios on equipment is lower than target frequency and can be classified as tolerable .

- Explosion

  there are no areas in the platform in which the explosion threshold contours of 0.35, 0.27, 0.15 and 0.07 bar are equal to or above 1.0E-04 per year, thus the risk from VCE is considered tolerable .

Following actions are recommended:

- In order to reduce the escalation risk from section 2 (storage section) it is suggest to reduce the total hold up involved in the hazardous scenarios. At the present, all vessels are considered aligned, and

BLPH SHEAMS SIGNATURE FORM

Action Title: **Action No:** **Ref. Doc.**	**FERA Study Actions** 6 K559-2254-SE-REP-007
Item No.	6
Cause:	N/A
Consequence:	N/A
Safeguards:	N/A
Actions:	Further protective measures against BESS thermal runaway events should be considered such as hydrogen storage blowdown on confirmed fire, data analytics tools, explosion hatches and early electrolytic vapour or off-gas detection technologies. Supplier to determine whether PFP protection around BESS area are required for asset protection purposes.
Assigned Respondent (By)	CROSSWIND Technical Safety Engineer
RESPONSE	The thermal runaway threat, including all safeguards for the BESS has been analysed and described in technical note "Title Thermal Runaway scenario recommendation for BLPH BESS System" No additional barriers are required.
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements

Company Discipline Lead	**Sign**
	Alessandro Sutto
Company HSE Lead	**Sign**
	Paul van Rossum Digitaal ondertekend door Paul van Rossum Datum: 2024.10.07 16:05:51 +02'00'
Company Project Manager	**Sign**
	Dominik Sznajder Digitally signed by Dominik Sznajder Date: 2024.10.07 17:17:01 +02'00'
Contractor received for information. Not independently verified. Information implemented.	**Sign**

4.2 FEED/EPC HAZID RECOMMENDATIONS

APPENDIX A CLOSED HSE ACTION SHEETS

BLPH
SHEAMS SIGNATURE FORM

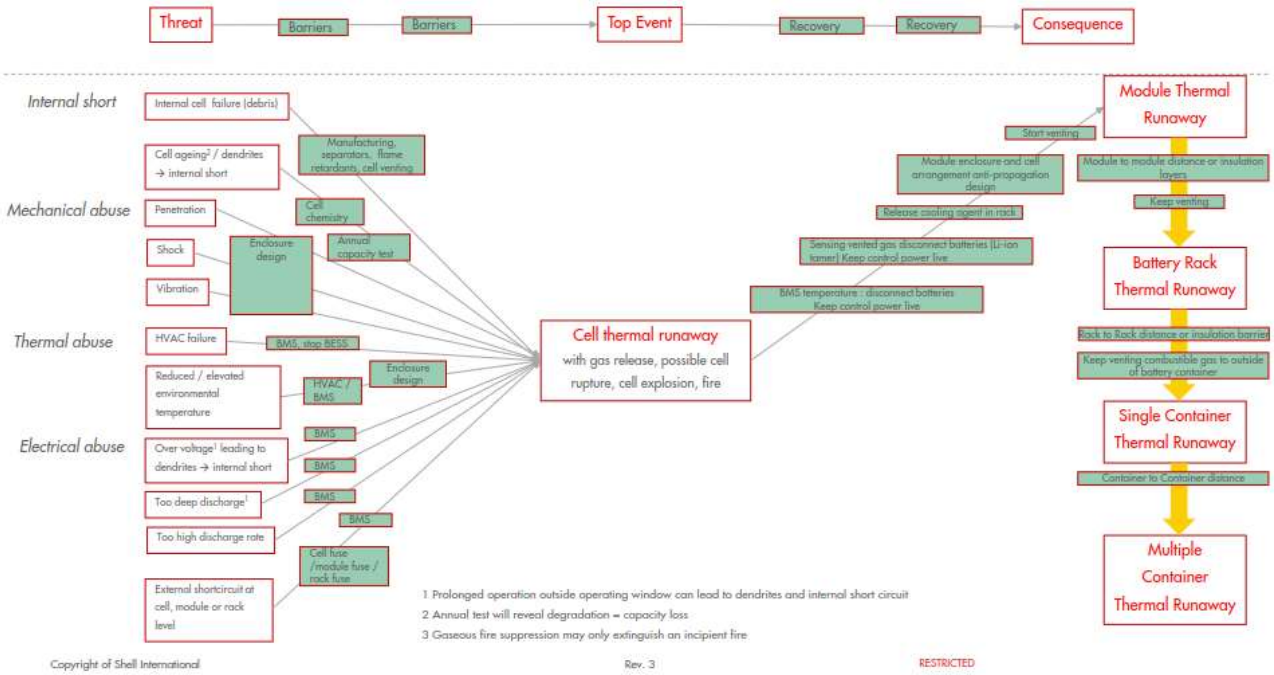
Action No:	**0001**	**Rev:**	1
Action Title:	**HAZID Study Actions**	**Date:**	25/03/2023
Ref. Doc:	K559-2254-SE-REP-001		
Title:	BLPH HAZID Study		
Node:	1: Electrical System		
Reference Drawings:	N/A		
Parameter	H-03.05b	**Deviation**	Hydrogen
Cause:	Thermal runaway within BESS.		
Consequence:	Potential explosive atmosphere. Asset damage. Potential fatalities.		
Safeguards:	Fire & gas detection philosophy will be developed during FEED phase.		
Action:	1 Shell to consider providing thermal runaway bow-tie information to KBR.		
RESPONSE:	**Responsible Discipline: Shell** Bow-Tie provided showing cell thermal runaway		
Attachments:	None		

Name: Signature: Raise PCN: Yes/No PCN No:

RESPONSE ACCEPTANCE:

Discipline Lead:	Nick Menegazzo	Signature:	Date: 2023-05-09 | 13:25 BST
HSE Lead:	Samer Bachir	Signature:	Date: 2023-05-15 | 03:34 CDT
Proj. Manager:	John Schofield	Signature:	Date: 2023-05-15 | 09:57 BST
Client:	Paul Sampessum	Signature:	Date: 2023-05-15 | 13:02 BST

FUTURE ACTION/CROSS REFERENCE:


Threat
Barriers
Barriers
Top Event
Recovery
Recovery
Consequence
Internal short
Internal cell failure (debris)
Cell ageing[2] / dendrites → internal short
Manufacturing, separators, flame retardants, cell venting
Mechanical abuse
Penetration
Cell chemistry
Shock
Enclosure design
Annual capacity test
Vibration
Thermal abuse
HVAC failure
BMS, stop BESS
Reduced / elevated environmental temperature
HVAC / BMS
Enclosure design
Electrical abuse
Over voltage[1] leading to dendrites → internal short
BMS
Too deep discharge[1]
BMS
Too high discharge rate
BMS
Cell fuse / module fuse / rack fuse
External shortcircuit at cell, module or rack level
Cell thermal runaway
with gas release, possible cell rupture, cell explosion, fire
BMS temperature : disconnect batteries Keep control power live
Sensing vented gas disconnect batteries (Li-ion tamer) Keep control power live
Release cooling agent in rack
Module enclosure and cell arrangement anti-propagation design
Start venting
Module Thermal Runaway
Module to module distance or insulation layers
Keep venting
Battery Rack Thermal Runaway
Rack to Rack distance or insulation barrier
Keep venting combustible gas to outside of battery container
Single Container Thermal Runaway
Container to Container distance
Multiple Container Thermal Runaway
1 Prolonged operation outside operating window can lead to dendrites and internal short circuit
2 Annual test will reveal degradation = capacity loss
3 Gaseous fire suppression may only extinguish an incipient fire
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BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	1
Cause:	Hydrogen released from BESS.
Consequence:	Potential explosive atmosphere. Asset damage.
Safeguards:	
Actions:	Update layout to show vent from BESS.
Assigned Respondent (By)	ROSETTI Piping & Layouts Engineer
RESPONSE	According with the mail attached, no vent from BESS will be provided. The Potential emergency exhaust of H2 shall be released on the lower deck with the following mitigation to manage the risk of accumulation. 1.Exhaust openings have been provided above BESS containers (see extract from 3D model attached) 2.Areas identified for accumulation shall be fitted with a H2 detector (1 per accumulation area. See 123A90-DDL-SAF-DL-30027 attached). These shall be voted in alignment with the platform FGS philosophy i.e. 2ooN
Attachments:	
Issue Date	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Carla Bortolin	Carla Bortolin Firma digitale: Carla Bortolin Nome distintivo: CN = Carla Bortolin email = carla.bortolin@rosetti.it C = IT O = Rosetti Marino OU = RPL Data: 2024.07.15 12:17:03 +02'00'
EPC HSE Lead	**Sign**
C.Caracciolo	**CC**
EPC Project Manager	**Sign**
D.Lo.Sterzo	
Client	**Sign**
	Digitaal ondertekend door Pieter Bosma Datum: 2024.08.21 08:22:35 +02'00'

Da: Stephen Bremner <stephen.bremner@crosswindhkn.nl>
Inviato: giovedì 18 aprile 2024 12:10
A: Giunchi Claudia (Rosetti) <Claudia.Giunchi@rosetti.it>; Lo Sterzo Davide (Rosetti) <Davide.LoSterzo@rosetti.it>
Cc: Dominik Sznajder <dominik.sznajder@crosswindhkn.nl>; Sutto, Alessandro GSNL-PTX/P/S <Alessandro.Sutto@shell.com>; Brunelli Massimiliano (Rosetti) <Massimiliano.Brunelli@rosetti.it>; Philip Robinson <Philip.Robinson@kbr.com>
Oggetto: RE: BLPH BESS ventilation - sensors on platform and communication

Hi Claudia/Davide,

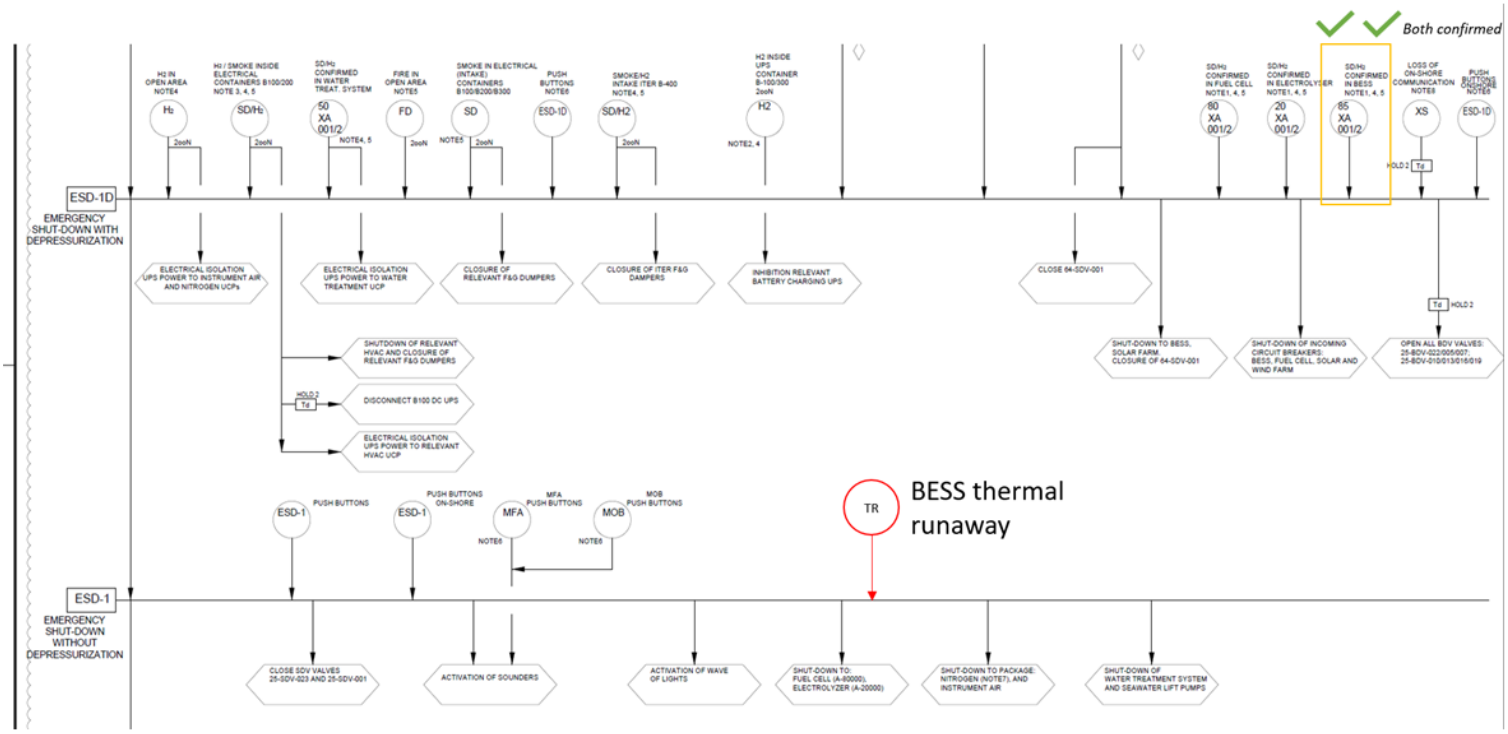
Thanks for the collaborative discussion last week on the way forward regarding the BESS vent.

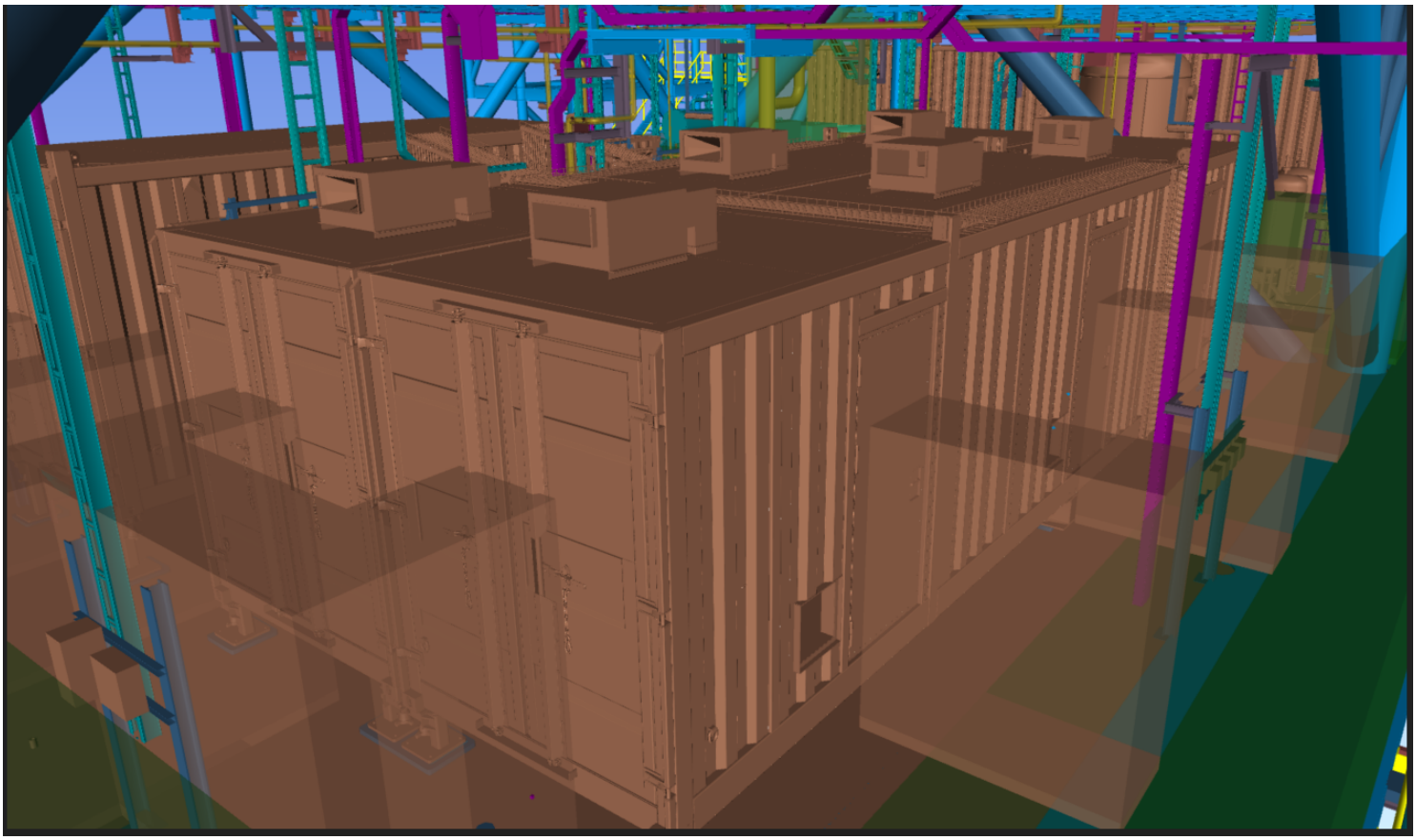
Summary and agreed way forward:

The emergency exhaust shall be released on the lower deck with the following mitigation to manage the risk of accumulation.

1. Areas for potential accumulation above BESS containers to be reviewed and identified
2. Areas identified for accumulation shall be fitted with a H2 detector (1 per accumulation area). These shall be voted in alignment with the platform FGS philosophy i.e. 2ooN and shall take the execute action as currently outlined in the process safety block diagram.

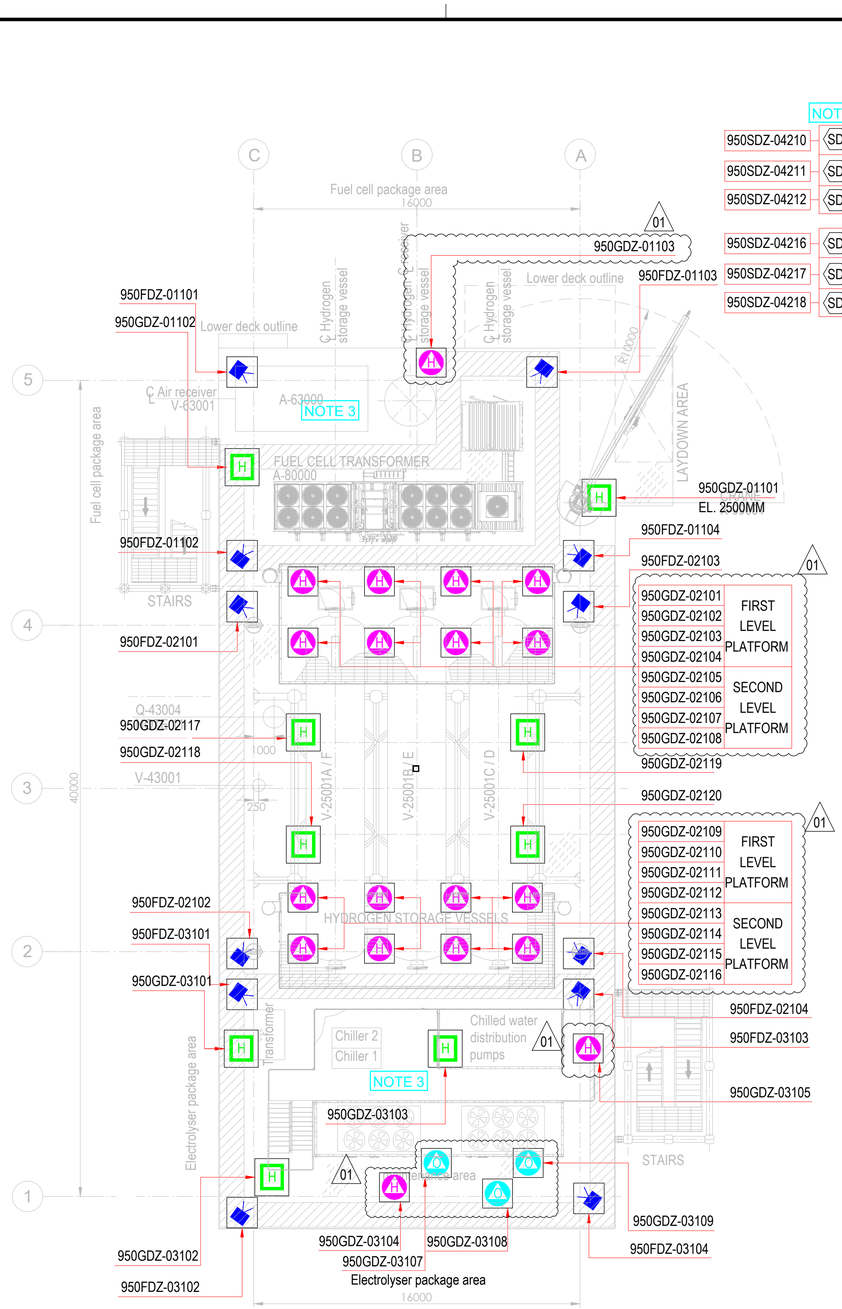
In addition, there will be a FGS hardwire signal from the BESS, "confirmed thermal runaway in BESS" as outline below. Critically, AUX power to the BESS shall remain active in this case.





DRAWING NO.: 123A90-DDL-PP-DL-30027

REV.: 00



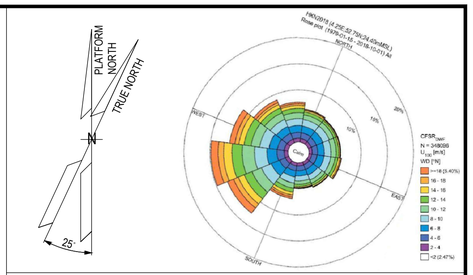
PLAN ON UPPER DECK
EL+30.310 T.O.S.

PLAN ON LOWER DECK
EL+23.310 T.O.S.

EQUIPMENT LIST

TAG NUMBER	DESCRIPTION	TAG NUMBER	DESCRIPTION
A-20000	ELECTROLYSER	TR-200DE1	TRANSFORMER AUX. 6.6kV/0.4kV
A-63000	INSTRUMENT AIR PACKAGE	TR-200ED1	SOLAR TRANSFORMER PV FARM EQUIPMENT
A-80000	FUEL CELL	RR-100AD1-NER	NEUTRAL EARTHING RESISTOR
A-85000	BESS	V-63001	AIR RECEIVER
A-50000	WATER TREATMENT PACKAGE	V-64001	NITROGEN RECEIVER
P-50001A/B	SEAWATER LIFT PUMPS	X-99001	CRANE
Q-43004	HYDROGEN VENT		
A-64000	NITROGEN SYSTEM		
V-25001A-F	HYDROGEN STORAGE VESSELS		
V-43001	HYDROGEN VENT KO DRUM		
YLB-079001/2	LIFE RAFTS		
B-100	HV/MV SWITCHROOM 66kV/6.6kV		
B-200	LV SWITCHROOM 400V		
B-300	AC UPS EQUIPMENT ROOM		
B-400	I&T EQUIPMENT ROOM		
TR-100AD1	TRANSFORMER MAIN 66kV/6.6kV		

SYMBOL	DESCRIPTION	QTY.	
	UV-IR FLAME DETECTOR (FDZ)	22	01
	POINT SOURCE HYDROGEN DETECTOR (GDZ)	46	01
SD	SMOKE DETECTOR (SDZ)	24	
	POINT SOURCE OXYGEN DETECTOR (GDZ)	3	
H	ULTRA SONIC HYDROGEN DETECTOR (GDZ)	9	01



NOTES

1. ALL DIMENSIONS IN mm U.N.O
2. ALL ELEVATIONS IN METERS.
3. VENDOR TO DEFINE AND SUPPLY ALL FIRE & GAS DETECTORS TO BE USED IN FUEL CELL, ELECTROLYSER AND BESS. TO BE IN COMPLIANCE WITH PROJECT REQUIREMENTS. THESE WILL BE SHOWN IN THE NEXT REVISON OF THE DOCUMENT.
4. PERSONNEL EXPECTED TO USE HANDHELD HYDROGEN AND LOW OXYGEN DETECTORS WHEN WORKING IN CONFINED SPACES ENTRY.
5. F&G LAYOUTS FOR I&T EQUIPMENT ROOM, AC UPS, LV SWITCH ROOM AND HV/MV SWITCHROOM CONTAINERS LOCATED AT DOOR ENTRANCE OF EACH ROOM (2003) AND START ABANDON. (01)
6. SMOKE DETECTORS (2003) AND POINT SOURCE HYDROGEN DETECTORS (2003) TO BE PROVIDED AROUND HVAC INLET AREAS AND UPON CONFIRMED DETECTION CLOSE DAMPERS TO ROOMS.
7. ULTRASONIC H2 DETECTORS TO BE LOCATED ON VALVE ACCESS PLATFORMS FOR H2 STORAGE VESSELS.
8. POINT SOURCE H2 DETECTORS TO BE LOCATED ON VALVE ACCESS PLATFORM FOR H2 STORAGE VESSELS.
9. EXACT LOCATION OF F&G DETECTORS AND DEVICES IS SHOWN IN THE 3D MODEL. (01)
10. LOCATION OF THE 6 SENSOR (950GDZ-05101/102/103/104/105/106) AT CEALING ABOVE BESS ROOF, TO AVOID GAS ACCUMULATION AT POCKETS

ELEVATION

FDZ = 2.0m El.
GDZ = 2.5m El. INSIDE THE COTAINER
SDZ = 2.0m El.

HOLDS

REFERENCE DOCUMENTS

123A90-DDL-PP-DS-70070	PLOT PLAN - LOWER & UPPER DECK
123A90-DDL-PP-DS-70071	PLOT PLAN - BELOW LOWER DECK
123A90-DDL-SAF-RE-30020	FERA REPORT

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	10/07/24	MMA	CCA	DLO	ACCEPTED FOR CONSTRUCTION (AFC)
00	12/02/24	MMA	CCA	DLO	ISSUE FOR APPROVAL (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

F & G DETECTORS LAYOUT - LOWER & UPPER DECK

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK	SCALE	1:150
DRAWN	CHECKED: C. CARACCIOLO	APPROVED: D. LO STERZO	DATE: 10/07/24
A1	DRAWING NO.: 123A90-DDL-SAF-DL-30027	SHEET: 001	REV.: 01

File Name: 123A90-DDL-SAF-DL-30027 Rev.01

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	2
Cause:	Hydrogen released from BESS.
Consequence:	Potential explosive atmosphere. Asset damage.
Safeguards:	
Actions:	Consider requirement for ATEX certification for BESS.
Assigned Respondent (By)	CROSSWIND
RESPONSE	There is no hazardous zoning for BESS containers. Ref doc K559-2254-CWIWP4202201-E99-099
Attachments:	
Issue Date	

Approvals / Endorsements

Company Discipline Lead	**Sign**
	Alessandro Sutto
Company **HSE Lead**	**Sign**
	Paul van Rossum Digitaal ondertekend door Paul van Rossum Datum: 2024.10.01 12:56:01 +02'00'
Company **Project Manager**	**Sign**
Contractor received for information. Not independently verified. Information implemented	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	3
Cause:	Hydrogen leaking into oxygen system leading to fire.
Consequence:	Potential for internal explosion.
Safeguards:	
Actions:	Review PEM electrolyser data to determine frequency of membrane failure & potential for internal explosion with Identification of mitigation measures.
Assigned Respondent (By)	CROSSWIND
RESPONSE	Failure data have been reviewed and added into the FERA. Refer to 123A90-DDL-SAF-LIS-30020
Attachments:	
Issue Date	

Approvals / Endorsements

Company **Discipline Lead**	**Sign**
Company **HSE Lead**	**Sign**
Company **Project Manager**	**Sign**
Contractor received for information. Not independently verified. Information implemented	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	4
Cause:	Maintenance activity (transfer of equipment between boat & platform)
Consequence:	Potential damage to high voltage cable on seabed. Refer to Node 2
Safeguards:	
Actions:	Clarify measures in place to prevent damage to HV cable during maintenance activities & transfer of equipment between asset & boats. Dropped object study to be undertaken.
Assigned Respondent (By)	ROSETTI Technical Safety Engineer
RESPONSE	According with dropped object and swinging loads study (doc. no. 123A90-DDL-SAF-RE-30018) the calculated risk linked with the demage of underwater power cable between the platform and the seaside falls in tolerable risk region (see attached). However, for offshore wind projects in the Dutch part of the North Sea a burial depth requirement of 2.0 m. applies. A depth of 2.0 m is considered sufficient for large dropped objects (say, vessel anchors) not to reach the cable.
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
E. Carminati	
EPC HSE Lead	**Sign**
C.Caracciolo	**CC**
EPC Project Manager	**Sign**
D.Lo.Sterzo	
Client	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	5
Cause:	Intermittent operation of electrolyser
Consequence:	Potential cyclic operations, potential leakage due to fatigue. Refer to hydrogen leak for risk ranking.
Safeguards:	
Actions:	Review PEM electrolyser data to determine intermittent operation & impact to electrolyser design.
Assigned Respondent (By)	CROSSWIND
RESPONSE	The electrolyser is capable of intermittent operation. Refer to the notes on Operational Limitation of Electrolyser and Rev 2.0 of the Chronogram and Control and Operational Philosophy for detailed information. The stacks are designed to withstand 5,000 pressure cycles, which corresponds to approximately 10 years of operation. The electrolyser can operate within a power range of 250 kW to 2500 kW, equivalent to 10-100% of its load capacity. The ramping rate of the electrolyser is 15 kW/second, allowing for flexible and responsive operation
Attachments:	
Issue Date	

Approvals / Endorsements	
Company Discipline Lead	**Sign**
	Hamant Patel
Company HSE Lead	**Sign**
Company Project Manager	**Sign**
Contractor received for information. Not independently verified. Information implemented	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	7
Cause:	PVC/ metallic piping within packages.
Consequence:	Potential fragmentation, leading to loss of containment.
Safeguards:	Vibration analysis conducted for process systems. Post- Meeting Note: (refer to hydrogen)
Actions:	Vendor to confirm PEM electrolyser stack design is developed to take into account expected movement associated with monopile design.
Assigned Respondent (By)	CROSSWIND
RESPONSE	Elogen confirmed that the electrolyser package design can withstand the acceleration as per CWD requirements, ref to CWHKN-INN-BPH-TQ-00031.
Attachments:	
Issue Date	

Approvals / Endorsements

Company **Discipline Lead**	**Sign**
	Hamant Patel
Company **HSE Lead**	**Sign**
Company **Project Manager**	**Sign**
Contractor received for information. Not independently verified. Information implemented	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	8
Cause:	Gas blowby to supporting systems.
Consequence:	Refer to connecting nodes.
Safeguards:	
Actions:	Develop philosophy for operation of electrolysers during periods of maintenance.
Assigned Respondent (By)	CROSSWIND
RESPONSE	The operating philosophy of the BLPH is that the electrolyser is completely shutdown when any person will come to the platform.
Attachments:	
Issue Date	

Approvals / Endorsements

Company **Discipline Lead**	**Sign**
Company **HSE Lead**	**Sign**
Company **Project Manager**	**Sign**
Contractor received for information. Not independently verified. Information implemented	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	9
Cause:	Boats in vicinity
Consequence:	Collision with asset. Loss of stability. Potential Fatalities.
Safeguards:	Navigation aids. Procedures developed by crosswind.
Actions:	Crosswind to provide results from boat collision studies from Shell Marine. Crosswind to provide lighting plan for facility.
Assigned Respondent (By)	CROSSWIND
RESPONSE	1) Boat Collision ("Ship Impact") with BLPH foundation was part of the project Deliverable from the wind farm foundation package. Van Oord Offshore Wind has provided the following report which has been accepted by the Crosswind wind farm team and which available on CW ACONEX VOWP-DEN-FND-RPT-00037, document reference 144671-VOOW-TF-ENG-REP-1056 Ship impact for BLPH. 2) Crosswind has already produced and issued to the Dutch Authorities the following document "CWHKN-PMG-PJA-PLN-00005, Identification marks and lighting plan" BLPH has been included into the document : "A temporary nautical light is foreseen on the BLPH foundation such that is marked like other installed foundations. The temporary light will be removed once the permanent nautical lighting contour has been commissioned. "
Attachments:	
Issue Date	

Approvals / Endorsements

Company **Discipline Lead**	**Sign**
N LE BRUN	26-09-2024 LE BRUN
Company **HSE Lead**	**Sign**
Company **Project Manager**	**Sign**
Contractor received for information. Not independently verified. Information implemented	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	11
Cause:	Salty conditions. Stray currents.
Consequence:	Potential electrocutions.
Safeguards:	Electrically earthed.
Actions:	Earthing design to be developed, taking in account fuel cell & electrolyser designs.
Assigned Respondent (By)	ROSETTI Electrical Engineer
RESPONSE	CPI will be connected to earth at two (2) battery limit points provided by each CPI.
Attachments:	
Issue Date (dd/mm/yy)	12/04/2024

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Andrea Madaschi	
EPC HSE Lead	**Sign**
Carolina Caracciolo	
EPC Project Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	13
Cause:	Potential oxygen rich atmosphere around vents
Consequence:	Potential impact on passing birds
Safeguards:	
Actions:	Clarify regulatory requirements for disposal of dead birds/ biodiversity of existing area. Environmental impact assessment to cover impact to birds.
Assigned Respondent (By)	CROSSWIND
RESPONSE	If dead birds are found the the BLPH , they will be disposed as per Dutch Industry stadnard Nogepa N.64
Attachments:	
Issue Date	

Approvals / Endorsements

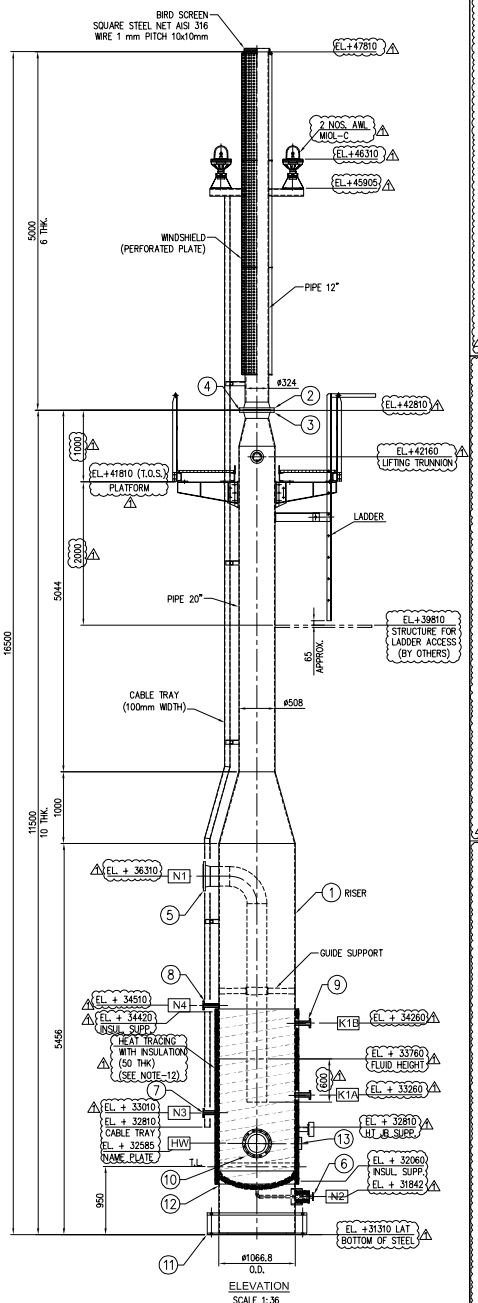
Company **Discipline Lead**	**Sign**
N LE BRUN	25/09/2024 LE BRUN
Company **HSE Lead**	**Sign**
Company **Project Manager**	**Sign**
Contractor received for information. Not independently verified. Information implemented	**Sign**

BLPH SHEAMS SIGNATURE FORM

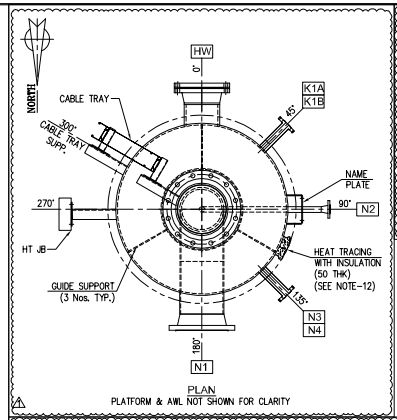
Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	14
Cause:	Bird droppings
Consequence:	Slippery surfaces
Safeguards:	
Actions:	Develop philosophy for preventing birds from forming habitats on asset.
Assigned Respondent (By)	ROSETTI Project Management
RESPONSE	Within BLPH scope the only critical asset where birds can try to create issues is the Hydrogen Vent outlet which has been equipped with bird screen. See detail of bird screen in the drawing 1724000887-MAC-DA-00003 below attached. Therefore, Rosetti will not develop a dedicated philosophy for preventing birds from forming habitats on asset
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
F.Mura	
EPC HSE Lead	**Sign**
C.Caracciolo	
EPC Project Manager	**Sign**
D.Lo Sterzo	
Client	**Sign**

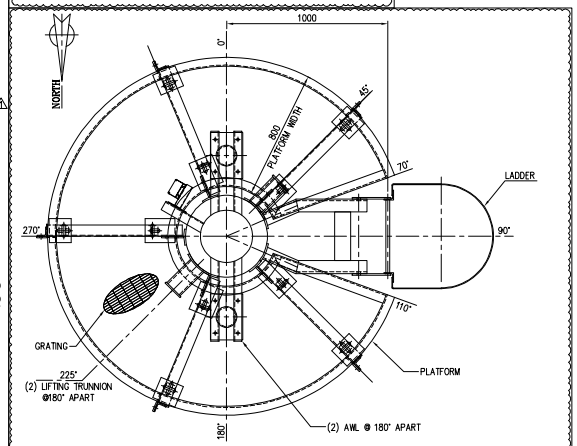
DRAWING NO. 1724000887-MAC-DA-00003_00 | REV. REV



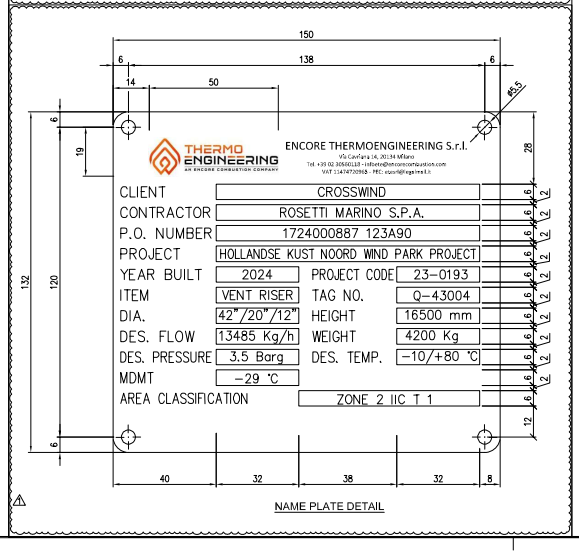
ELEVATION
SCALE 1:36
(FOR TRUE ORIENTATION REFER PLAN VIEWS)



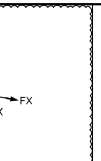
PLAN
PLATFORM & AWL NOT SHOWN FOR CLARITY



PLAN OF PLATFORM & AWL



NAME PLATE DETAIL



NOZZLE LOADS

	LOADS [kN]			MOMENTS [kN x m]		
	FX	FY	FZ	MX	MY	MZ
INLET N1 (10")	7.78	14.45	14.45	6.31	4.74	4.74

MATERIAL LIST

ITEM	Q.TY	DESCRIPTION	DIMENSION	MATERIALS
1	1	FLARE RISER SHELL	42" (1066.8) OD. x 10 THK	A516 GR.60/EQUIV
		FLARE RISER SHELL	20" (508) OD. x 10 THK	A516 GR.60/EQUIV
		VENT TIP SHELL	12" (323.9) OD. x 6 THK	AISI 316
2	1	VENT TIP FLANGE	ø12" 150# WNRF ASME B16.5	A350 GR LF2
3	1	RISER OUTLET FLANGE	ø12" 150# WNRF ASME B16.5	A350 GR LF2
4	1	GASKET	ø12" 150# SPIRAL WOUND	NOTE-10
5	1	VENT INLET	ø10" 150# WNRF, SCH.40 ASME B16.5	A350 GR LF2
6	1	DRAIN CONNECTION FLANGE	ø1" 150# WNRF, SCH. 80 ASME B16.5	A350 GR LF2
7	1	SWAN NECK CONNECTION FLG.	ø1" 150# LWNRF ASME B16.5	A350 GR LF2
8	1	FILLING LINE FLANGE	ø1" 150# LWNRF ASME B16.5	A350 GR LF2
9	2	LEVEL TRANSMITTER CONNECTION	ø1" 150# LWNRF ASME B16.5	A350 GR LF2
10	1	HAND HOLE FLANGE	48" 150# WNRF, SCH.40 ASME B16.5	A350 GR LF2
11	1	ANCHOR CHAIR	-	S275J0 or EQUIV.
12	1	SKIRT SHELL	42" (1066.8) OD.	S275J0 or EQUIV.
13	1	NAMEPLATE	-	AISI 316

NOZZLES LIST

POS.	QT'Y	SIZE	RATING	FLANGE	SERVICE	PROJECTION FROM RISER C/L
N1	1	10"	150#	WNRF	VENT INLET FROM V-43001 W/ DIP PIPE	750
N2	1	1"	150#	WNRF	DRAIN	800
N3	1	1"	150#	LWNRF	SWAN NECK CONNECTION	750
N4	1	1"	150#	LWNRF	FILLING LINE	750
K1A/B	2	1"	150#	LWNRF	LEVEL TRANSMITTER	750
HW	1	8"	150#	WNRF	HAND HOLE W/ BLIND	750

LOADS AT THE BASE

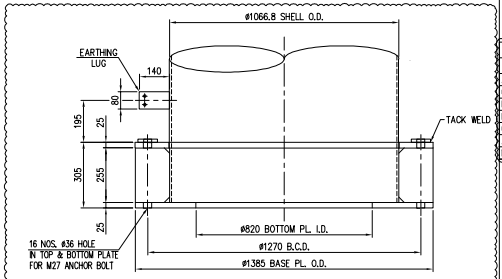
		Vertical [kN]	Shear [kN]	Moment [kN]
DEAD LOAD	DL	-27.66	0.00	0.00
DEAD LOAD CONTENT	DL_O	-17.06	0.00	0.00
LIVE LOAD ON PLATFORM	LL	-13.34	0.00	0.00
NOZZLE LOADS	NL	4.97	24.63	134.99
THERMAL	TL	0.00	0.00	0.00
WIND LOAD	WL	0.00	28.845	235.65
WAVE AND CURRENT LOADS	HL	0.00	-6.99	-55.95

THESE ARE THE RESULTANT FORCES AND THE SHEAR AND MOMENT CAN OCCUR IN ANY DIRECTION.

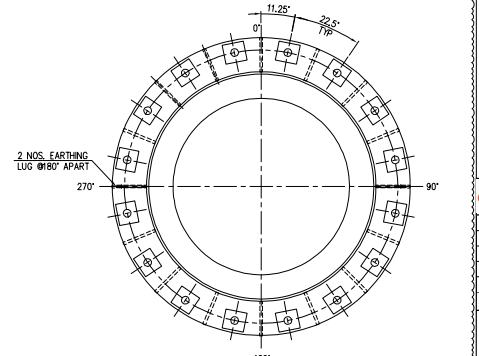
SHEAR = RESULTANT SHEAR: (FX^2 + FZ^2)^0.5

MOMENT = RESULTANT MOM: (MX^2 + MZ^2)^0.5

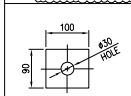
VERTICAL LOAD IS POSITIVE UPWARD



ELEVATION
ANCHOR CHAIR DETAIL
SCALE 1:12

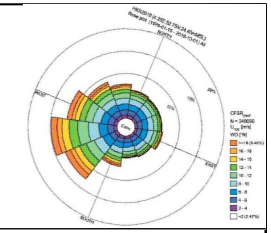


PLAN VIEW



WASHER DETAIL

REFERENCE DOCUMENT	No.
MECHANICAL CALCULATION - HYDROGEN VENT	1724000887-MAC-CA-00004
DETAILED DRAWING WITH PART LIST - HYDROGEN VENT	1724000887-MAC-DD-00005
LIFTING DRAWING - HYDROGEN VENT	1724000887-MAC-DD-00019
.	-



NOTES

GENERAL NOTES:

1. ALL DIMENSION ARE IN mm UNLESS OTHERWISE STATED.
2. ALL ELEVATIONS ARE IN mm UNLESS OTHERWISE STATED.
3. ALL WELDING SHALL BE CONTINUOUS WITH CATHETUS EQUAL TO MINIMUM THK. TO BE WELDED.
4. REFERRING TO MAJOR AXIS FLANGE HOLES SHALL BE SYMMETRICALLY DISPOSED WITH EXCEPTION OF PILOTS FLANGES.
5. ALL FLANGES <= 24" ARE ACCORDING TO ASME B16.5 WITH FINISHING 125 AARH.
6. FOR SURFACE TREATMENT PLEASE REFER TO THE DOCUMENT NO. 1724000887-MAT-PRO-00010 (23-0193-0030).
7. MAIN COMPONENT WEIGHTS (APPROX.):
   RISER WEIGHT : 3800 kg (INCLUDING PLATFORM & LADDER)
   VENT TIP : 400 kg
8. FOR WIRING DIAGRAM (JB AND HT) REFER DOCUMENT NO. 1724000887-MAC-DG-00007 (23-0193-0170)
9. DELETED.
10. GASKET SHALL BE STAINLESS STEEL, SPIRAL WOUND, GRAPHITE FILLED, EPOXY-COATED CARBON STEEL CENTERING RING AND STAINLESS STEEL INNER RING.
11. FOR RISER CONSTRUCTION DETAILS REFER DRAWING NO. 1724000887-MAC-DD-00005 (23-0193-131).
12. HEAT TRACING CABLES AND INSULATION SUPPORTS ARE IN ETE SCOPE OF WORK. INSULATION SUPPLY & INSTALLATION BY OTHERS.

NAME PLATE NOTES:

a. ALL DIMENSIONS ARE IN mm, UNLESS OTHERWISE STATED.
b. NAMEPLATE MATERIAL : AISI 316L
   NAMEPLATE THK. : 2 mm
   TEXT COLOR : BLACK
   TEXT ENGRAVED
c. NAMEPLATE WILL BE FIXED ON VENT RISER REFER TO DOC. 1724000887-MAC-DD-00005 (23-0193-0131).

DESIGN DATA

DESCRIPTION	VALUES
AMBIENT TEMPERATURE	-8.4 / +25 °C
OPERATING PRESSURE	ATM barg
DESIGN TEMPERATURE	-10 / +80 °C
DESIGN PRESSURE	3.5 barg
CORROSION ALLOWANCE	3 mm (FOR CARBON STEEL ONLY)
AREA CLASIFICATION	ZONE 2 II T 1
MDMT	-29 °C

THERMO ENGINEERING — AN ENCORE CONVERGENCE COMPANY

ETE JOB	23-0193
ETE DWG NR.	23-0193-0101

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	30-07-2024	SCB	VT	AL	ISSUED FOR REVIEW
00	03-06-2024	RJS	SCB	AL	ISSUED FOR REVIEW

CROSSWIND — ROSETTI MARINO

TITLE :
HYDROGEN VENT
GENERAL ARRANGEMENT
INCLUDING FOUNDATION LOADS

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK | SCALE 1:36

DRAWN	CHECKED	APPROVED	DATE
RJS	SCB	AL	03/06/24

A1 | DRAWING NO. 1724000887-MAC-DA-00003 | SHEET 001 | REV. 01

File Name : 1724000887-MAC-DA-00003_00

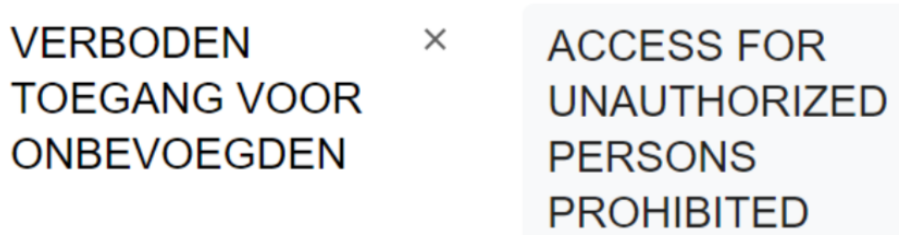
BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	15
Cause:	PVC piping within packages
Consequence:	Potential fragmentation, leading to loss of containment. Post-Meeting Note: (refer to hydrogen)
Safeguards:	Vibration analysis conducted for process systems.
Actions:	Determine material selection philosophy used by vendors.
Assigned Respondent (By)	CROSSWIND
RESPONSE	Refer to Material Selection Report K559-2254-MT-REP-001, from FEED phase, and 123A90-DDL-MAT-RE-60011 rev 01. Also, refer to document Basic Design Engineering Packages, K559-2254-PM-PLN-003.
Attachments:	
Issue Date	

Approvals / Endorsements

Company **Discipline Lead**	**Sign** DocuSigned by: Hamant Patel 899F2B...
Company **HSE Lead**	**Sign**
Company **Project Manager**	**Sign**
Contractor received for information. Not independently verified. Information implemented	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	16
Cause:	Unauthorised access
Consequence:	Damage to facility. Potential danger.
Safeguards:	
Actions:	Clarify measures taken to prevent unauthorised access. Procedures to be developed to ascertain facility condition on arrival.
Assigned Respondent (By)	ROSETTI Project Management
RESPONSE	Warning signs will be placed on the side of the access gate of the platform to prevent unauthorised access. The safety sign will be placed at the entrance of the staircase from the MAP access with followind text both in Dutch and English 
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
C.Giunchi	
EPC HSE Lead	**Sign**
C.Caracciolo	**CC**
EPC Project Manager	**Sign**
D.Lo.Sterzo	
Client	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	17
Cause:	Leakages from pumps
Consequence:	Potential injuries for personnel. Environmental hazards. Possible small localised oil mist/spill.
Safeguards:	Spill tray for pumps.
Actions:	Consider use of seal less pumps to minimise lube/seal oil leakages & maintenance activities.
Assigned Respondent (By)	ROSETTI Mechanical Engineer
RESPONSE	P-50001 A/B - This pump handle sea water which is a not a hazardous liquid, single seal will be used. Shaft line bearings are lubricated by pumped fluid (sea water). Lubrication of thust bearing is made by a constant level oiler, not under pressure. P-50009 A/B - This pump handle fresh water, which is not a hazardous fluid, single seal will be used. Radial sleeve bearing will be lubricated by pumped fluid, thrust bearing lubrication, due to very small dimension of the pump will be done by greased bearings, usually sealed berings grease for life.
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
F.Mura	
EPC HSE Lead	**Sign**
C.Caracciolo	**CC**
EPC Project Manager	**Sign**
D.Lo.Sterzo	
Client	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	18
Cause:	Leakage of lube & seal oil into electrolyser water. (Refer to oxygen leak - Node 2)
Consequence:	Potential hydrocarbon into oxygen rich stream, potential explosion risk.
Safeguards:	
Actions:	Within electrolyser package clarify mitigations in place to prevent leakage of seal oil into oxygen rich streams.
Assigned Respondent (By)	CROSSWIND
RESPONSE	There is no lube/seal oil on the BLPH electrolyser package. hence this recommendations is superceded.
Attachments:	
Issue Date	

Approvals / Endorsements

Company **Discipline Lead**	**Sign**
	Hamant Patel
Company **HSE Lead**	**Sign**
Company **Project Manager**	**Sign**
Contractor received for information. Not independently verified. Information implemented	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	19
Cause:	Sodium hypochlorite is used as a biocide
Consequence:	Hazardous to health (chlorine). Production of hydrogen leading to fomration of explosive atmosphere
Safeguards:	Post-meeting note: (Dosing to be conducted at low sodium hypochlorite concentrations (less than 1% chlorine) (quantities of hydrogen generated are small) (no stored quantities of sodium hypochlorite)
Actions:	Ensure hydrogen produced from chlorination plant is routed to safe location (away from oxygen vent).
Assigned Respondent (By)	CROSSWIND
RESPONSE	During WTP HAZOP has been decided to use biocide instead of chloride; action no longer applicable.
Attachments:	
Issue Date	

Approvals / Endorsements	
Company Discipline Lead	**Sign** DocuSigned by: Hamant Patel 899F2B5FED01487...
Company HSE Lead	**Sign**
Company Project Manager	**Sign**
Contractor received for information. Not independently verified. Information implemented	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	20
Cause:	By-product water from fuel cell
Consequence:	Potential Environmental consequence.
Safeguards:	
Actions:	Fuel cell vendor to confirm quality of by-product water to determine potential for re-use / disposal.
Assigned Respondent (By)	CROSSWIND
RESPONSE	The process water drain goes to the Brine Discharge Caisson. The water is not reused. The water is categorised as DI water “similar to tap water”.
Attachments:	
Issue Date	

Approvals / Endorsements

Compnay **Discipline Lead**	**Sign**
Company **HSE Lead**	**Sign**
Company **Project Manager**	**Sign**
Contractor received for information. Not independently verified. Information implemented	**Sign**

5.0 Water Drainage System

The fuel cell process will produce a max. of 18 L/min of deionized (DI) water at full load. For sizing purposes, it is assumed that all of this DI water condenses and exits through the process water drain. The DI water exiting from the system may be disposed of similar to tap water or reutilized for other purposes if needed by the customer.

The drainage system is internally designed so that it shall not freeze nor block the water flow. The drainage system outlet pipe is guided to the outside of the container, where care must be taken to ensure proper functionality, also during freezing.

Note: This is a bi-directional interface.

Water Drain [19]* (Tag-Nr.: =JB01+DA02-XM01)			
Temperature		**Volume Flow**	
Min.	Max.	Min.	Max.
°C	°C	L/min	L/min
20	70	0	18

Note: Volume flow varies depending on environmental and operating conditions.
Max. value assumes all process water exits through the water drain.

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	21
Cause:	Various chemicals (post-meeting note: sodium hydroxide, nitric acid, sodium hypochlorite)
Consequence:	Personnel injury.
Safeguards:	Chemical Selection to reduce impact on personnel. PPE.
Actions:	Develop strategy for chemical handling (storage basis) & potential use of safety showers on platform.
Assigned Respondent (By)	ROSETTI Technical Safety Engineer
RESPONSE	Due to typology and number of site visit, it has been agreed that personnel will bring the portable eye wash prior each visit to the platform. No fixed safety shower neither eye was are deemed necessary.
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
E.Carminati	
EPC HSE Lead	**Sign**
C.Caracciolo	**CC**
EPC Project Manager	**Sign**
D.Lo.Sterzo	
Client	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZID Study Actions** K559-2254-SE-REP-001
Item No.	22
Cause:	Growth of legionella, due to decrewed platform philosophy
Consequence:	Adverse impact to operators
Safeguards:	
Actions:	Study work to be conducted to determine potential for legionella on platform & mitigation measures to be adopted.
Assigned Respondent (By)	ROSETTI Technical Safety Engineer
RESPONSE	Study work shall not be conducted as the hazard will not be present in case there are no fixed eye wash nor safety shower.
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
C. Caracciolo	
EPC HSE Lead	**Sign**
C. Caracciolo	
EPC Project Manager	**Sign**
D. Lo Sterzo	
Client	**Sign**

BLPH SHEAMS SIGNATURE FORM

Action Title:	**HAZID Study Actions**
Ref. Doc.	K559-2254-SE-REP-001
Item No.	23
Cause:	Lack of welfare facilities for personnel
Consequence:	Adverse health/ mental impact on personnel.
Safeguards:	HRA design developed as part of FEED.
Actions:	Crosswind Health risk assessment to be conducted.
Assigned Respondent (By)	CROSSWIND
RESPONSE	Crosswind Innovations project register include the health element. CTV will be the main welfare facilities whilst personnel being offshore, similar to the current situation for the wind farm BoP contractors. Subcontractors could define additional measures as part of their own task risk assessments
Attachments:	
Issue Date	

Approvals / Endorsements

Company **Discipline Lead**	**Sign**
N LE BRUN	26-09-2024 LE BRUN
Company **HSE Lead**	**Sign**
Company **Project Manager**	**Sign**
Contractor received for information. Not independently verified. Information implemented	**Sign**

CROSSWIND ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action N : 02	**Rev.:** 001
Action Title: HAZID Study	**Date:** 05/10/2023
Reference Document n:	
Node: 1-Electrical System	
Hazard/Parameter: Hydrogen	**Deviation Low oxygen atmospheres**
Cause: Potential operations of firefighting system within instrument cabinet or BESS	
Consequence: Asphyxiation of personne	
Safeguards: Operation & Maintenance (O&M) Procedure. Manual selector to inhibit release when people are inside. Inergen is not considered asphyxiant based on concentration	
Recommendation: Verify with the BESS supplier the type of fire suppression system and update HER if required	
Responsible Part: CROSSWIND	
Response:	

The only active (chemical) suppression in the BESS system are the Stat-x cartridges. They are located inside the battery cabinets inside the 2 BESS containers. In the HAZID this scenario is considered a 4C with potential to harm personnel in the container during activation of the fire suppression system leading to asphyxiation. Due to local release of the fire suppression in the BESS cabinets, it will not remove oxygen from the container causing asphyxiation. According to MSDS the release of Stat-x may cause temporary, mild irritation of mucous membranes if inhaled (H335). Additionally, it may cause skin and eye irritation (H315/319). It is not highly toxic and therefore, Ranking can be reduced to a 3C in HAZID.

Ref. Docs / Dwgs.:
123A90-DDL-EL-DG-20015; 123A90-DDL-PP-DS-70070;123A90-DDL-PR-DG-80003; 123A90-DDL-PR-DG-80004;123A90-DDL-PR-DG-80005;123A90-DDL-PR-DG-80006; 123A90-DDL-PR-DG-80007; 123A90-DDLPR-DG-80008

RESPONSE ACCEPTANCE

Company Discipline Leader:	**Signature:** *Alessandro Sutto*	**Date:** 01/10/2024
Company HSE Leader:	**Signature:** Paul van Rossum Digitaal ondertekend door Paul van Rossum Datum: 2024.10.01 12:55:29 +02'00'	**Date:**
Company Project Manager:	**Signature:** Dominik Sznajder Digitally signed by Dominik Sznajder Date: 2024.10.02 08:20:12 +02'00'	**Date:**
Contractor received for information. Not independently verified. Information Implemented :	**Signature:**	**Date:**

CROSSWIND ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action N : 03	**Rev.:** 001
Action Title: HAZID Study	**Date:** 05/10/2023
Reference Document n:	
Node: 1-Electrical System	
Hazard/Parameter: Hydrogen	**Deviation Cadmium compounds and other**
Cause: Leakage from UPS	
Consequence: Potential for personnel injury if exposed	
Safeguards: Operation & Maintenance (O&M) Procedure. Manual selector to inhibit release when people are inside. Inergen is not considered asphyxiant based on concentration	
Recommendation: Check the risk ranking based on Company Health SME and update the HER if required	
Responsible Part: CROSSWIND	
Response: Internal HSE Risk register has been checked , CW comfirm the exposure risk to UPS battery counpond is to be considered not applicable.	
Ref. Docs / Dwgs.: 123A90-DDL-EL-DG-20015; 123A90-DDL-PP-DS-70070;123A90-DDL-PR-DG-80003; 123A90-DDL-PR-DG-80004;123A90-DDL-PR-DG-80005;123A90-DDL-PR-DG-80006; 123A90-DDL-PR-DG-80007; 123A90-DDLPR-DG-80008	

RESPONSE ACCEPTANCE

Company Discipline Leader: Le Brun N. **Signature:** LE BRUN **Date:** 25-09-2024

Company HSE Leader: **Signature:** Paul van Rossum Digitaal ondertekend door Paul van Rossum Datum: 2024.10.01 10:24:53 +02'00' **Date:**

Company Project Manager: **Signature:** Dominik Sznajder Digitally signed by Dominik Sznajder Date: 2024.10.02 08:22:23 +02'00' **Date:**

Contractor received for information. Not independently verified. Information Implemented : **Signature:** **Date:**

CROSSWIND ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action N : 04	**Rev.:** 001
Action Title: HAZID Study	**Date:** 05/10/2023
Reference Document n:	
Node: 1-Electrical System	
Hazard/Parameter: Cadmium compounds and other heavy metals	**Deviation**
Cause: Leakage from UPS	
Consequence: Potential for personnel injury if exposed	
Safeguards: Operation & Maintenance (O&M) Procedure. Manual selector to inhibit release when people are inside. Inergen is not considered asphyxiant based on concentration	
Recommendation: Evaluate the possibility to use portable eye wash and shower	
Responsible Part: ROSETTI Technical Safety	
Response: Due to typology and number of site visit (scheduled inly twice a year), it has been decided that personnel will bring the portable eye wash prior each visit to the platform.	
Ref. Docs / Dwgs.: 123A90-DDL-EL-DG-20015; 123A90-DDL-PP-DS-70070;123A90-DDL-PR-DG-80003; 123A90-DDL-PR-DG-80004;123A90-DDL-PR-DG-80005;123A90-DDL-PR-DG-80006; 123A90-DDL-PR-DG-80007; 123A90-DDLPR-DG-80008	

RESPONSE ACCEPTANCE

Discipline Leader: Edoardo Carminati	**Signature:**	**Date: 05/08/2024**
HSE Leader: Carolina Caracciolo	**Signature: CC**	**Date: 05/08/2024**
Project Engineering Manager: Davide Lo Sterzo	**Signature:**	**Date: 05/08/2024**
Company:	**Signature:** Digitaal ondertekend door Paul van Rossum Datum: 2024.08.21	**Date:**

CROSSWIND ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action N : 06	**Rev.:** 001
Action Title: HAZID Study	**Date:** 05/10/2023
Reference Document n:	
Node: 2-Hydrogen System	
Hazard/Parameter: Hydrogen	**Deviation Hydrogen**
Cause: Venting of hydrogen when flying object is operating in the wind farm	
Consequence: Potential ignition of the vent Increased turbolence and potential for flying object crash (Risk not ranked because it is a Crosswind general hazard instead of a BLPH specific one)	
Safeguards: Vent dispersion and radiation study (to indicate the area affected by dispersion of fire)	
Recommendation: Ensure a no-fly zone is established around the facilities if required	
Responsible Part: CROSSWIND	
Response: Exclusion zone around BLPH will be implemented offshore by the Marine coordination, similar to the wind farm. Same altitude flight restriction for helicopter flying above the Crosswind wind turbine will apply for the BLPH. Hydrogen hazard with with the presence of the BLPH offshore has been reported to the Dutch Aviation Authorities , including BLPH exact GPS coordinates. Aviation Authorities will implement specific H2 warning mark on the aviation map prior the start of the offshore commissioning.	
Ref. Docs / Dwgs.	

RESPONSE ACCEPTANCE

Company Discipline Leader: N LE BRUN	**Signature:** LE BRUN	**Date:** 26/09/2024
Company HSE Leader:	**Signature:** Paul van Rossum — Digitaal ondertekend door Paul van Rossum Datum: 2024.10.01 10:25:25 +02'00'	**Date:**
Company Project Manager:	**Signature:** Dominik Sznajder — Digitally signed by Dominik Sznajder Date: 2024.10.02 08:23:21 +02'00'	**Date:**
Contractor received for information. Not independently verified. Information Implemented :	**Signature:**	**Date:**

CROSSWIND | ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action N : 07	**Rev.:** 001
Action Title: HAZID Study	**Date:** 05/10/2023
Reference Document n:	
Node: 2-Hydrogen System	
Hazard/Parameter: Excessive N2	**Deviation Excessive N2**
Cause: Leakage of nitrogen within electrolyzer container	
Consequence: Fatality	
Safeguards: Forced ventilation inside container. Operating and maintenance procedure	
Recommendation: Verify that electrolyzer container is not considered a confined space	
Responsible Part: CROSSWIND	
Response: Crosswind has received written confirmation from Elogen that the electrolyser process container will be classified as confined space area.	
Ref. Docs / Dwgs.	

RESPONSE ACCEPTANCE

Company Discipline Leader: N LE BRUN	**Signature:** LE BRUN		**Date:** 26-09-2024
Company HSE Leader:	**Signature:** Paul van Rossum	Digitaal ondertekend door Paul van Rossum Datum: 2024.10.01 10:25:49 +02'00'	**Date:**
Company Project Manager:	**Signature:** Dominik Sznajder	Digitally signed by Dominik Sznajder Date: 2024.10.02 08:23:56 +02'00'	**Date:**
Contractor received for information. Not independently verified. Information Implemented :	**Signature:**		**Date:**

CROSSWIND ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action N : 8	**Rev.:** 001
Action Title: HAZID Study	**Date:** 05/10/2023
Reference Document n:	
Node:3- Water&Utilities	
Hazard/Parameter: Bottled gases under pressure	**Deviation**
Cause: Potential dropped objects on nitrogen bottle	
Consequence: Potential for rupture causing missiles potentially leading to fatality	
Safeguards: Bottles to be stored in secure area. Material handling philosophy. Lifting & Dropped object plan. Nitrogen distribution network to minimise handling of bottles.	
Recommendation: Establish requirements for nitrogen bottle on the platform. Update HER if required	
Responsible Part: ROSETTI Technical Safety	
Response: No nitrogen bottle is present on the platform, thus the cause is eliminated.	
Ref. Docs / Dwgs.: 123A90-DDL-EL-DG-20015; 123A90-DDL-PP-DS-70070;123A90-DDL-PR-DG-80003; 123A90-DDL-PR-DG-80004;123A90-DDL-PR-DG-80005;123A90-DDL-PR-DG-80006; 123A90-DDL-PR-DG-80007; 123A90-DDLPR-	

RESPONSE ACCEPTANCE

Discipline Leader: Edoardo Carminati	**Signature:**	**Date: 05/08/2024**
HSE Leader: Carolina Caracciolo	**Signature:** CC	**Date: 05/08/2024**
Project Engineering Manager: Davide Lo Sterzo	**Signature:**	**Date: 05/08/2024**
Company:	**Signature:** Digitaal ondertekend door Paul van Rossum Datum: 2024.08.21 08:26:11 +02'00'	**Date:**

CROSSWIND ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action N : 9	**Rev.:** 001
Action Title: HAZID Study	**Date:** 05/10/2023
Reference Document n:	
Node:3- Water&Utilities	
Hazard/Parameter: Ultraviolet radiation	**Deviation**
Cause: UV radiation from water filter	
Consequence: No significant consequence	
Safeguards:	
Recommendation: Vendor to confirm that UV radiation is safe	
Responsible Part: ROSETTI Mechanical Engineer	

Response:

PSC confirm that the UV lamp is installed inside a close stainless-steel cylindrical chamber. For this reason, since the lamp is isolated from the ambient (not visible and reachable), there is no risk associated to the field operator

Please see GENERAL ARRANGEMENT - UV PACKAGE AND DATA SHEET / Document Number: 1724000448-MAC-DA-00011

Ref. Docs / Dwgs.:
123A90-DDL-EL-DG-20015; 123A90-DDL-PP-DS-70070;123A90-DDL-PR-DG-80003; 123A90-DDL-PR-DG-80004;123A90-DDL-PR-DG-80005;123A90-DDL-PR-DG-80006; 123A90-DDL-PR-DG-80007; 123A90-DDLPR-

RESPONSE ACCEPTANCE

Discipline Leader: F. Mura	**Signature:**		**Date:**	**02/08/2024**
HSE Leader: Carolina Caracciolo	**Signature:**	**CC**	**Date:**	**30/08/2024**
Project Engineering Manager: Davide Lo Sterzo	**Signature:**		**Date:**	**30/08/2024**
Company:	**Signature:**	Digitaal ondertekend door Paul van Rossum Datum: 2024.09.03 15:59:32 +02'00'	**Date:**	

Base Load Power Hub (BLPH)

GENERAL ARRANGEMENT - UV PACKAGE AND DATA SHEET

Document Number: 1724000448-MAC-DA-00011

Document Class: 3

02	30/08/2024	Issue for Information (IFI)	WR	RM	RM
01	22/07/2024	Issue for Information (IFI)	WR	RM	RM
00	05/06/2024	Issue for Information (IFI)	ED	RM	RM
Rev.	Date	Description	Prepared	Reviewed	Approved

PSC

Reference: DOC No. PK2885-P-008

This document undergoes an issuance cycle within EDMS "Fusionlive".
File: 1724000448-MAC-DA-00011_Rev.02_GENRAL ARRANGEMENT - UV PACKAGE AND DATA SHEET. Any document printed shall be considered as "NOT CONTROLLED" copy

Table of Contents

SH.	DESCRIPTION	REVISIONS							
		00	01	02					
1	Cover	X	X	X					
2	Table of Contents	X	X	X					
3	Revision / Change Log	X	X	X					
4	Drawing	X	X	X					
5	Datasheet	X	X	X					

This document undergoes an issuance cycle within EDMS "Fusionlive".
Content of this document is strictly confidential. Any hard copy once printed shall be considered as "NOT CONTROLLED" copy

Revision / Change Log

Rev.	Description
00	ISSUE FOR INFORMATION(IFI)
01	ISSUE FOR INFORMATION(IFI)
02	ISSUE FOR INFORMATION(IFI)

HOLDS LIST

No.	Description
1.	
2.	
3.	
4.	

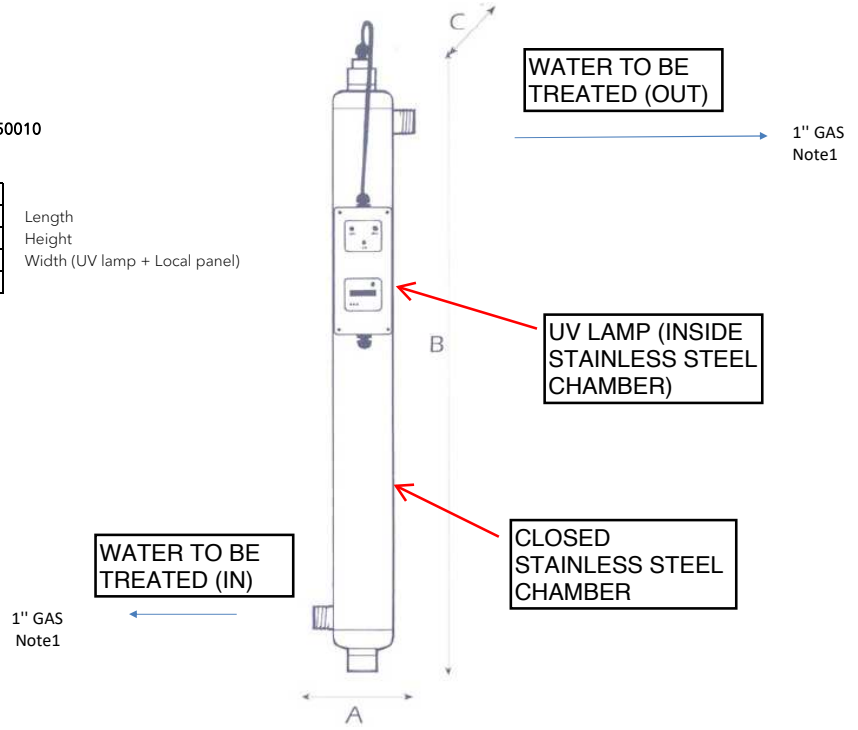
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Supplier: NOBEL

Models:1S

TAG= S-50010

	Dimens.	
A	150	Length
B	930	Height
C	160	Width (UV lamp + Local panel)



Note 1: Process connection threaded 1" Gas (Male)

REFERENCE DOCUMENTS	
1724000448-MAC-DA-00005	GENERAL ARRANGEMENT DRAWINGS AND FOUNDATIONS LAODING CALCULATIONS
1724000448-PR-PID-00013	WATER TREATMENT PACKAGE-P&I DIAGRAM

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Electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

UV PACKAGE DATA SHEET

SPECIFICA PER LAMPADA UV

	PLANT: Impianto: Water treatment package	**CUSTOMER:** Cliente: Rosetti Marino S.p.A	**Page: 5/5**
	LOCATION: Località: HOLLANDSE KUST NOORD	**JOB:** Commessa: PK2885	**ITEM:** Sigla: S-50010
DEPARTMENT : Reparto	**P&I :** 172400448-PR-PID-00013	**MFR:** Costruttore: Nobel	**DOC.Nr.** Doc. Nr.: PK2885-M-001

1	SERVICE OF UNIT / Servizio: **UV STERILIZER**			No. OF UNITS / No. di unità: **1**
2	FLUID HANDLED / Fluido trattato:			**Fresh Water (TDS 350ppm)**
3	FLOW RATE / Portata:	OPERATING INLET	m^3/h	**0,8**
4	OPERATING / DESIGN PRESSURE / Pressione di esercizio /progetto		barg	**5 / 8**
5	OPERATING TEMPERATURE / Temperatura di esercizio:		°C	**10 / 20.2**
6	FLUID DENSITY/ Densità:		kg/m^3	**1000**
7	FLUID VISCOSITY / Viscosità:		mPa sec	**1,00**
8	DESIGN TEMPERATURE / Temperatura di progetto:		°C	**50**
9	UV STERILIZER DIMENSIONS		mm	**Please refer to sheet 4**
10	UV STERILIZER WEIGHT		kg	**15 (50 full)**
11	VESSELMATERIAL			**AISI 316**
12	LAMP / FLUID SEPARATORS			**Quartz Sleeves**
13	LIGHT SPECTRUM		Nm	**254**
14	CORROSION ALLOWANCE / Sovraspessore di corrosione:		mm	**-**
15	CONNECTIONS / Connessioni	IN /OUT		**1" GAS Male**
16		DRAIN / Scarico:		**1" GAS Male**
17		VENT / Sfiato:		**N.A.**
18	POWER SUPPLY		W	**40**
19	THERMAL INSULATION TYPE / Tipo isolamento: **N.A.**	THICKNESS / Spessore:	mm	**N.A.**
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38	**REMARKS**			
39				
40				
41				

REV. Rev.	DATE Data	DESCRIPTION Descrizione	PREPARED Compilato da	CHECKED Controllato da	APPR. BY Approvato da
2	30/08/2024	Issued for Information	WR	RM	RM
1	22/07/2024	Issued for Information	IT	WR	RM
0	24/06/2024	Issued for Information	IT	WR	RM

CROSSWIND ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action N : 10	**Rev.:** 001
Action Title: HAZID Study	**Date:** 05/10/2023
Reference Document n:	
Node:3- Water&Utilities	
Hazard/Parameter: Chlorine	**Deviation**
Cause: Production of hydrogen from the electrolysis process	
Consequence: Production of hydrogen leading to formation of explosive atmosphere	
Safeguards:	
Recommendation: Verify with Vendor the amount of hydrogen produced by electroclorination package. Update the risk ranking and HER based on the outcome of this verification	
Responsible Part: ROSETTI Technical Safety	
Response: The current configuration of the package features a biocide injection, instead of electroclorination package. Biocide injection does not produce hydrogen. Hence the risk ranking and HER necessity no update. This solution has been shared with Crosswind as describe in vendor offers and TBE reviewed by Crosswind	
Ref. Docs / Dwgs.: 123A90-DDL-EL-DG-20015; 123A90-DDL-PP-DS-70070;123A90-DDL-PR-DG-80003; 123A90-DDL-PR-DG-80004;123A90-DDL-PR-DG-80005;123A90-DDL-PR-DG-80006; 123A90-DDL-PR-DG-80007; 123A90-DDLPR-	

RESPONSE ACCEPTANCE

Discipline Leader:	**Signature:**	**Date: 20-08-2024**
HSE Leader: Carolina Caracciolo	**Signature:** CC	**Date: 23/02/2024**
Project Engineering Manager: Davide Lo Sterzo	**Signature:**	**Date: 23/02/2024**
Company:	**Signature:** Paul van Rossum Digitaal ondertekend door Paul van Rossum Datum: 2024.10.01 14:03:47 +02'00'	**Date:**

47	**ELECTRO-CHLORINATOR**			**REPLACED WITH NON OXIDIZING BIOCIDE DOSING UNIT** **Detail below according to the proposed solution**	OFFER/TQ

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CROSSWIND

VENDOR IS ALLOWED TO INSERT ADDITIONAL ROWS TO BETTER DETAIL THE DESCRIPTION OF SUPPLY, BY USING **RED COLORAND BOLD CHARACTER**

HOLLANDSE KUST NOORD WIND PARK Project

Discipline: **MEC** | System & Sub-sys:

Document Type: | Equipment Type: **Water Treatment Package** | **Attachment to TBE 123A90-DDL-MAC-TBE-50024**

POS.	DESCRIPTION	UNIT	REQUIREMENT	Bidder: Offer no. Revised offer: **PSC** OF6739 Rev.03 BIDDER DATA	CLARIFIED WITHIN
48	Quantity		1	**Confirmed**	OFFER/TQ
49	Media to be treated		Sea Water form Coarse filter	**Confirmed**	OFFER/TQ
50	~~**Brine Supply Flow (Design)**~~	m^3/h	**6**	**100 Lt tank (with mixer)**	OFFER/TQ
51	~~**Brine Supply Pressure**~~	barg	**8,5**	**Tank Material :PP or PE**	OFFER/TQ
52	~~**Brine Supply Temperature**~~	°C	~~**1,3 ÷ 22,6**~~	**Tank des : Full liquid**	OFFER/TQ
53	~~**Clorine Capacity**~~	g/h	**VTA**	**Biocide pumps : dosing type, manual control (10÷100%)**	OFFER/TQ
54	~~**Hypoclorite Concentration**~~	mg/l	**VTA**	**2x100% dosing pump to sea water caisson**	OFFER/TQ
55	~~**Sea Water Flowrate Inlet**~~	m^3/h	**VTA**	**2x100% to inlet of WT Package**	OFFER/TQ
56	~~**Design Pressure**~~	barg	**VTA**	**2x100% dosing pump to waste water tank**	OFFER/TQ
57	~~**Electrodes Material**~~		~~**Suitable for Sea Water**~~	**Pumps Material: membrane PTFE**	OFFER/TQ
58	~~**Electolyzer absorbed power**~~	W	**VTA**	**Not applicable**	OFFER/TQ
59	Power Supply Required	V/Ph/Hz	VTA	**0,37 kW- 400/3/50**	OFFER/TQ

CROSSWIND ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action N : 11	**Rev.:** 001
Action Title: HAZID Study	**Date:** 05/10/2023
Reference Document n:	
Node:3- Water&Utilities	
Hazard/Parameter: Scale inhibitors	**Deviation**
Cause: Leakage from stored chemicals (e.g. nitric acid / acetic acid etc)	
Consequence: Potential Environmental consequence and personnel injury	
Safeguards: Bund's provided where required to contain leakages from storage tanks. Chemical selection to minimise environmental impact.	
Recommendation: Clarify type of chemical used as scale inhibitor and update HER afterwards, if required	
Responsible Part: ROSETTI Technical Safety	

Response:

The chemicals used in the WTP A-50000 are the following:

Biocide → EB-Biocide Plus (Everblue SRL). The product is classified as hazardous pursuant to the provisions set forth in (EC) Regulation 1272/2008 (CLP). For safety operation please refer to applicable Safety datasheet in order to manage safety and correctly the chemical. The tank material is compatible with the chemical used to avoid leakage problem due to tank corrosion. This substance has to be considered as 4B risk ranking categorization on people (see below extract from MSDS)

- Antiscalant → EVERBLUE 600 (Everblue SRL).. The product does not contain substances classified as being hazardous to human health or the environment pursuant to the provisions Regulation (EC) 1272/2008 (CLP) (and subsequent amendments and supplements) in such quantities as to require the statement. No need to update the HER (see below extract from MSDS)

For safety operation please refer to applicable Safety datasheet. The tank material is compatible with the chemical used to avoid leakage problem due to tank corrosion.

Caustic Soda (2% solution): the product is classified as hazardous. For the water treatment package, Caustic soda 20% shall be diluted with demineralised water on shore to obtain a Caustic soda solution 2%, then will be transported off-shore. 1B risk ranking categorization on people is considered, according with MSDS, for this substance (see below extract from MSDS)

On shore the operator shall follow the safety product datasheet during the dilution operation.

Ref. Docs / Dwgs.:
123A90-DDL-EL-DG-20015; 123A90-DDL-PP-DS-70070;123A90-DDL-PR-DG-80003; 123A90-DDL-PR-DG-80004;123A90-DDL-PR-DG-80005;123A90-DDL-PR-DG-80006; 123A90-DDL-PR-DG-80007; 123A90-DDLPR-DG-80008

RESPONSE ACCEPTANCE

Discipline Leader: Edoardo Carminati	**Signature:**	**Date:30/08/2024**
HSE Leader: Carolina Caracciolo	**Signature:** CC	**Date: 30/08/2024**
Project Engineering Manager: Davide Lo Sterzo	**Signature:**	**Date: 30/08/2024**
Company: Nicolas Le Brun	**Signature:** LE BRUN Signer ID: 5VSEXLUIBO...	**Date:** 04/09/2024

EVERBLUE EB-BIOCIDE PLUS MSDS:

Any additional information concerning the risks for health and/or the environment are given in sections 11 and 12 of this sheet.

Hazard classification and indication:

Acute toxicity, category 4	H302	Harmful if swallowed.
Acute toxicity, category 4	H332	Harmful if inhaled.
Specific target organ toxicity - repeated exposure, category 1	H372	Causes damage to organs through prolonged or repeated exposure.
Serious eye damage, category 1	H318	Causes serious eye damage.
Skin irritation, category 2	H315	Causes skin irritation.
Skin sensitization, category 1	H317	May cause an allergic skin reaction.
Hazardous to the aquatic environment, chronic toxicity, category 2	H411	Toxic to aquatic life with long lasting effects.

EVERBLUE 600 MSDS:

Information Sheet outside the scope of application of art. 31 of REACH Regulation

SECTION 1. Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name **EVERBLUE 600**

1.2. Relevant identified uses of the substance or mixture and uses advised against

Intended use **Antiscalant for membranes**

Identified Uses	Industrial	Professional	Consumer
Additive for industrial water treatment	✔	-	-

Uses Advised Against

Any use not included among those recommended

1.3 Details of the supplier of the safety data sheet

Name	**EVERBLUE SRL**
Full address	**Via Alberto Zanrè, 16**
District and Country	**43051 - Loc. Gotra - Albareto (PR)** **Italia**
	tel. 0039 0525 1920100
Produced for Everblue S.r.l. by:	**N. 408994 REA di Bologna**
e-mail address of the competent person responsible for the Safety Data Sheet	**info@everblue.it**
Resp. for placing on the market:	**EVERBLUE SRL**

1.4. Emergency telephone number

For urgent inquiries refer to

Italia:
CAV Ospedale Niguarda Ca' Granda - Milano 02 66101029
CAV Azienda Ospedaliera Papa Giovanni XXII - Bergamo 800 883300
CAV Centro Nazionale di Informazione Tossicologica - Pavia 0382 24444
CAV Az. Osp. Careggi - Firenze 055 7947819
CAV Policlinico Gemelli - Roma 06 3054343
CAV Policlinico Umberto I - Roma 06 49978000
CAV Osp. Pediatrico Bambino Gesù - Roma 06 68593726
CAV Az. Osp. Cardarelli - Napoli 081 7472870
CAV Az. Osp. Univ. Foggia - Foggia 800183459

SECTION 2. Hazards identification

2.1. Classification of the substance or mixture

The product is not classified as hazardous pursuant to the provisions set forth in EC Regulation 1272/2008 (CLP) (and subsequent amendments and supplements).

CAUSTIC SODA 20%:

CAUSTIC SODA 20% SOLUTION
Safety Data Sheet

1. MATERIAL AND SUPPLY COMPANY IDENTIFICATION

Product name: CAUSTIC SODA 20% SOLUTION

Synonyms
Sodium Hydroxide 20%

Product Code
399

Recommended use: Cleaner and degreaser.

Supplier Name	**CLEAN PLUS CHEMICALS PTY LTD**
Address	16 George Young Street AUBURN NSW 2144
Telephone	02 9738 7444
Emergency	1800 201 700
Email	customerservice@cleanplus.com.au
Web Site	www.cleanplus.com.au
SDS Date	21 JANUARY 2021 Version 1.2

2. HAZARDS IDENTIFICATION

This material is hazardous according to health criteria of Safe Work Australia.



Signal Word
Danger

Hazard Classifications
Corrosive to Metals - Category 1
Skin Corrosion/Irritation - Category 1A
Serious Eye Damage/Irritation - Category 1

ITEM NO.	HAZARD	THREAT	CONSEQUENCE	SAFEGUARDS	RISK RANKING C-CONSEQUENCE; L-LIKELIHOOD; R-RISK												RECOMMENDATION	OWNER	PROJECT PHASE	COMMENTS
					People				Assets			Community		Environment						
H-20.10	HF	N/A																		
TOXIC LIQUID																				
H-21.01	Mercury	N/A																		
H-21.02	PCBs	N/A																		
H-21.03	Biocides	Refer to H20.05 (Chlorine)																		
H-21.04	Methanol	N/A																		
H-21.05	Brines	Refer to General Node																		
H-21.06	Glycols	N/A																		
H-21.07	Degreasers	N/A																		
H-21.08	Isocyanates	N/A																		
H-21.09	Sulphanol	N/A																		
H-21.10	Amines	N/A																		
H-21.11	Corrosion inhibitors	N/A																		
H-21.12	Scale inhibitors	Leakage from stored chemicals *(e.g. nitric acid / acetic acid etc)*	Potential Environmental consequence and personnel injury	Bund's provided where required to contain leakages from storage tanks. Chemical selection to minimise environmental impact.	4		B	4B						1	B	1B	Clarify type of chemical used as scale inhibitor and update HER afterwards, if required	Contractor		

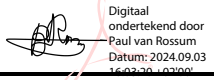
CROSSWIND ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action N : 12	**Rev.:** 001
Action Title: HAZID Study	**Date:** 05/10/2023
Reference Document n:	
Node:3- Water&Utilities	
Hazard/Parameter: Chemicals for Cleaning RO Membrane	**Deviation**
Cause: Leak of Various chemicals (sodium hydroxide, nitric acid, sodium hypochlorite)	
Consequence: Personnel injury.	
Safeguards: Chemical Selection to reduce impact on personnel. Personnel Protective equipment (PPE). Emergency Response Plan (ERP).	
Recommendation: Clarify type of chemical used for cleaning RO membrane and update the HER	
Responsible Part: ROSETTI Technical Safety	
Response: CIP vessel has been replaced with the complete supply of the membranes needed by the process for the 2 years operation. Membranes will be replaced every 6 months. No chemical will be used for the cleaning of RO membrane. No need to update the HER.	
Ref. Docs / Dwgs.: 123A90-DDL-EL-DG-20015; 123A90-DDL-PP-DS-70070;123A90-DDL-PR-DG-80003; 123A90-DDL-PR-DG-80004;123A90-DDL-PR-DG-80005;123A90-DDL-PR-DG-80006; 123A90-DDL-PR-DG-80007; 123A90-DDLPR-	

RESPONSE ACCEPTANCE

Discipline Leader: Edoardo Carminati	**Signature:** 	**Date: 20/08/2024**
HSE Leader: Carolina Caracciolo	**Signature:** CC	**Date: 20/08/2024**
Project Engineering Manager: Davide Lo Sterzo	**Signature:** 	**Date: 20/08/2024**
Company:	**Signature:**  Digitaal ondertekend door Paul van Rossum Datum: 2024.09.03 16:03:30 +02'00'	**Date:**

CROSSWIND ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action N : 13	**Rev.:** 001
Action Title: HAZID Study	**Date:** 05/10/2023
Reference Document n:	
Node:3- Water&Utilities	
Hazard/Parameter: Small animals	**Deviation**
Cause: Marine growth or small marine faune	
Consequence: Blockage of sea water intake systems. Impact to process. Potential for fish decomposing and health effect to personnel (scenario not ranked as not sufficient information are available)	
Safeguards: Sea water filtration & chemical dosing systems. Screen on the suction side of pumps. Backwash filter cleaning.	
Recommendation: Verify with Sea Water Treatment System Vendor if it is possible to have fish trapped and decomposing in the package	
Responsible Part: ROSETTI Mechanical	
Response: The feed water is delivered by P-50001 A/B out of WTP vendor scope. The pump has been purchased by RM. Pump feature a suction screen 7 mm mesh size, to avoid entry of foreign objects that could clog the pump. Pump internals, and caisson are injected with biocide to avoid presence of microorganisms, muscles spores, algae's, and very small fishes. According with Vendor, tighter mesh is not possible, because affect suction of the pump.	
Ref. Docs / Dwgs.: 123A90-DDL-EL-DG-20015; 123A90-DDL-PP-DS-70070;123A90-DDL-PR-DG-80003; 123A90-DDL-PR-DG-80004;123A90-DDL-PR-DG-80005;123A90-DDL-PR-DG-80006; 123A90-DDL-PR-DG-80007; 123A90-DDLPR-	

RESPONSE ACCEPTANCE

Discipline Leader:	**Signature:**		**Date:20-08-2024**
HSE Leader: Carolina Caracciolo	**Signature:**	**CC**	**Date: 20-08-2024**
Project Engineering Manager: Davide Lo Sterzo	**Signature:**		**Date: 20-08-2024**
Company:	**Signature:**	Digitaal ondertekend door Paul van Rossum Datum: 2024.08.23 14:08:26 +02'00'	**Date:**

Base Load Power Hub (BLPH)

PUMP DATA SHEETS INCLUDING WEIGHT DATA SHEET
For Sea Water Lift Progressive Cavity Pumps (P-50001 A/B)

Document Number: 1724000936-MAC-DS-00012

Document Class: 2

01	18/07/2024	Accepted for Construction (AFC)	APD	GLL	AHN
00	24/06/2024	Issue for Review (IFR)	APD	GLL	AHN
Rev.	Date	Description	Prepared	Reviewed	Approved

PCM | keep it moving

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Revision / Change Log

Rev.	Description
00	Issue for Review (IFR)
01	Accepted for Construction (AFC)

HOLDS LIST

No.	Description
1	
2	
3	
4	

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CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
Document Title:	PUMP DATA SHEETS	Sh. 3 of 7 Date : 18/07/2024 Rev. 01

NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER ☐ BY MANUFACTURER

GENERAL

NO. MOTORS DRIVEN	2 (TWO)	OTHER DRIVER TYPE			
PUMP ITEM NO'S	P-5001A/B	PUMP ITEM NO'S			
MOTOR ITEM NO'S	PM-5001A/B	DRIVER ITEM NO'S		GEAR ITEM NO'S	
MOTOR PROVIDED BY	ABB	DRIVER PROVIDED BY	N/A	GEAR PROVIDED BY	NORD
MOTOR MOUNTED BY	PUMP VENDOR	DRIVER MOUNTED BY	N/A	GEAR MOUNTED BY	PUMP VENDOR
MOTOR DATA SHEET NO.	1724000936-MAC-DS-00014	DRIVER DATA SHEET NO.		GEAR DATA SHEET NO.	

● OPERATING CONDITIONS

- ● CAPACITY @ PT (m³/h):
  - @ MAXIMUM VISCOSITY _____ @ MIN. VISCOSITY **2,5**
- ● DISCHARGE PRESSURE (kPa)(BARG):
  - MAXIMUM **5.3 (note 3)** MINIMUM _____
- ● SUCTION PRESSURE (kPa)(BARG):
  - MAXIMUM _____ MINIMUM **Flooded (note 1)**
- ● DIFFERENTIAL PRESSURE (kPa)(BARG)
  - MAXIMUM _____ MINIMUM **(note 3)**
- ● NPSH AVAILABLE (m) **>7 @ level +0,00 (note 1)**
- ○ HYDRAULIC kW _____

PSV Set Value : 7.6 barg

● LIQUID

- ● TYPE OR NAME OF LIQUID **SEA WATER**
- ● PUMPING TEMPERATURE (°C):
  - NORMAL **20** MAX _____ MIN **1,3**
- ● SPECIFIC GRAVITY **1,03** MAXIMUM **1,02** MINIMUM
- ○ SPECIFIC HEAT _____ Cp (kJ/kg °C)
- ● VISCOSITY (Cp) **0,9** MINIMUM _____ MAXIMUM
- ● CORROSIVE/EROSIVE AGENTS **SAND/SALT PARTICLES**
- ● CHLORIDE CONCENTRATION (PPM) max 35,000 ppm
- ○ H_2S CONCENTRATION (PPM) _____

LIQUID ○ TOXIC ○ FLAMMABLE ○ OTHER _____

Fluid considered with no H2S / C02 / BTEX and TSS < 5%

■ PERFORMANCE

- ■ RATED CAPACITY (m³/h) **2,5**
- ■ NPSH REQUIRED (m) **0.56 mH2O**
- ■ RATED SPEED (RPM) **118**
- ■ DISPLACEMENT (m³/h) **3,3**
- ■ VOLUMETRIC EFFICIENCY (%) **81,6**
- ■ MECHANICAL EFFICIENCY (%) **56,7**
- ■ kW @ MAXIMUM VISCOSITY **1,45**
- ■ kW @ RELIEF VALVE SETTING **1,55**
- ■ MAXIMUM ALLOWABLE SPEED (RPM) **450**
- ■ MINIMUM ALLOWABLE SPEED (RPM) **100**

■ CONSTRUCTION

	SIZE	ANSI RATING	FACING	POSITION
CONNECTIONS				
SUCTION				**BOTTOM**
DISCHARGE	**1" 1/2**	**150#**	**RF**	**SIDE**
MOUNTING	**16"**	**150#**	**RF**	
DRAINS				
VENTS				
JACKET				

PUMP TYPE:

☐ INTRN'L GEAR ☐ TWIN-SCREW ☐ VANE
☐ EXTRN'L GEAR ☐ 3-SCREW ■ PROGRESSING CAVITY

GEAR TYPE

☐ SPUR ■ HELICAL
☐ OTHER _____

● SITE AND UTILITY DATA

LOCATION ○ INDOOR ● OUTDOOR
○ HEATED ● UNHEATED ○ UNDER ROOF
○ ELECTRICAL AREA CLASS SAFE GROUP _____ DIV _____
○ WINTERIZATION REQD ○ TROPICALIZATION REQD

SITE DATA

○ RANGE OF AMBIENT TEMPS:MIN/MAX -8 / 25 °C

UNUSUAL CONDITIONS

○ DUST ○ FUMES ● SALT ATMOSPHERE
○ OTHER _____
○ UTILITY CONDITIONS

ELECTRICITY	DRIVERS	HEATING	CONTROL	SHUTDOWN
VOLTAGE	**400**			
HERTZ	**5**			
PHASE	**50**			

COOLING WATER	INLET	RETURN	DESIGN	MAX Δ
TEMP °C		MAX		
PRESS. (BARG) (kPa)		MIN		
SOURCE				

INSTRUMENT AIR MAX MIN
PRESSURE (kPa)(BARG) _____ _____

APPLICABLE SPECIFICATIONS:

API 676 POSITIVE DISPLACEMENT PUMPS - ROTARY

○ GOVERNING SPECIFICATION (IF DIFFERENT) **(5)**

REMARKS: _____

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CONSTRUCTION (CONTINUED)

CASING

- ■ MAXIMUM ALLOWABLE PRESSURE: 20 (BARG) 20 °C
- ■ HYDROSTATIC TEST PRESSURE: 30 (BARG)
- □ STEAM JACKET PRESSURE: (BARG) °C
- ROTOR MOUNT □ BTWN. BEARINGS ■ OVERHUNG
- TIMING GEARS □ YES □ NO
- BEARING TYPE: ■ RADIAL TIMKEN (2) □ THRUST
- LUBRICATION TYPE: ○ CONSTANT LEVEL OILERS
- □ PUMPED FLUID □ RING OIL □ OIL MIST
- □ EXTERNAL □ OIL FLOOD ■ GREASE
- ■ LUBRICANT TYPE Fuchs Renolin CLP 220
- ● MECHANICAL SEALS
- ■ MANUFACTURER AND MODEL Flowserve / ISC2-PX
- ■ MANUFACTURER CODE 1CW-FX
- ● API 610 SEAL FLUSH PLAN API PLAN 51
- ■ API 610 SEAL CODE 21A-FFQ-060-13/51
- ○ PACKING: ○ LANTERN RING
- □ MFR. AND TYPE □ NO. OF RINGS

DRIVE MECHANISM

- ○ DIRECT-COUPLED ○ V-BELT ■ GEAR
- ■ COUPLING MANUFACTURER John Crane

DRIVERS

- ● MOTOR:
- ■ MANUFACTURER ABB
- ■ TYPE 4 poles, safe area induction motor
- ■ FRAME NO. IEC 132
- ● CONSTANT SPEED
- ○ VARIABLE SPEED
- ■ kW 5,5 RPM 1463
- ● VOLTS 400 PHASE 3
- ● HERTZ 50 SERVICE FACTOR S1
- ● ENCLOSURE TEFC
- ○
- ○ STEAM TURBINE
- ○ OTHER (SEE SEPARATE DATA SHEETS)

OTHER PURCHASER REQUIREMENTS

- NAMEPLATE UNITS ○ U.S. CUSTOMARY ● SI
- ● RELIEF VALVES BY PUMP MFRG ● INTERNAL ○ EXTRNL.
- PIPING FOR SEAL FLUSH FURNISHED BY:
- ● PUMP VENDOR ○ OTHERS
- PIPING FOR COOLING/HEATING FURNISHED BY:
- ○ PUMP VENDOR ○ OTHERS
- ● PROVIDE TECHNICAL DATA MANUAL

MATERIALS (1)

- ■ CASING Super Duplex SS (25%Cr)
- ■ STATOR NBR
- ■ END PLATES N/A
- ■ ROTOR (S) Super Duplex SS (25%Cr)
- ■ VANES N/A
- ■ SHAFT Super Duplex SS (25%Cr)
- ■ SLEEVE (S) Super Duplex SS (25%Cr)
- ■ GLAND (S) Super Duplex SS (25%Cr)
- ■ BEARING HOUSING Cast Iron
- ■ TIMING GEARS N/A
- ○ SPECIAL MATERIAL TESTS
- ○ LOW AMBIENT TEMP. MATERIALS TESTS

QA INSPECTION AND TEST

- ● COMPLIANCE WITH INSPECTORS CHECK LIST
- ● CERTIFICATION OF MATERIALS (Material certificate 3.1)
- ● FINAL ASSEMBLY CLEARANCES
- ● SURFACE AND SUBSURFACE EXAMINATIONS
- ○ RADIOGRAPHY
- ○ ULTRASONIC
- ○ MAGNETIC PARTICLE
- ● LIQUID PENETRANT 100 % of welds
- ● CLEANLINESS PRIOR TO FINAL ASSEMBLY
- ○ HARDNESS OF PARTS, WELDS & HEAT AFFECTED ZONES
- ○ FURNISH PROCEDURES FOR OPTIONAL TESTS

TESTS	REQ'D	WIT	OBS
HYDROSTATIC	○	●	○
MEHANICAL RUN	○	●	○
PERFORMANCE	○	●	○
NPSH	○	○	○

PREPARATION FOR SHIPMENT

- ● DOMESTIC ○ EXPORT ○ EXPORT BOXING REQ'D
- ○ OUTDOOR STORAGE MORE THAN 6 MONTHS

WEIGHTS (kg)

■ PUMP 1836 □ BASE 0 ■ GEAR 26 ■ MOTOR 81

BASEPLATE

- ● BY PUMP MANUFACTURER ○ SUITABLE FOR EPOXY GROUT
- ○ EXTENDED FOR
- ● SUBSOLE PLATES BY PUMP MANUFACTURER
- ○ DRAIN-RIM ○ DRAIN-PAN

REMARKS

(1) DELETED

(2) Shaft sleeves hardnedned in correspondence of plain bearings

Plan 51 will be mounted on the pump assembly and connected to the seal with SS316L tubing and fitting.

Plan 51 is to be filled with clean fresh water. I t needs to be maintained at positive temperature.

Heating Jacket provided by PCM.

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once 1724000936-MAC-DS-00012 printed shall be considered as “NOT CONTROLLED” copy

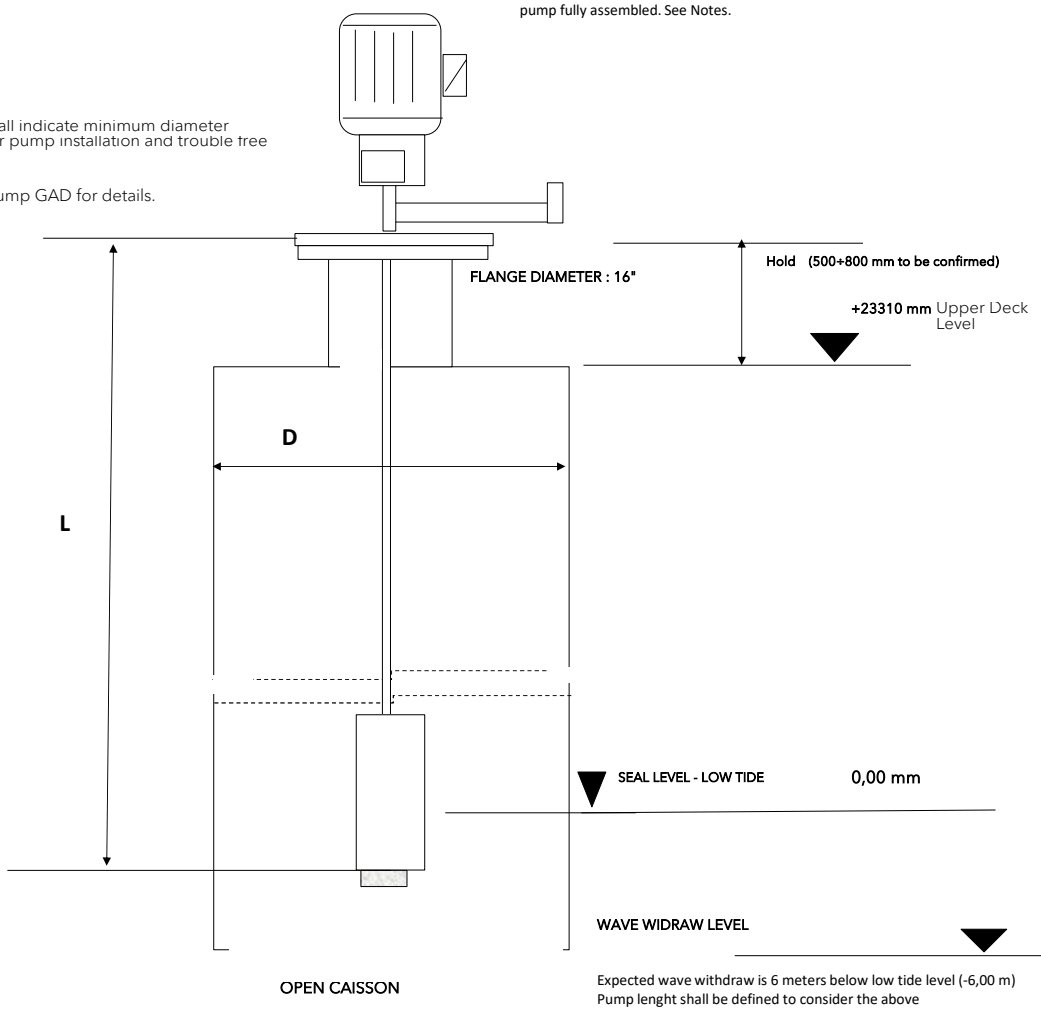
L 30.41 m

D 333.34 mm

NOTE:
Vendor shall indicate minimum diameter suitable for pump installation and trouble free operation

Refer to pump GAD for details.

Vendor to declare the mounting/dismountig clearance considering the pump fully assembled. See Notes.



OPEN CAISSON

Expected wave withdraw is 6 meters below low tide level (-6,00 m)
Pump lenght shall be defined to consider the above

1724000936-TMS-DOC-00012 undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

NOTES

1) For NPSHA vendor to consider 1bara at minimum seawater level (+ 0,00 mm)

2) Pump lenght to be calculated by vendor according to a reliable margin (VTA) between NPSHA vs NPSHR and minimum submergence
Vendor to advise the suction nozzle depth, according to the above sentence

3) Discharge pressure / head is referred to pump battery limit (i.e. dicharge nozzle)

4) Suction strainer to be provided by vendor.
Mesh size is 7mm diameter as per PCM standard design for the selected pumps.
Mesh size shall be minimized without jeopardizing suction condition.

5) Full compliance to API Std 676 is not strictly mandatory. Vendor to submit a list of deviation supported by reference list
Please refer to attached list of technical clarifications & deviations, including API 676.

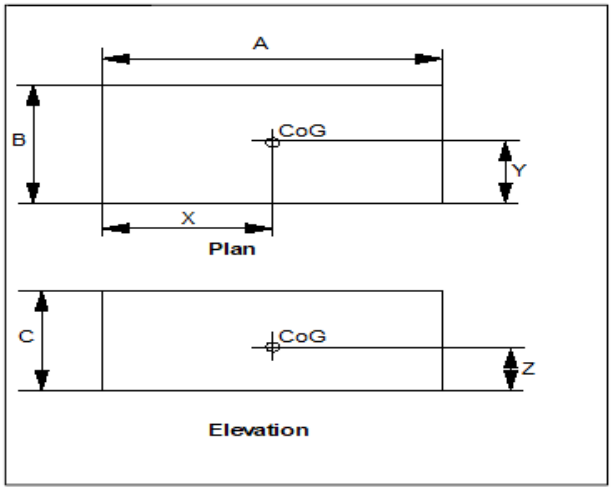
6) Vendor to declare mounting/dismantling clearance considerinf full assmbled pump
For full assembled pump mounting/ dismantling, the required minimum vertical clearance will be the total length of the equipment (including motor & all casing extensions : approx 35 m estimated), plus the required length for slings, depending on the lifting equipment to be used.
the supporting flange elevation.

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

WEIGHT DATA (kg)

		Areas for input by Supplier
Dry Weight	(I)	1943 kg
Content	(II)	2150 kg
Operating Weight	(I+II)	4093 kg
Auxiliaries' weight, included in I (specify under Notes)		kg
Test weight, i.e. filled with water		kg
Transport weight		1943 kg

CENTRE OF GRAVITY (CoG) DATA FOR INSTALLED DRY CONDITION



Overall dimensions	
A =	971 mm
B =	597 mm
C =	32170 mm

CoG location (mm)	
X =	7 mm
Y =	-1 mm
Z =	-12398 mm

NOTES

Datum point considered to locate the C.O.G of the pump is the center of the mounting flange.

WEIGHT AND CoG STATUS (TICK OFF AS APPROPRIATE)

☐ Estimated ☐ Calculated

☐ Catalogue data ☐ Weighed

CROSSWIND ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

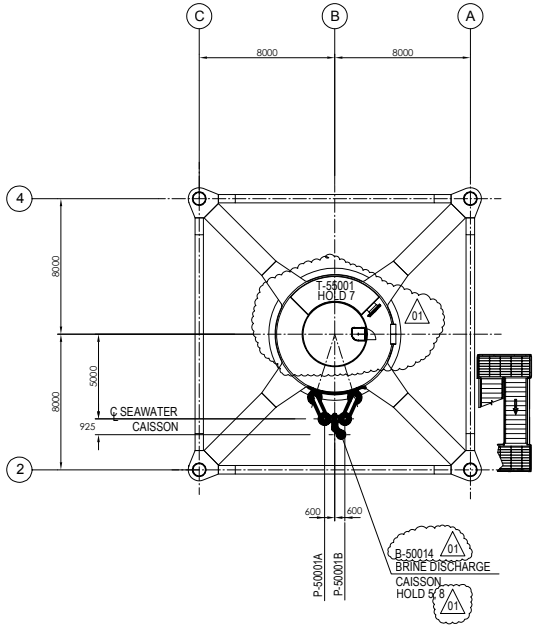
Action N : 14	**Rev.:** 001
Action Title: HAZID Study	**Date:** 05/10/2023
Reference Document n:	
Node: General Node	
Hazard/Parameter: Piracy, hijack, kidnap, terrorism	**Deviation**
Cause: Unauthorised access	
Consequence: Damage to facility	
Safeguards: Surveilance by marine operation HVAC room and electrical room are locked	
Recommendation: Consider to provide physical barrier on the stair	
Responsible Part: ROSETTI Architectural	
Response: An anti-intrusion security gate will be provided at the beginning of the platform access staircase. It will be represented in a Plot Plan Below Lower Deck drawing doc. N. 123A90-DDL-PP-DL-70071.	
Ref. Docs / Dwgs.:	

RESPONSE ACCEPTANCE

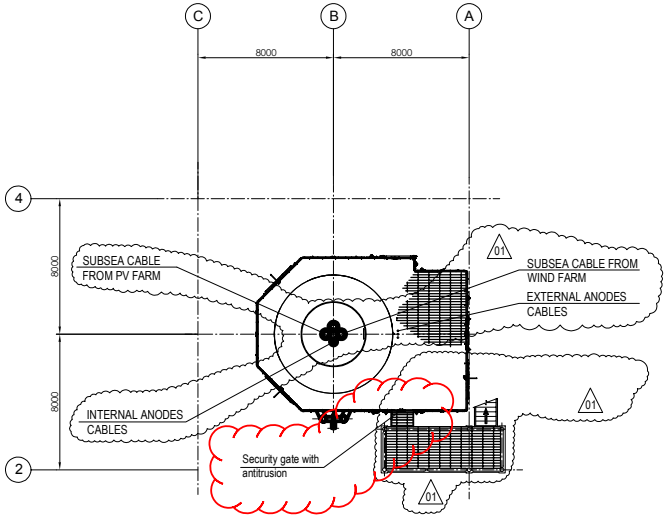
Discipline Leader: Maurizio Gatti	**Signature:** Maurizio Gatti	Autore firma digitale: Maurizio Gatti Nome distintivo: CN = Maurizio Gatti email = maurizio.gatti@rosetti.it C = IT O = Rosetti Marino SpA Data: 2024.02.26 14:46:05 +01'00'	**Date: 23/02/2024**
HSE Leader: Carolina Caracciolo	**Signature:** CC		**Date: 23/02/2024**
Project Engineering Manager: Davide Lo Sterzo	**Signature:**		**Date: 23/02/2024**
Company:	**Signature:**		**Date:**

DRAWING NO. 123A90-DDL-PP-DL-70071

REV. 01



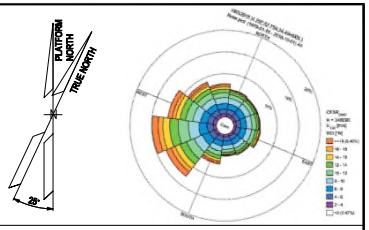
PLAN ON TRANSITION PIECE
EL+21.710 T.O.S.



PLAN ON EXISTING
PLATFORM AT
EL+16.860 T.O.S.

EQUIPMENT LIST	
TAG NUMBER	DESCRIPTION
P-50001A/B	SEAWATER LIFT PUMPS
T-55001	WASTE WATER TANK
B-50014	BRINE CAISSON

01



NOTES

1. ALL DIMENSIONS IN mm U.N.O
2. ALL ELEVATIONS IN METERS.
3. EQUIPMENT SIZES ARE BASED ON PRELIMINARY MASTER EQUIPMENT LIST 123A90-DDL-MAC-LIS-50000. 01
4. ALL ELEVATIONS RELATE TO LOWEST ASTRONOMICAL TIDE (LAT) = 0.000.
5. PLAN SHOWS PRIMARY ESCAPE/MATERIAL HANDLING ROUTES ONLY.
6. EQUIPMENT AND PACKAGE MAINTENANCE AND WITHDRAWAL AREAS TO BE CONFIRMED.
7. MISCELLANEOUS SAFETY EQUIPMENT ARE SHOWN IN DOC. 123A90-DDL-SAF-DL-3002516_Escape Routes, Fire Fighting, Life Saving Equipment and Safety Equipment Layouts Drawings.
8. PREVAILING WIND DIRECTION INFLUENCING EQUIPMENT/VENT LAYOUT FROM THE SOUTH WEST.
9. PLATFORM NORTH DIRECTION IS N 25°W.

LEGEND

DENOTES PLATED DECK

ESCAPE/MATERIAL HANDLING ROUTE

DENOTES OPEN GRATING

HOLDS

01
1. DELETED
2. PLATFORM CO-ORDINATES
3. DELETED
4. DELETED
5. BRINE DISCHARGE CAISSON LOCATION
6. DELETED
7. ARRANGEMENT TO BE CONFIRMED
8. DIMENSIONS TO BE CONFIRMED
9. DELETED

REFERENCE DOCUMENTS

123A90-DDL-PP-DS-70070	PLOT PLAN - LOWER & UPPER DECK
123A90-DDL-PP-DS-70072	PLOT PLAN - ELEVATION LOOKING NORTH & EAST

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	07/02/24	MMA	CBO	DLO	ISSUE FOR REVIEW (IFR)
0	31/10/23	MMA	CBO	DLO	ISSUE FOR REVIEW (IFR)

CROSSWIND

ROSETTI MARINO

TITLE :
BASE LOAD POWER HUB (BLPH)
PLOT PLAN
BELOW LOWER DECK

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK | SCALE 1:150

DRAWN M. MAGNI | CHECKED C. BORTOLIN | APPROVED D. LO STERZO | DATE 07/02/24

A1 | DRAWING NO. 123A90-DDL-PP-DL-70071 | SHEET 001 | REV. 01

File Name : 123A90-DDL-PP-DL-70071 Rev.01

4.3 FEED/EPC HAZOP RECOMMENDATIONS

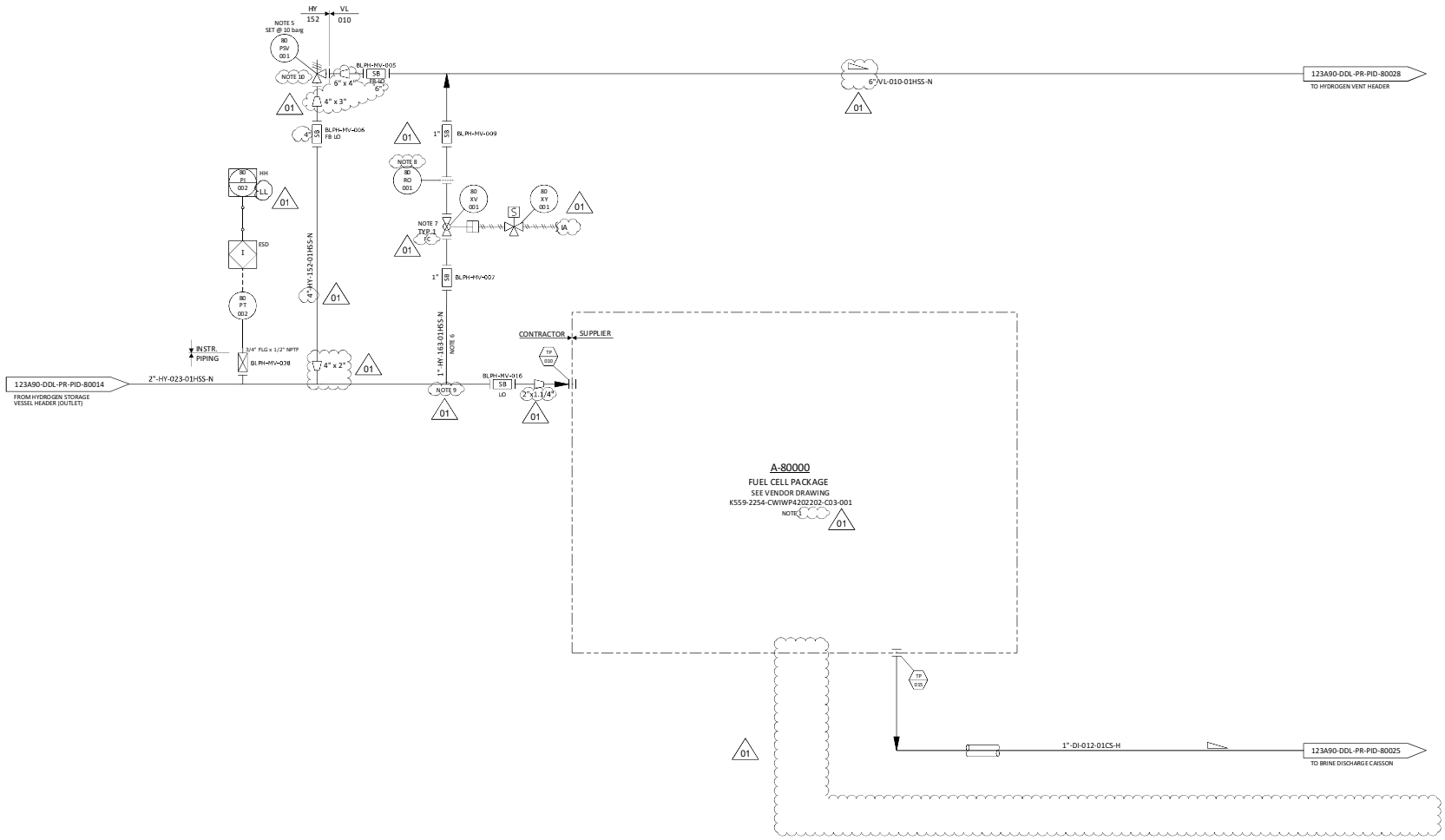
BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	6
Cause:	Open Blowdown Valve
Consequence:	Continuous venting of hydrogen. Leading to environmental emissions.
Safeguards:	
Actions:	Review necessity of emergency blowdown for hydrogen feed & distribution manifold.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	Emergency blowdown system has been reviewed during EPC phase. For reference see P&iDs: 123A90-DDL-PR-PID-80012_01, 123A90-DDL-PR-PID-80013_01 and 123A90-DDL-PR-PID-80014_01, attached to this Action as Attachment 1.
Attachments:	
Issue Date	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice	Ciro Impradice Autore firma digitale: Ciro Impradice Norme distintivo: CN = Ciro Impradice email = ciro.impradice@rosetti.it C = IT O = Rosetti Marino OU = Private Data: 2024.04.15 09:15:42 +02'00'
EPC HSE Lead	**Sign**
Carolina Caracciolo	CC
EPC Project Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.08.21 08:12:24 +02'00'

DRAWING_NO. DRAWING_NO.

REV. REV.



NOTES

1. THE VENDOR PACKAGE WILL CONTAIN AIR INTAKE AND EXHAUST, SUITABLY SAFEGUARDED AND SEPARATED.
2. DELETED.
3. DELETED.
4. DELETED

01

5. ONE UNINSTALLED SPARE PSV SHALL BE AVAILABLE.
6. LINE REQUIRED FOR PURGING OF PIPING WORK.
7. TIGHT SHUT-OFF VALVE.
8. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
9. LINE 1"-HY-163-01HSS-N WILL BE LOCATED AS CLOSE TO THE PACKAGE AS POSSIBLE TO ENSURE COMPLETE PURGING OF THE LINE.
10. 80PSV001 SIZED FOR CV FAILURE OF UPSTREAM CONTROL VAVE 25PV055A/B.

01

HOLDS

1. DELETED.
2. DELETED.

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

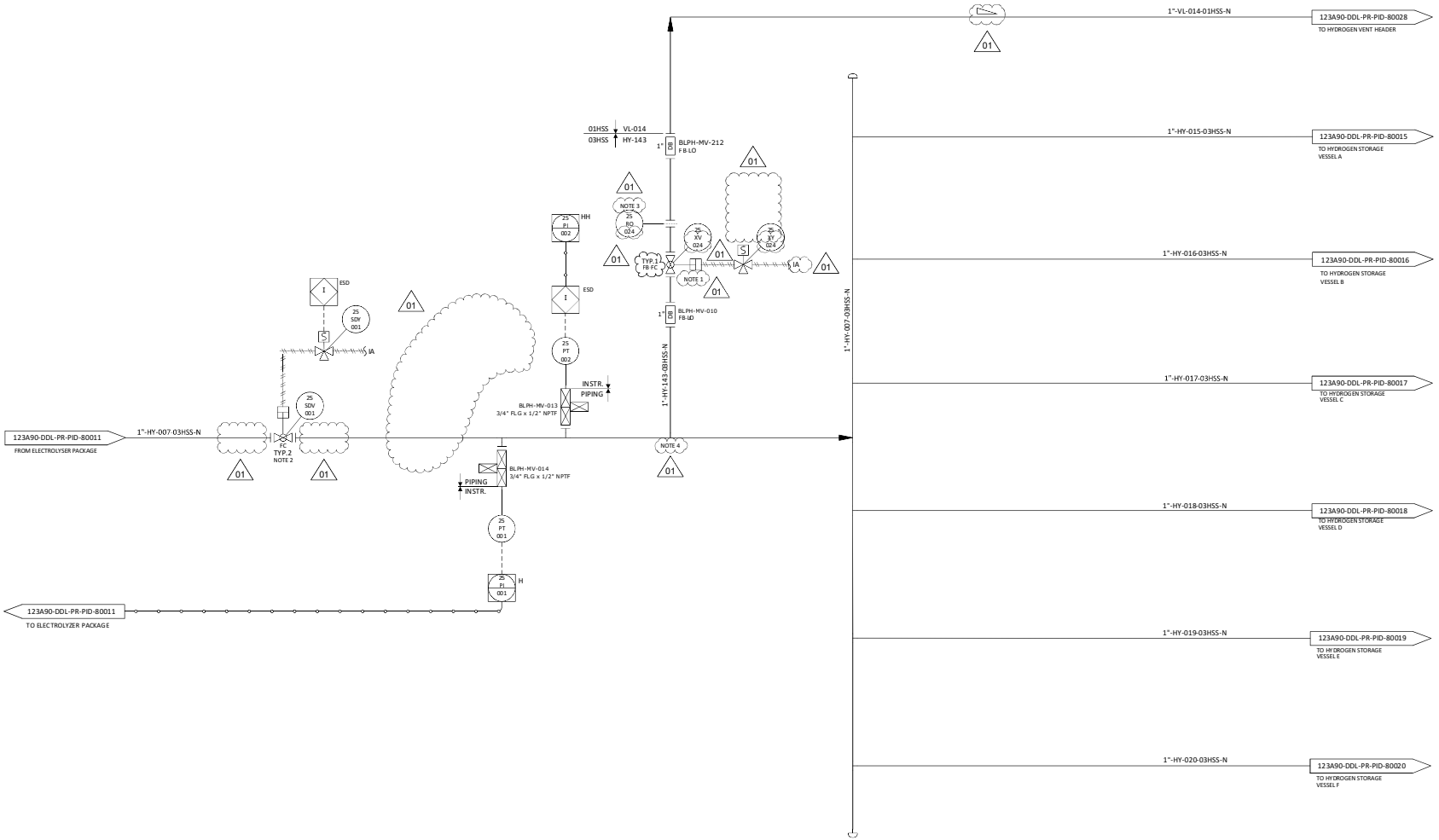
BLPH PIPING AND INSTRUMENTATION DIAGRAM
FUEL CELL PACKAGE

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK	SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE
A1	DRAWING NO. 123A90-DDL-PR-PID-80012	SHEET 001	REV. 01

File Name : FILE_NAME

DRAWING NO. DRAWING_NO.

REV. REV.



NOTES

1. TIGHT SHUT OFF XV.
2. NECESSARY CONTROL SYSTEM SOFTWARE SHALL BE INCLUDED TO SUPPORT ADVACED VALVE CONTROL, PARTIAL STROKE TESTING AND DIAGNOSTICS FOR ANY SAFETY CRITICAL ON/OFF VALVES. THESE APPLICATION SHALL BE IDENTIFIED BY HAZOP AND LOPA EVALUATION IF PARTIAL STROKE TESTING WILL BE REQUIRED:
   THE "TYP. 3" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 2" FOR SDV
   THE "TYP. 5" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 4" FOR BDV.
3. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
4. PIPING CONNECTION TO 25-XV-003 SHALL BE AS CLOSE TO THE MANIFOLD AS POSSIBLE, TO ENSURE COMPLETE PURGING OF FEED LINE.

01

HOLDS

1. DELETED. 01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

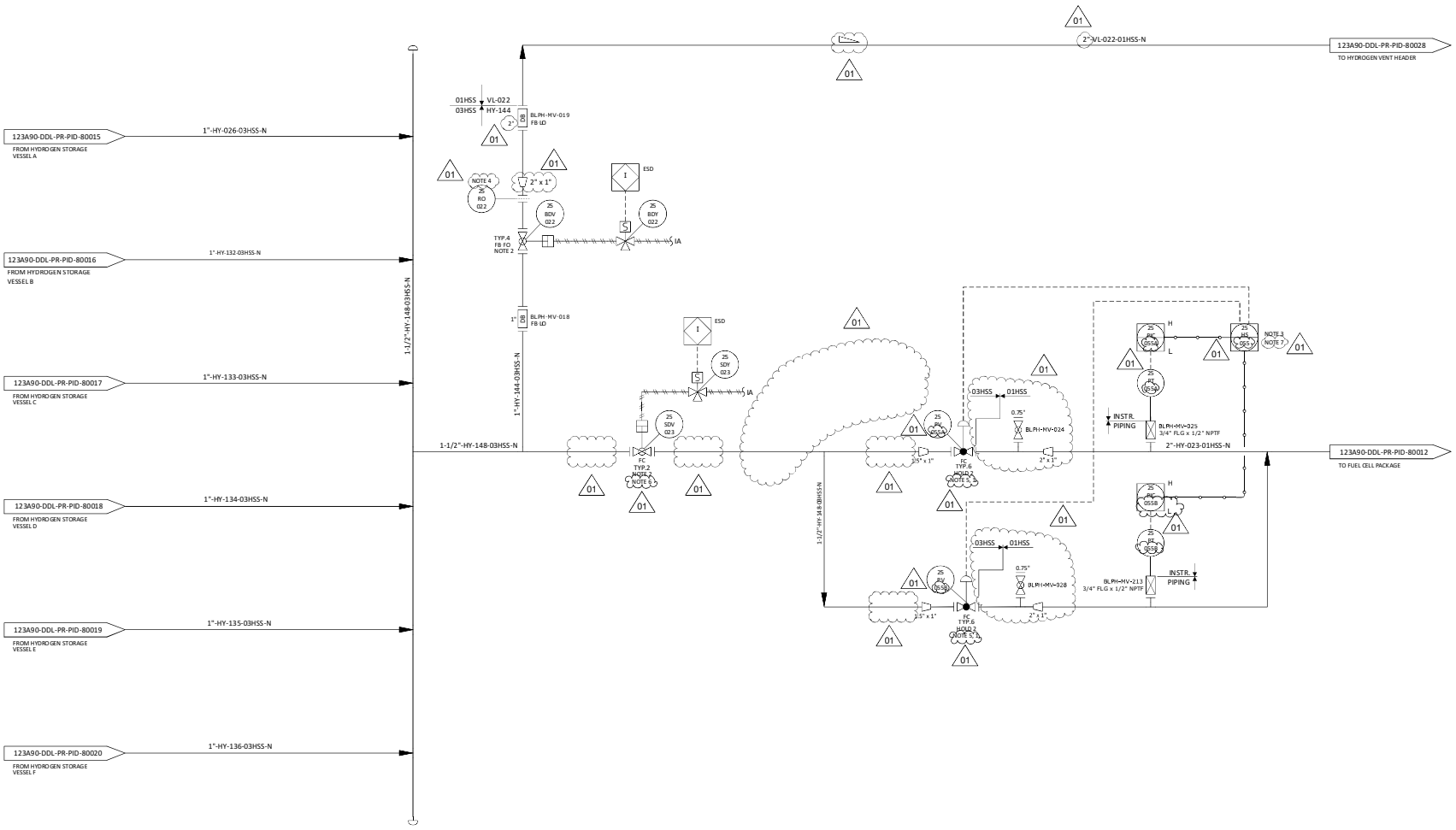
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSELS HEADER (INLET)

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80013		SHEET 001	REV. 01

File Name : FILE_NAME

DRAWING NO. DRAWING_NO.

REV. REV.



NOTES

1. DELETED.
2. NECESSARY CONTROL SYSTEM SOFTWARE SHALL BE INCLUDED TO SUPPORT ADVACED VALVE CONTROL, PARTIAL STROKE TESTING AND DIAGNOSTICS FOR ANY SAFETY CRITICAL ON/OFF VALVES. THESE APPLICATION SHALL BE IDENTIFIED BY HAZOP AND LOPA EVALUATION IF PARTIAL STROKE TESTING WILL BE REQUIRED:
   THE "TYP. 3" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 2" FOR SDV
   THE "TYP. 5" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 4" FOR BDV
3. HAND SELECTOR TO ALLOW THE OPERATOR TO SELECT THE CONTROL LOOP (REMOTELY).
4. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
5. SOFTWARE INTERLOCK PREVENTS OPENING OF THE CONTROL VALVES 25-PV-055A/B IN CASE FUEL CELL PACKAGE (A-80000) IS NOT RUNNING.
6. SDV VALVE 25-SDV-023 TO BE INSTALLED AS CLOSE AS POSSIBLE TO THE CONTROL VALVES 25-PV-055A/B.
7. HS INCLUDES SOFTWARE INTERLOCK TO PREVENT BOTH VALVES TO BE ONLINE SIMULTANEOUSLY. SOFTWARE INTERLOCK PREVENTS VALVE 25PV055B TO OPEN IF VALVE 25PV055A IS NOT CLOSED.

01

HOLDS

1. DELETED.
2. CONTROL VALVE SIZE (BY VENDOR).

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSELS HEADER (OUTLET)

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80014		SHEET 001	REV. 01

File Name : FILE_NAME

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	7
Cause:	External Fire due to either hydrogen jet fire or BESS,
Consequence:	Potential to escalation for Hydrogen inventories.
Safeguards:	Fire detection. Emergency Isolation & Blowdown (PRV). PIC 'high high' alarm on hydrogen storage vessel
Actions:	Ensure heat input calculations for sizing fire case relief valves are based on heat input from hydrogen fire.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	Contractor confirms that heat input calculations for sizing fire case relief valves are based on heat input from hydrogen fire. For reference see "Attachment 1 - FEED HAZOP action n7", which is part of the "Relief, Vent and Blowdown Report".
Attachments:	
Issue Date (21/02/24)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice	
EPC HSE Lead	**Sign**
Carolina Caracciolo	CC
EPC Project Engineering Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**

Digitaal ondertekend door Paul van Rossum
Datum: 2024.03.14 17:02:10 +01'00'

Base Load Power Hub (BLPH)

Relief, Vent and Blowdown Report

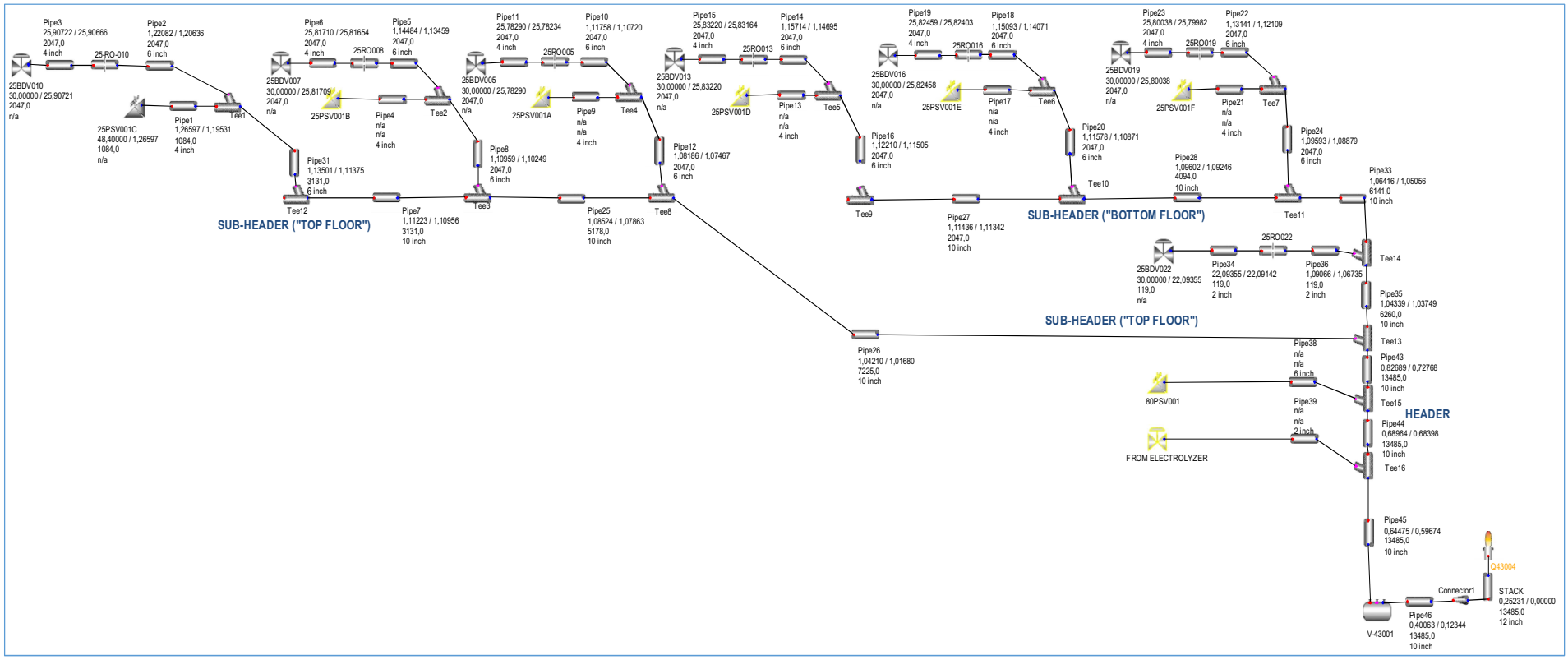
Document Number: 123A90-DDL-PR-RE-80030

Document Class: 1

01	05/02/2024	Accepted for Construction (AFC)	CIM	RZI	DLO
00	04/12/2023	Issue for Acceptance (IFA)	CIM	RZI	DLO
Rev.	Date	Description	Prepared	Reviewed	Approved

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

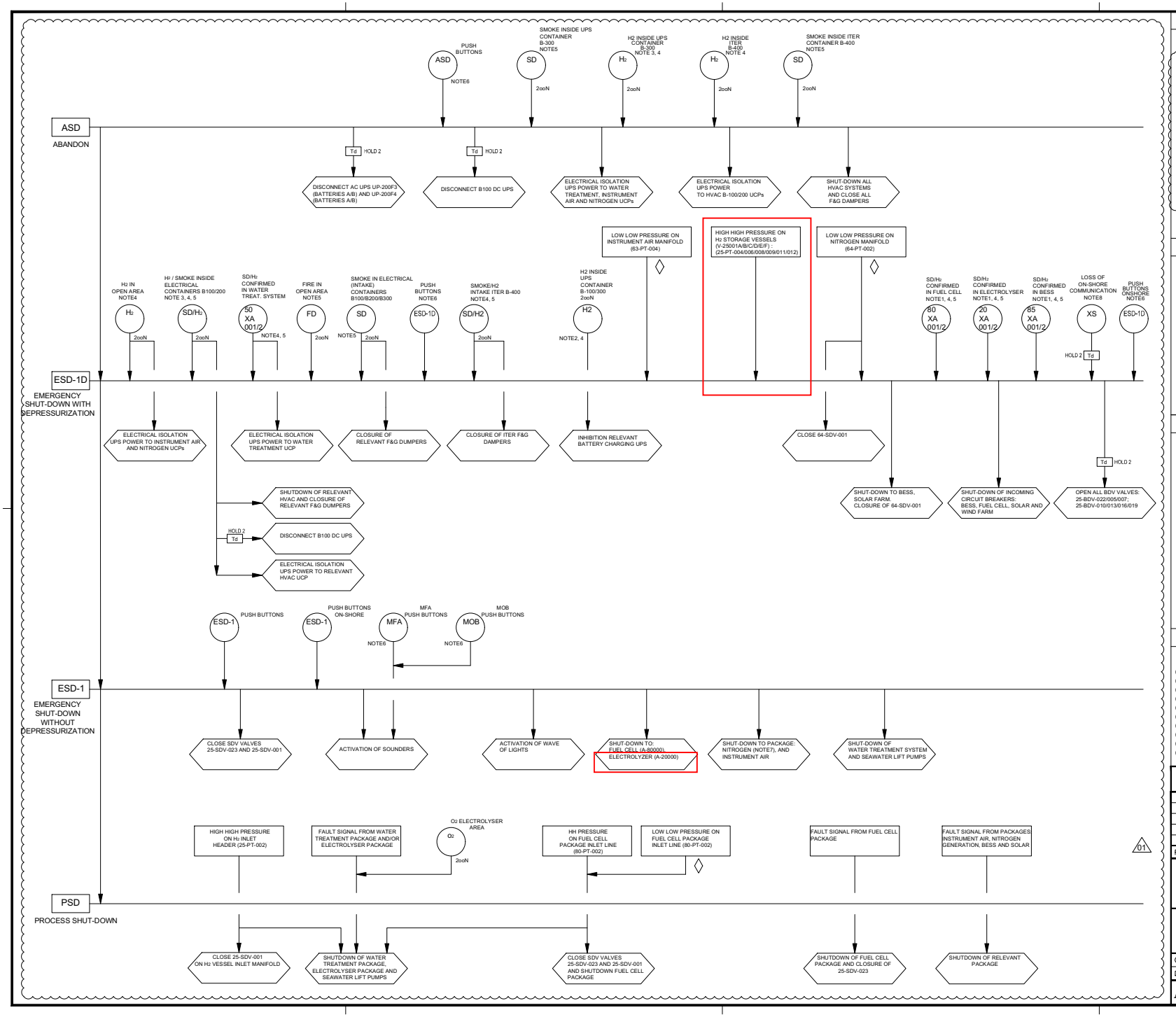
6.4 APPENDIX 04 –VENT NETWORK DESIGN (PRESSURE(BARG)/MASSFLOW(KG/H)/SIZE(INCHES)) – GOVERNING SCENARIO



BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	14
Cause:	Electrolyser continue operation.
Consequence:	Overpressure of hydrogen storage. See 2.9- Pressure More.
Safeguards:	
Actions:	Review control system design to ensure that potential overpressure can be reliability detected, and PEM electrolyser package shutdown initiated.
Assigned Respondent (By)	Rosetti Instrumentation Engineer
RESPONSE	As per project doc. "Process Safety Cause & Effect Block Diagram" n° 123A90-DDL-PR-DG-80000 rev.01, in case of overpressure of Hydrogen Storage Tanks the Pressure Transmitters 25-PT-004/006/008/009/011/012 (High High Alarm) will activate the ESD-1D with shutdown of Electrolyser package.
Attachments:	
Issue Date	24-04-2024

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
L.Calabrese	
EPC HSE Lead	**Sign**
C. Caracciolo	CC
EPC Project Manager	**Sign**
D. Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.05.14 12:24:02 +02'00'



NOTES

1. F&G LOGIC VOTING IS MANAGED BY RELEVANT UCP (BESS, FUEL CELL AND ELECTROLYSER PACKAGES).
2. LOGIC ACTIVATION ONLY IN CASE OF 2ooN H2 CONFIRMED IS CAUSED BY H2 DETECTORS INSIDE UPS CONTAINERS (B-100/300) AND ALL THE OTHERS PLATFORM H2 DETECTORS SHALL NOT BE ALARMED/FAILED.
3. LOGIC ACTIVATION ONLY IN CASE OF 2ooN H2 CONFIRMED IS CAUSED BY H2 DETECTORS INSIDE UPS CONTAINERS (ONLY FOR B-100 OR B-300) AND AT LEAST ONE OF PLATFORM H2 DETECTORS (EXCLUDED INSIDE UPS CONTAINERS B-100/300) IS ALARMED/FAILED.
4. ACTIVATION OF AMBER BEACONS (H2).
5. ACTIVATION OF RED BEACONS (FIRE).
6. ACTIVATION OF BOTH AMBER AND RED BEACONS.
7. SHUTDOWN OF NITROGEN PACKAGE WILL BE PERFORMED ONLY AFTER THE ELECTROLYSER PACKAGE HAS BEEN SAFELY SHUTDOWN (IF IT IS ON LINE).
8. IN CASE OF LOSS OF ON-SHORE COMMUNICATION THE ESD-1D LOGIC WILL BE ACTIVATED DUE TO THE IMPOSSIBILITY OF REMOTE CONTROL DEPRESSURIZATION.

01

LEGEND

HOLDS

01

1. DELETED
2. TIME DELAY TO BE DEFINED.

LEGEND

◇ = START-UP INHIBIT

01

ABBREVIATIONS

FC: Fuel Cell (A-80000)
BESS: Battery Energy Storage System
Electrolyser Package (A-200000)

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	19/03/24	RZI	CIM	DLO	ACCEPTED FOR CONSTRUCTION (AFC)
00	10/11/23	RZI	CIM	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BASE LOAD POWER HUB (BLPH)
Process Safety Cause & Effect
Block Diagram

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE N/A
DRAWN	CHECKED	APPROVED	DATE

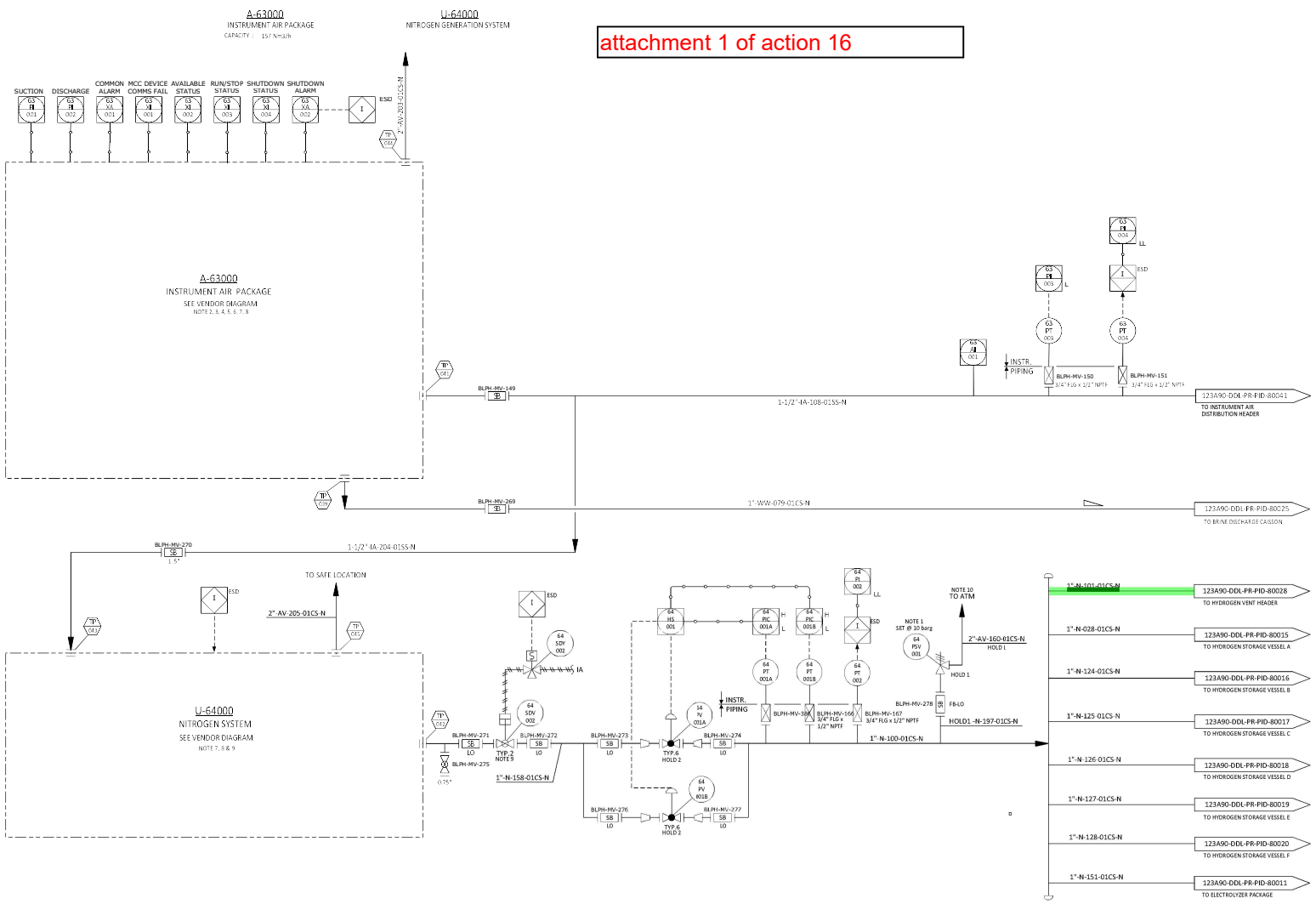
A1	DRAWING NO. 123A90-DDL-PR-DG-80000	SHEET 001	REV. 01

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	16
Cause:	Loss of nitrogen at any cause
Consequence:	Potential air ingress into hydrogen vent. Leading to explosion, LOC & risk to personnel.
Safeguards:	
Actions:	Ensure secure nitrogen supply suitable for continuous purge of the hydrogen vent head is provided.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	Nitrogen supply suitable for continuous purge of the hydrogen vent head is provided. For details see attachment 1.
Attachments:	
Issue Date (19-01-24)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice (Process)	
EPC HSE Lead	**Sign**
Carolina Caracciolo	CC
EPC Project Engineering Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.08.21 08:12:50 +02'00'

attachment 1 of action 16



NOTES

1. ONE UNINSTALLED SPARE PSV SHALL BE AVAILABLE.
2. COMPRESSORS AND DRIERS DESIGNED FOR 2 X 100% CONFIGURATION. INSTRUMENT AIR RECEIVER DESIGNED FOR 1 X 100%.
3. VENDOR TO PROVIDE NECESSARY CONTROLS, INSTRUMENTATIONS AND ISOLATIONS IN ORDER TO OPERATE THE PLANT IN SAFE MANNER.
4. COMPRESSORS WILL OPERATE ON THE BASIS OF ONE WORKING AND ONE ON STANDBY.
5. COMPRESSORS TO BE SCREW TYPE OIL FREE.
6. AIR COMPRESSOR INLET TO BE LOCATED AWAY FROM ANY VENTS.
7. PACKAGE DATA AND DESIGN TO BE CONFIRMED BY VENDOR AND DRAWING MADE AVAILABLE.
8. PACKAGE VENDOR TO DEFINE INTERFACE WITH CONTRACTOR AND CCS CONNECTION REQUIREMENTS.
9. NECESSARY CONTROL SYSTEM SOFTWARE SHALL BE INCLUDED TO SUPPORT ADVACED VALVE CONTROL, PARTIAL STROKE TESTING AND DIAGNOSTICS FOR ENY SAFETY CRITICAL ON/OFF VALVES. THESE APPLICATION SHALL BE IDENTIFIED BY HAZOP AND LAPA EVALUATION IF PARTIAL STROKE TESTING WILL BE REQUIRED:
   THE "TYP. 3" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 2" FOR SDV
   THE "TYP. 5" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 4" FOR BDV
10. TO SAFE LOCATION, ROUTED AWAY FROM WALKWAYS.

HOLDS

1. PSV AND LINE SIZE.
2. CONTROL VALVE SIZE (BY VENDOR).

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
00	20/10/2023	CIM	RZ	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
INSTRUMENT AIR PACKAGE

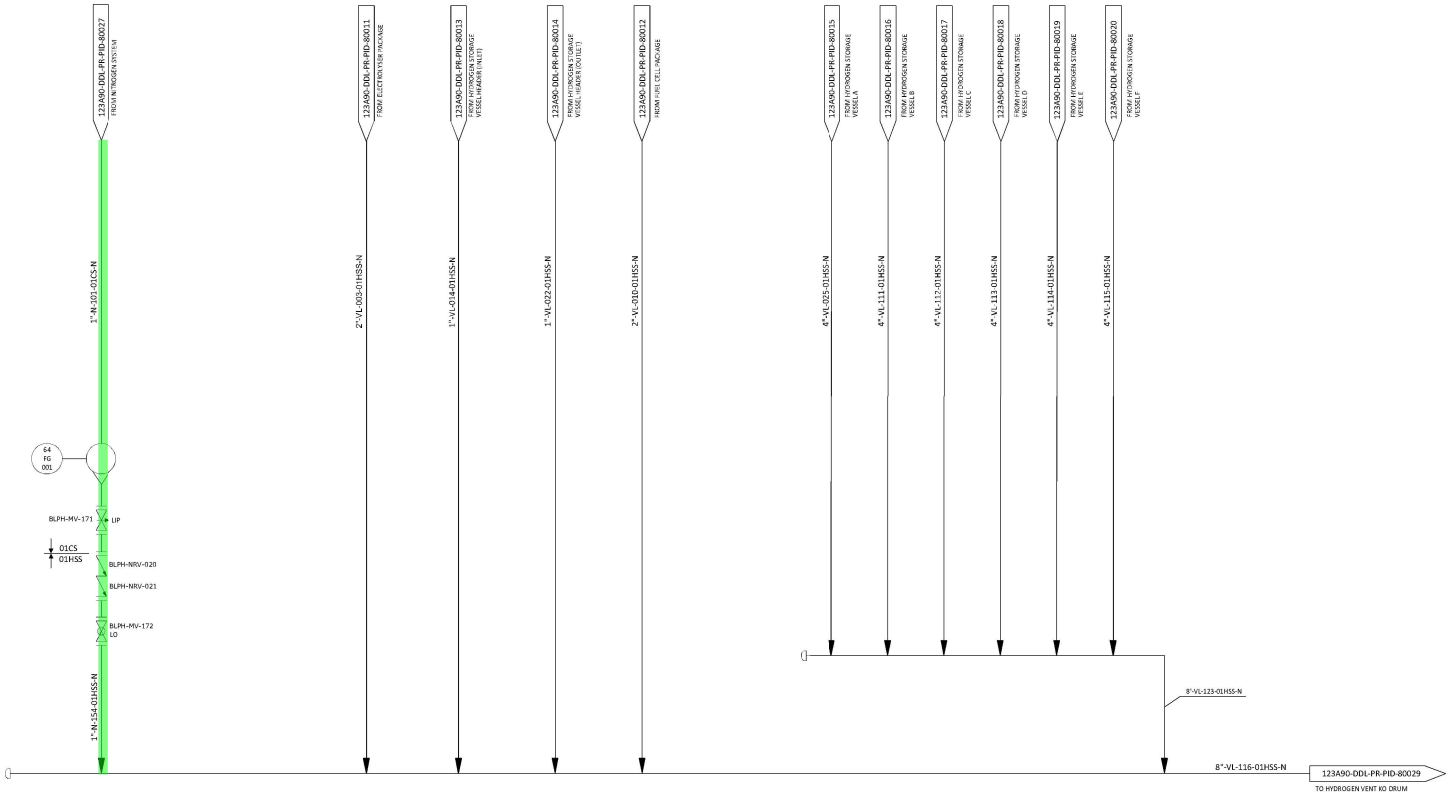
CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORDWIND PARK	SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE
A1	DRAWING NO. 123A90-DDL-PR-PID-80027	SHEET 001	REV. 00

DRAWING_NO.

REV.

File Name : FILE_NAME

attachment 1 of action 16



NOTES

HOLDS

1. VENT LINES DIAMETER.

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
00	23/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN VENT HEADER

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK	SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE
A1	DRAWING NO. 123A90-DDL-PR-PID-80028	SHEET 001	REV. 00

DRAWING NO.

REV.

File Name : FILE_NAME

Base Load Power Hub (BLPH)

Process Control, Operation, Start-up and Shutdown philosophy

Document Number: 123A90-DDL-PR-RE-80031

Document Class: 1

attachment 1 of action 16

00	13/12/2023	Issue for Approval (IFA)	CIM	RZI	DLO
Rev.	Date	Description	Prepared	Reviewed	Approved

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3.4 UTILITIES OTHER THAN WATER TREATMENT

3.4.1 Vent system and hydrogen vent KO Drum V-43001

The Hydrogen Vent will be comprised of:

- A gathering network of hydrogen gas emergency discharges or maintenance discharges
- A Hydrogen Knock-Out Drum V-43001
- A Hydrogen Vent Stack Q-43004 equipped with a Liquid seal at its bottom

The hydrogen vent will be required for all emergency relief and blowdown scenarios and to vent the H2 off-spec from the Electrolyser package (A-20000). Furthermore, the blowdown network is continuously purged with nitrogen in order to keep it slightly pressurized and inert.

3.4.1.1 Process Operation and Control Philosophy

attachment 1 of action 16

The hydrogen KO drum V-43001 is equipped with the following transmitters:

- 43-PT-001 as remote pressure indicator to DCS
- 43-LT-001 as remote level indicator that allows to control any liquid level inside the boot thanks to the control loop (43-LIC-001) handled via the level control valve 43-LV-001
- 43-LT-002 as additional interlock trip signal (HOLD4)

Moreover, at the exit of the V-43001 a flow transmitter (43-FT-001 with High alarm threshold) is provided to monitor the flowrate towards the stack.

3.4.1.2 Overpressure protection

No need for overpressure protection. The sole and only overpressure protection is established by the proper design of the network.

3.4.2 Instrument air package A-63000

The unit is fully prefabricated and self-standing package; thus in general, being a vendor specific item, for any further information and details the vendor's documentation shall be necessarily seen.

3.4.2.1 Process Operation and Control Philosophy

However, the instrument air package A-63000 will have the following main sensors installed at distribution header:

- 63-AI-001 that is a dew point analyzer
- 63-PT-003 to monitor the pressure value at the distribution header (signal to DCS)
- 63-PT-004 to procure shutdown effects in case of low-low pressure value at the distribution header (the signal is replicated to DCS via software link)

3.4.2.2 Start-up and Shut-Down philosophy

The following signals will inform about the package A-63000 status:

BLPH SHEAMS SIGNATURE FORM

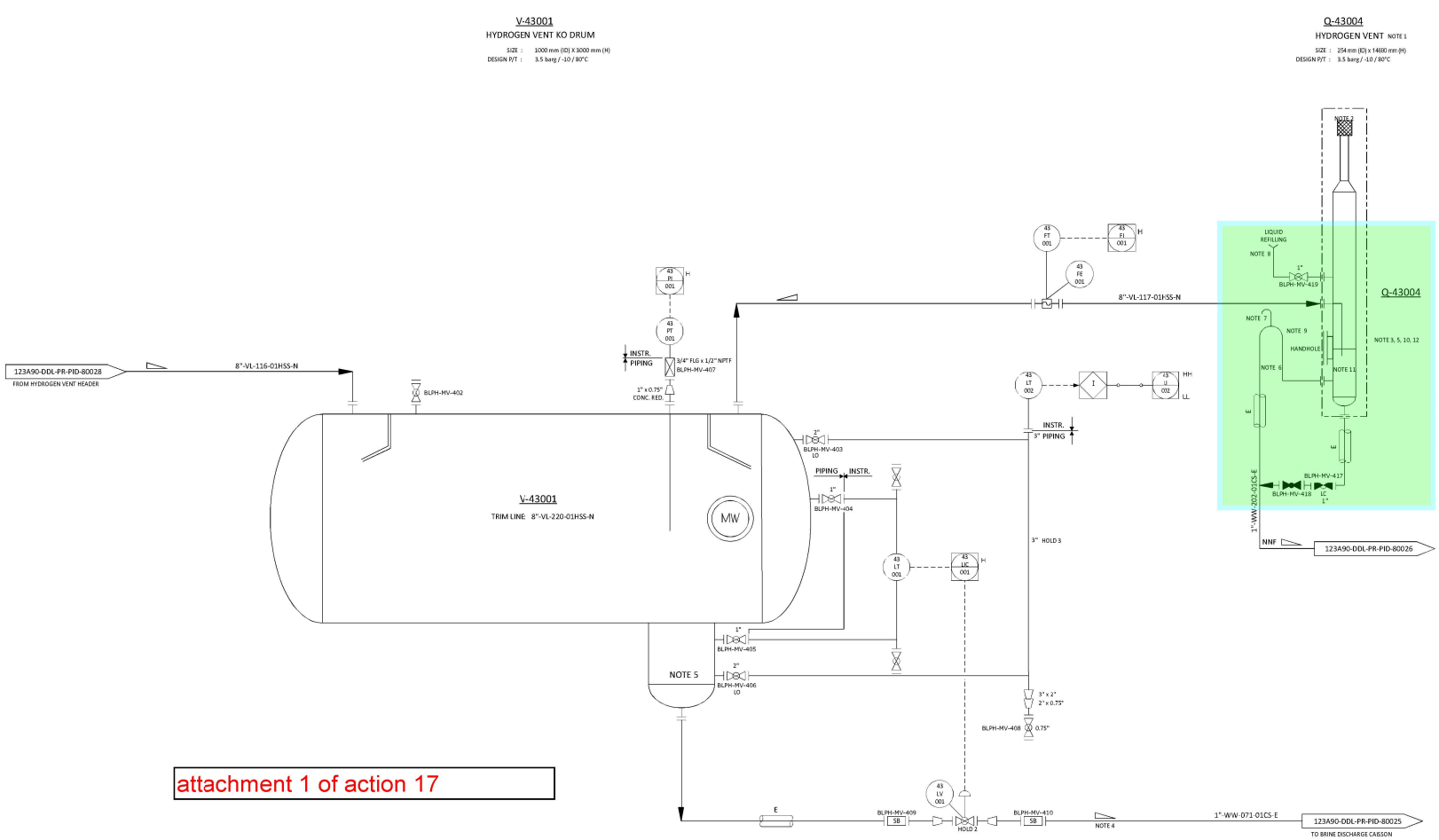
Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	17
Cause:	Loss of nitrogen at any cause
Consequence:	Potential air ingress into hydrogen vent. Leading to explosion, LOC & risk to personnel.
Safeguards:	
Actions:	In case of failure of primary nitrogen purge, ensure a suitable contingency plan is developed.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	A liquid seal drum has been added. The aim of such seal is to avoid air ingress into hydrogen vent in case of loss of nitrogen purging. For reference see PID 123A90-DDL-PR-PID-80029, attachment 1
Attachments:	
Issue Date (19/01/24)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice (Process)	
EPC HSE Lead	**Sign**
Carolina Caracciolo	CC
EPC Project Engineering Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**

Digitaal ondertekend door Paul van Bossum
Datum: 2024.03.14 17:00:44 +01'00'

DRAWING NO. DRAWING_NO.

REV. REV



attachment 1 of action 17

NOTES

1. VENT TO SAFE LOCATION SEGREGATED FROM OTHER VENTS.
2. VENT TO BE EQUIPPED WITH FLAME ARRESTOR AND BIRD SCREEN.
3. LIQUID SEAL DRUM IS PART OF THE VENT SYSTEM.
4. LIQUID DRAINLINES TO BE ROUTED TO ENSURE GRAVITY DRAIN.
5. HYDROGEN VENT KO DRUM BOOT AND LIQUID SEAL DRUM TO BE HEAT TRACING.
6. SEAL LEG WILL BE DETERMINATED ON THE MAXIMUM BACK PRESSURE IN THE VENT.
7. SEAL VENT TO BE PLACED INTO A SAFE POSITION.
8. FILLING LINE TO BE PLACED IN AN ACCESSIBLE POSITION.
9. TRACED FOR 1.5 m, INSULATED UP TO THE BEND.
10. LIQUID SEAL DRUM I.D. 590 mm, HEIGHT 2350 mm (T/T). TBC BY H2 VENT VENDOR.
11. INLET DIP LEG SUBMERSION HEIGHT OF 0,2 m.
12. FLUID HEIGHT OF 1.5 m FROM BOTTOM T.L.

HOLDS

1. VENT LINES DIAMETER.
2. CONTROL VALVE SIZE (BY VENDOR).
3. TO BE CONFIRMED.

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
00	23/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN VENT DRUM

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK	SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE
A1	DRAWING NO. 123A90-DDL-PR-PID-80029	SHEET 001	REV. 00

File Name : FILE_NAME

Base Load Power Hub (BLPH)

attachment 1 of action 17

Process Control, Operation, Start-up and Shutdown philosophy

Document Number: 123A90-DDL-PR-RE-80031

Document Class: 1

00	13/12/2023	Issue for Approval (IFA)	CIM	RZI	DLO
Rev.	Date	Description	Prepared	Reviewed	Approved

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3.4 UTILITIES OTHER THAN WATER TREATMENT

3.4.1 Vent system and hydrogen vent KO Drum V-43001

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- A gathering network of hydrogen gas emergency discharges or maintenance discharges
- A Hydrogen Knock-Out Drum V-43001
- A Hydrogen Vent Stack Q-43004 equipped with a Liquid seal at its bottom

The hydrogen vent will be required for all emergency relief and blowdown scenarios and to vent the H2 off-spec from the Electrolyser package (A-20000). Furthermore, the blowdown network is continuously purged with nitrogen in order to keep it slightly pressurized and inert.

3.4.1.1 Process Operation and Control Philosophy

attachment 1 of action 17

The hydrogen KO drum V-43001 is equipped with the following transmitters:

- 43-PT-001 as remote pressure indicator to DCS
- 43-LT-001 as remote level indicator that allows to control any liquid level inside the boot thanks to the control loop (43-LIC-001) handled via the level control valve 43-LV-001
- 43-LT-002 as additional interlock trip signal (HOLD4)

Moreover, at the exit of the V-43001 a flow transmitter (43-FT-001 with High alarm threshold) is provided to monitor the flowrate towards the stack.

3.4.1.2 Overpressure protection

No need for overpressure protection. The sole and only overpressure protection is established by the proper design of the network.

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The unit is fully prefabricated and self-standing package; thus in general, being a vendor specific item, for any further information and details the vendor's documentation shall be necessarily seen.

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However, the instrument air package A-63000 will have the following main sensors installed at distribution header:

- 63-AI-001 that is a dew point analyzer
- 63-PT-003 to monitor the pressure value at the distribution header (signal to DCS)
- 63-PT-004 to procure shutdown effects in case of low-low pressure value at the distribution header (the signal is replicated to DCS via software link)

3.4.2.2 Start-up and Shut-Down philosophy

The following signals will inform about the package A-63000 status:

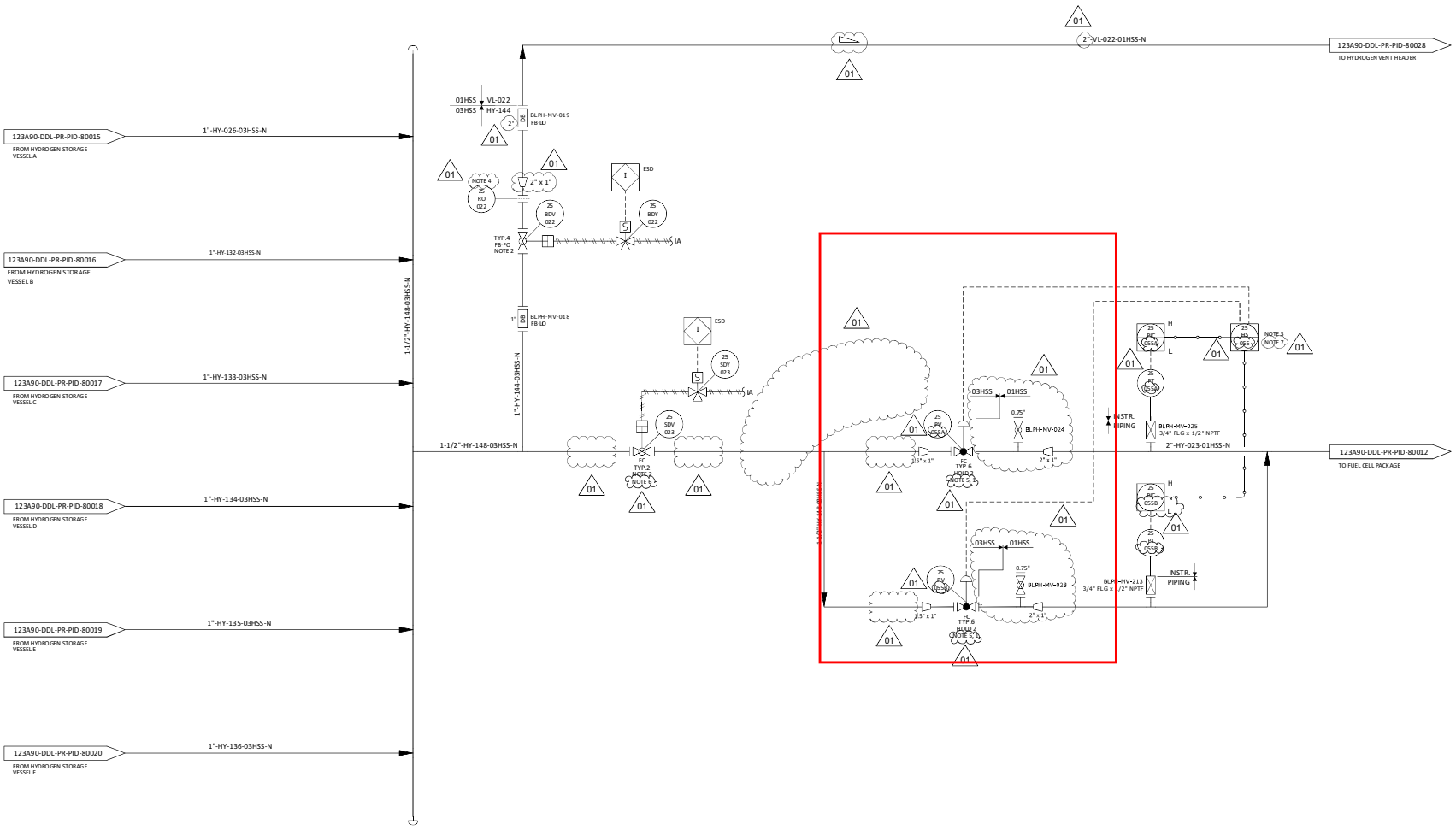
BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	20
Cause:	Fail closure of PVA/B in line of fuel cell,.
Consequence:	Unknow consequences to fuel cell.
Safeguards:	
Actions:	Review control requirements for PVA & PVB from fuel cell and delete if not required.
Assigned Respondent (By)	Rosetti Instrumentation Engineer
RESPONSE	As per project doc. P&ID " HYDROGEN STORAGE VESSELS HEADER (OUTLET)" n° 123A90-DDL-PR-PID-80014 rev.01, the pressure control valves 25-PV-055A/B are necessary to regulate the H2 pressure to Fuel Cell package and avoid the 80-PSV-001 intervention. These pressure control valves are designed as “Typ.6” that means critical control valve. The typ. 6 foresees the following status feedbacks to better monitor the behavior of the control valves: - Open limit switch - Closed limit switch - Position transmitter
Attachments:	
Issue Date	24-04-2024

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
L.Calabrese	
EPC HSE Lead	**Sign**
C. Caracciolo	CC
EPC Project Manager	**Sign**
D. Lo Sterzo	
Client	**Sign**
	Paul van Rossum Datum: 2024.05.10

DRAWING NO. DRAWING_NO.

REV. REV.



NOTES

1. DELETED.
2. NECESSARY CONTROL SYSTEM SOFTWARE SHALL BE INCLUDED TO SUPPORT ADVACED VALVE CONTROL, PARTIAL STROKE TESTING AND DIAGNOSTICS FOR ANY SAFETY CRITICAL ON/OFF VALVES. THESE APPLICATION SHALL BE IDENTIFIED BY HAZOP AND LOPA EVALUATION IF PARTIAL STROKE TESTING WILL BE REQUIRED:
   THE "TYP. 3" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 2" FOR SDV
   THE "TYP. 5" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 4" FOR BDV
3. HAND SELECTOR TO ALLOW THE OPERATOR TO SELECT THE CONTROL LOOP (REMOTELY).
4. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
5. SOFTWARE INTERLOCK PREVENTS OPENING OF THE CONTROL VALVES 25-PV-055A/B IN CASE FUEL CELL PACKAGE (A-80000) IS NOT RUNNING.
6. SDV VALVE 25-SDV-023 TO BE INSTALLED AS CLOSE AS POSSIBLE TO THE CONTROL VALVES 25-PV-055A/B.
7. HS INCLUDES SOFTWARE INTERLOCK TO PREVENT BOTH VALVES TO BE ONLINE SIMULTANEOUSLY. SOFTWARE INTERLOCK PREVENTS VALVE 25PV055B TO OPEN IF VALVE 25PV055A IS NOT CLOSED.

01

HOLDS

1. DELETED.
2. CONTROL VALVE SIZE (BY VENDOR).

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSELS HEADER (OUTLET)

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80014		SHEET 001	REV. 01

File Name : FILE_NAME

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	21
Cause:	Back pressure due to depressurisation blowdown
Consequence:	Potential for other users of hydrogen vent header to be unable to access vent due to back pressure.
Safeguards:	
Actions:	Carry out flare network back pressure analysis when detailed information is available in order to ensure all users can access hydrogen vent when required.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	Flare network back pressure analysis has been carried out. The maximum back pressure that can be reached during the worst scenario is 1.27 barg. For reference see “Attachment 1 - FEED HAZOP action n21”, which is part of the “Relief, Vent and Blowdown Report”. This value is well below all the pressure sources of the systems to be depressurized. Therefore, all users can access hydrogen vent when required.
Attachments:	
Issue Date (21/02/24)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice	Impradice Ciro
EPC HSE Lead	**Sign**
Carolina Caracciolo	CC
EPC Project Engineering Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.03.14 17:02:50 +01'00'

Base Load Power Hub (BLPH)

Relief, Vent and Blowdown Report

Document Number: 123A90-DDL-PR-RE-80030

Document Class: 1

01	05/02/2024	Accepted for Construction (AFC)	CIM	RZI	DLO
00	04/12/2023	Issue for Acceptance (IFA)	CIM	RZI	DLO
Rev.	Date	Description	Prepared	Reviewed	Approved

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maintenance and/or mitigation systems such as external insulation, depressuring systems, isolation of leaks, equipment and/or flange orientation and minimization and emergency response. On the other hands, unlike pool fire, a jet fire can, in essence, be "turned off" through isolation and depressurization of the jet fire source. Moreover, multiple studies show that in many cases, the installation of a PRV offers little or no protection therefore it provides an unfounded sense of security. Often and in many cases the vessel wall is weakened by high temperatures, before the PRV relieving pressure is reached. Thus, a transient thermomechanical response analysis has been carried out to accurately determine vessel rupture time. In general, it is demonstrated worldwide that only vessels with relatively thick walls may get a benefit from the presence of a PRV, while for most cases no appreciable increase in the vessel survival time beyond the onset of relief is observed.

Therefore, as mentioned before, we recommend that extreme caution should be taken, if and when designing relief systems for gas-filled vessels, and we propose the following recommendations:

- Never base relief valve sizing for gas-filled vessels on API 521 equations–except maybe for early phase studies. For detailed design and actual installation purposes, always base relief valve sizing on dynamic simulations with rigorous modelling of the heat transfer process in order to avoid grossly oversized PRVs
- Carefully consider if the vessel survival time actually benefits from an installed PRV by performing thermomechanical calculations of the vessel rupture time and taking the chosen material properties into account
- If the vessel rupture time is not significantly prolonged by the presence of a PRV, consider alternative means for protecting the vessel, such as e.g., insulation, fireproofing or even better, blowdown activated by fusible plugs or equivalent detection, deluge systems.

In case of protection against jet fire, never rely on a PRV; always consider alternative means of protection even if in conjunction with PRV (Ref. [14]). In particular for this project a blowdown system has been foreseen as an alternative means of protection against jet fire attack; however, additional protection (i.e.: fireproofing on vessel saddles) can be provided to furtherly reduce the risk of collapse.

3.2.1.1.1 Fire Heat Flux Modelling

The net heat flux (global) is calculated based on the Stefan–Boltzmann fire equation, being more appropriate to mimicking the jet-fire attack. The general formula is as follows:

$$Q_{fire} = \alpha_s \cdot \sigma \cdot \left(\varepsilon_f \cdot T_f^4 - \varepsilon_s \cdot T_s^4\right) + h_f \cdot \left(T_f - T_s\right)$$

Where:

- Q_{fire}: heat absorbed by a segment (W/m^2)
- σ: Stefan–Boltzmann constant, 5.67×10^{-8} ($W/m^2\ K^4$)
- T_f: flame temperature (K)
- T_{amb}: ambient temperature (K)
- h_f: flame convective heat transfer coefficient ($W/m^2\ K$)
- α_s: surface absorptivity
- ε_s: surface emissivity
- ε_f: flame emissivity
- T_s: segment temperature (K) (time dependent)

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	21
Cause:	Back pressure due to depressurisation blowdown
Consequence:	Potential for other users of hydrogen vent header to be unable to access vent due to back pressure.
Safeguards:	
Actions:	Carry out flare network back pressure analysis when detailed information is available in order to ensure all users can access hydrogen vent when required.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	Flare network back pressure analysis has been carried out. The maximum back pressure that can be reached during the worst scenario is 1.27 barg. For reference see “Attachment 1 - FEED HAZOP action n21”, which is part of the “Relief, Vent and Blowdown Report”. This value is well below all the pressure sources of the systems to be depressurized. Therefore, all users can access hydrogen vent when required.
Attachments:	
Issue Date (21/02/24)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice	Impradice Ciro
EPC HSE Lead	**Sign**
Carolina Caracciolo	CC
EPC Project Engineering Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.03.14 17:02:50 +01'00'

Base Load Power Hub (BLPH)

Relief, Vent and Blowdown Report

Document Number: 123A90-DDL-PR-RE-80030

Document Class: 1

01	05/02/2024	Accepted for Construction (AFC)	CIM	RZI	DLO
00	04/12/2023	Issue for Acceptance (IFA)	CIM	RZI	DLO
Rev.	Date	Description	Prepared	Reviewed	Approved

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maintenance and/or mitigation systems such as external insulation, depressuring systems, isolation of leaks, equipment and/or flange orientation and minimization and emergency response. On the other hands, unlike pool fire, a jet fire can, in essence, be "turned off" through isolation and depressurization of the jet fire source. Moreover, multiple studies show that in many cases, the installation of a PRV offers little or no protection therefore it provides an unfounded sense of security. Often and in many cases the vessel wall is weakened by high temperatures, before the PRV relieving pressure is reached. Thus, a transient thermomechanical response analysis has been carried out to accurately determine vessel rupture time. In general, it is demonstrated worldwide that only vessels with relatively thick walls may get a benefit from the presence of a PRV, while for most cases no appreciable increase in the vessel survival time beyond the onset of relief is observed.

Therefore, as mentioned before, we recommend that extreme caution should be taken, if and when designing relief systems for gas-filled vessels, and we propose the following recommendations:

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- If the vessel rupture time is not significantly prolonged by the presence of a PRV, consider alternative means for protecting the vessel, such as e.g., insulation, fireproofing or even better, blowdown activated by fusible plugs or equivalent detection, deluge systems.

In case of protection against jet fire, never rely on a PRV; always consider alternative means of protection even if in conjunction with PRV (Ref. [14]). In particular for this project a blowdown system has been foreseen as an alternative means of protection against jet fire attack; however, additional protection (i.e.: fireproofing on vessel saddles) can be provided to furtherly reduce the risk of collapse.

3.2.1.1.1 Fire Heat Flux Modelling

The net heat flux (global) is calculated based on the Stefan–Boltzmann fire equation, being more appropriate to mimicking the jet-fire attack. The general formula is as follows:

$$Q_{fire} = \alpha_s \cdot \sigma \cdot \left(\varepsilon_f \cdot T_f^4 - \varepsilon_s \cdot T_s^4\right) + h_f \cdot \left(T_f - T_s\right)$$

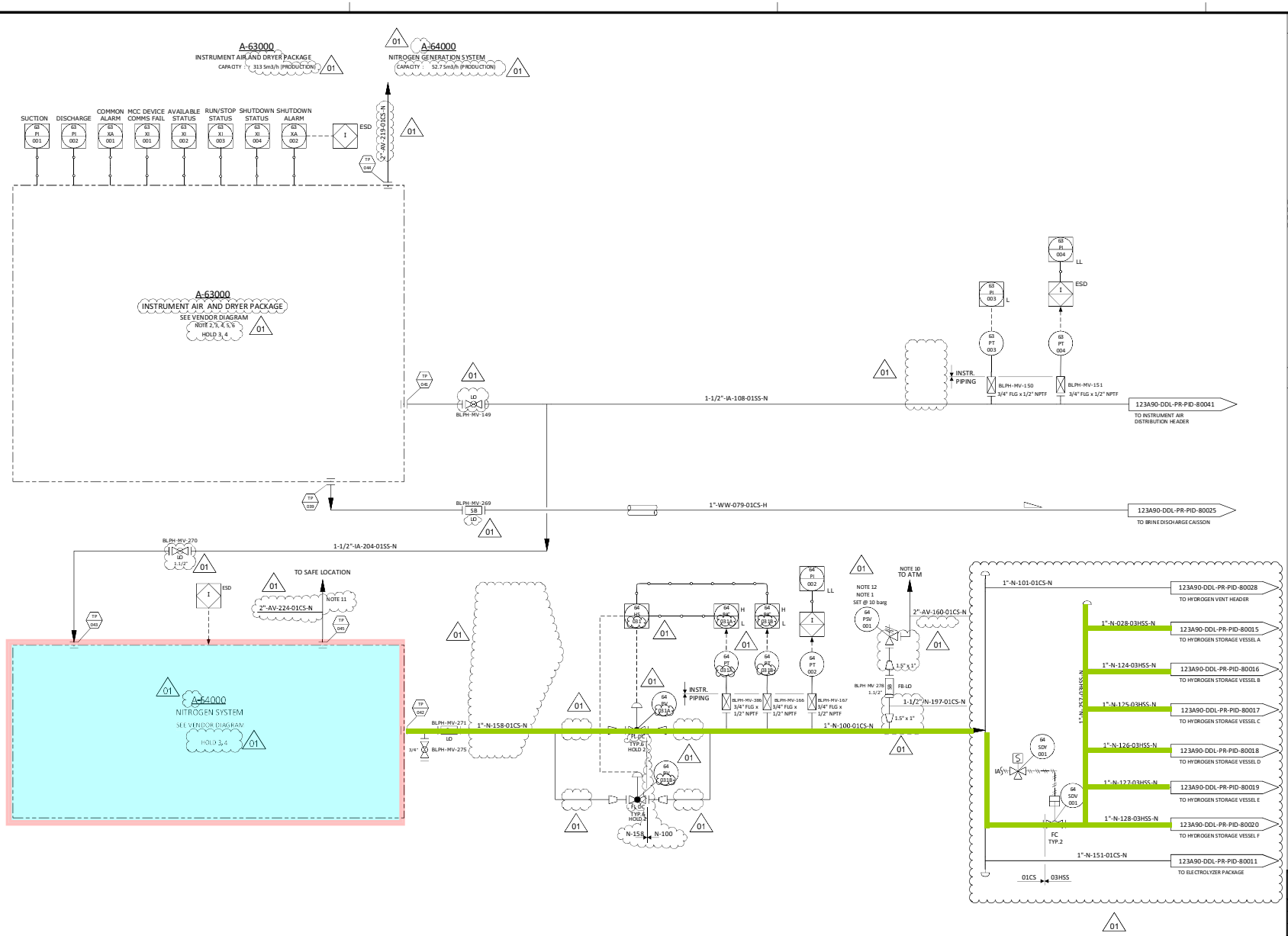
Where:

- Q_{fire}: heat absorbed by a segment (W/m^2)
- σ: Stefan–Boltzmann constant, 5.67×10^{-8} ($W/m^2\ K^4$)
- T_f: flame temperature (K)
- T_{amb}: ambient temperature (K)
- h_f: flame convective heat transfer coefficient ($W/m^2\ K$)
- α_s: surface absorptivity
- ε_s: surface emissivity
- ε_f: flame emissivity
- T_s: segment temperature (K) (time dependent)

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	22
Cause:	Restart of individual package/component after maintenance.
Consequence:	Potential for Air within hydrogen vent header & start- up, leading to possible hydrogen air mix & potential explosion & risk to personnel & asset.
Safeguards:	
Actions:	Review means of sweeping residual air within hydrogen vent header prior to reintroduction of item/package that will shut down for maintenance.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	Sweeping of residual air within hydrogen vent header prior to reintroduction of item/package (that will shut down for maintenance) has been provided. The sweeping of residual air will be performed by means of nitrogen, that will be taken from the Nitrogen Package (A-64000). For reference see PID "123A90-DDL-PR-PID-80027_01", attachment 1. The sweeping of the residual air will be performed through the H2 Storage Vessels (where a permanent nitrogen connection is provided). The inventory, which could contain residual air, will be then vented up to the exit of the H2 vent Q-43004.
Attachments:	
Issue Date	28-02-2024

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice	Ciro Impradice Autore firma digitale: Ciro Impradice Nome distintivo: GN = Ciro Impradice email = ciro.impradice@rosetti.it C = IT O = RosettiMarino SpA Process Data: 2024.05.15 14:29:48 +02'00'
EPC HSE Lead	**Sign**
C.Caracciolo	CC
EPC Project Manager	**Sign**
D.Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.06.24 08:04:30 +02'00'



NOTES

1. ONE UNINSTALLED SPARE PSV SHALL BE AVAILABLE.
2. COMPRESSORS AND DRIERS DESIGNED FOR 2 X 100% CONFIGURATION. INSTRUMENT AIR RECEIVER DESIGNED FOR 1 X 100%.
3. VENDOR TO PROVIDE NECESSARY CONTROLS, INSTRUMENTATIONS AND ISOLATIONS IN ORDER TO OPERATE THE PLANT IN SAFE MANNER.
4. COMPRESSORS WILL OPERATE ON THE BASIS OF ONE WORKING AND ONE ON STANDBY.
5. COMPRESSORS TO BE SCREW TYPE OIL FREE.
6. AIR COMPRESSOR INLET TO BE LOCATED AWAY FROM ANY VENTS.
7. DELETED.
8. DELETED.
9. DELETED.
10. TO SAFE LOCATION, ROUTED AWAY FROM WALKWAYS.
11. THE LINE 2"-AV-224-01CS-N IS PREDOMINATELY OXYGEN.
12. 64PSV001 SIZED FOR UPSTREAM CV FAILURE..

01

HOLDS

1. DELETED.
2. CONTROL VALVE SIZE (BY VENDOR).
3. CONTROL INTERFACES SHOWN FOR THE PACKAGES ARE IN HOLD UNTIL ALL DETAILS ARE PROVIDE BY THE RESPECTIVE VENDORS AND CONFIRMED.
4. VENDOR DOCUMENT NUMBER.

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM
INSTRUMENT AIR PACKAGE

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80027		SHEET 001	REV. 01

DRAWING NO. DRAWING_NO.

REV. REV.

File Name : FILE_NAME

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	23
Cause:	P-50001A failure
Consequence:	Loss of flow towards sea water coarse filter, also to electro chlorination package, leading to loss of production of hypochlorite. Loss of sea water flow to ultra-filtration unit, filtered sea water tank, desalination unit, leading to unknown consequences to desalination unit.
Safeguards:	Low' Pressure alarm on discharge of P- 50001A. 'Low level' alarm on filtered sea water tank, T- 50006. 'LL' trip on filtered sea water tank , T- 50006. Standby pump P-50001B
Actions:	Consider loss of flow of sea water in desalination unit HAZOP Package.
Assigned Respondent (By)	Rosetti Mechanical
RESPONSE	Case of loss flow of sea water have been assessed during the HAZOP sessions. See attachment
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
F.Mura	
EPC HSE Lead	**Sign**
C.Caracciolo	**CC**
EPC Project Manager	**Sign**
D. Lo Sterzo	
Client	**Sign**

Digitaal ondertekend door Paul van Rossum
Datum: 2024.09.03 16:17:41 +02'00'

Node: 4. Hydrogen Vent System

Deviation	Cause	Consequence	Hazard Register	SIF Summation - Threat	RAM Score				LOPA?	Barriers			Recommendation	Responsibility	ALARP Determination
					R	S	L	RR		Barrier Tag	Barrier Description	Validity			
4.17. Catalysts	4.17.1. No credible causes														
4.18. Utilities	4.18.1. Loss of Power	4.18.1.1. Loss of heat tracing to instrumentation and seal pot. See 4.8.1 and 4.11.1: Cause: 4.11.1 Cause: 4.8.1													
	4.18.2. Loss of Nitrogen Supply	4.18.2.1. See No flow from N2 system 4.1.11: Cause: 4.1.11													
	4.18.3. Loss of Instrument Air	4.18.3.1. 43LV001 moves to air fail position.											42. Make air fail position of 43LV001 fail closed and type 6 (critical).	Rosetti Process	
4.19. Corrosion/Erosion	4.19.1. No additional causes.														
4.20. Other	4.20.1. Lute provision on base of stack within Rosetti Package	4.20.1.1. Refer to Recommendation.											28. Review the requirement for a Lute within the Elogen Package H2 vent system as the package vent discharge is via a knockout pot V43001 within the Rosetti scope. If Elogen Lute not required consider removal of the Elogen package Lute.	Crosswind	

Node: 5. Seawater and Treated Water Systems

Deviation	Cause	Consequence	Hazard Register	SIF Summation - Threat	RAM Score				LOPA?	Barriers			Recommendation	Responsibility	ALARP Determination
					R	S	L	RR		Barrier Tag	Barrier Description	Validity			
5.1. Flow No/Less	5.1.1. Blocked Caisson B-50013A (Marine debris or marine life)	5.1.1.1. Unable to pull seawater into system and damage to pump P-50001A or Caisson.	Asset Damage to Pump(s)		A	1	C	1C		50-XA001	Trip/Fault alarm on pump P-50001A				
										Spare Seawater Pump	2 x 100% capacity with automatic changeover.				
		5.1.1.2. No flow into seawater treatment system.													
	5.1.2. P-50001A pump tripped Consequence: 5.1.3.2 Consequence: 5.18.1.1	5.1.2.1. No flow into coarse filter package A-50003 resulting in failure of backwash cycle, operational issue requiring additional backwash cycles. No hazardous consequences.								50-XA001	Trip/Fault alarm on pump P-50001A		43. Update the control narrative to identify alternate seawater lift pump auto-start on 50-PI001/002 low pressure alarm or 50-XA001/003 trip/fault alarm.	Rosetti Instrumentation	
										50-PI001	Low Pressure alarm in discharge of P-50001A				
		5.1.2.2. No flow into T-50006 treated seawater tank leading to potential low level in tank resulting in loss of flow to desalination unit A-50007. No hazardous consequences.								50-XA001 / 50-XA003	Trip/Fault alarm on pump P-50001A/B				
										50-PI001	Low Pressure alarm in discharge of P-50001A				
										50-LI020L	Low level alarm on T-50006				
										50-LI020LL	Low low level trip on T-50006. Trips P-50002A/B and P-50003A/B				
	5.1.3. 50-XV001 fails closed / BLPH-MV-043 inadvertently closed	5.1.3.1. Block discharged of P-50001A leading to potential damage to pump.	Asset Damage to Pump(s)		A	1	C	1C		50-PI001	High Pressure alarm in discharge of P-50001A				
										50-PSV006	Relief valve on discharge of P-50001A				
		5.1.3.2. Loss of forward flow. See Cause: 5.1.2													
	5.1.4. 50-XV004 fails closed on return line on offline Pump / BLPH-MV-050 inadvertently closed	5.1.4.1. Loss of biocide dosed water to P-50001B leading to potential for bacterial growth and clogging of seawater system, operational issue. No hazardous consequences.													
	5.1.5. Inadvertent closure of MV-500	5.1.5.1. Potential deadheading of pumps P-50001A/B and exceeding DP of pipework with LOC of sea water. Potential flooding of WTP container. Damage to electrical equipment within container. Asset damage. Consequence: 5.1.6.1	Asset Damage to Electrical Equipment		A	1	B	1B		50-PSV011	Design for blocked outlet, set point 6 barg				
										50-PI020L	Low pressure alarm upstream of A-50003				
										50-FI020L	Low flow alarm upstream of S-50001				
					A	1	C	1C		50-PI020L	Low pressure alarm upstream of A-50003				

Node: 5. Seawater and Treated Water Systems

Deviation	Cause	Consequence	Hazard Register	SIF Summation - Threat	RAM Score				LOPA?	Barriers			Recommendation	Responsibility	ALARP Determination
					R	S	L	RR		Barrier Tag	Barrier Description	Validity			
		5.1.5.2. No flow to tank T-50006 potential low level in tank. Potential dry running of P-50002A/B resulting in damage to pump and asset damage to pump. Consequence: 5.1.6.1 Consequence: 5.2.3.1 Consequence: 5.2.4.1	Asset Damage to Pump (s)							50-FI020L	Low flow alarm upstream of S-50001				
										50-LI020L	Low level alarm on T-50006				
										50-LI020LL	Low low level trip on T-50006. Trips P-50002A/B and P-50003A/B				
		5.1.5.3. No flow to tank T-50006 potential low level in tank. Potential dry running of P-50003A/B resulting in damage to pump and asset damage to pump. Consequence: 5.1.6.1 Consequence: 5.2.3.1 Consequence: 5.2.4.1	Asset Damage to Pump (s)		A	1	C	1C		50-PI020L	Low pressure alarm upstream of A-50003				
										50-FI020L	Low flow alarm upstream of S-50001				
										50-LI020L	Low level alarm on T-50006				
										50-LI020LL	Low low level trip on T-50006. Trips P-50002A/B and P-50003A/B				
		5.1.5.4. No flow through H-50001. Potential overheating of PVC pipework (DT 60 degC) with damage to pipework and interuption of operation. Consequence: 5.1.6.1 Consequence: 5.2.3.1 Consequence: 5.2.4.1	Asset damage		A	1	C	1C		50-PI020L	Low pressure alarm upstream of A-50003				
										50-FI020L	Low flow alarm upstream of S-50001				
										50-TAAH20	High temperature trip (110 degC) of H-50001. Trip setting is internal to heater and appropriate for heater design temperature.				
		5.1.5.5. Continued dosage of biocide into stagnant system, potential overdose of biocide to downstream system. No significant hazard as biocide is removed by reverse osmosis unit.													
	5.1.6. Closure of 50-XV020 out of sequence Consequence: 5.1.7.1 Consequence: 5.1.8.1 Consequence: 5.1.9.1 Consequence: 5.1.10.1 Consequence: 5.1.11.1 Consequence: 5.1.12.1 Consequence: 5.1.13.1 Consequence: 5.18.3.2	5.1.6.1. See Consequence: 5.1.5.2 Consequence: 5.1.5.1 Consequence: 5.1.5.3 Consequence: 5.1.5.4													
		5.1.6.2. Potential reverse flow of sea water to biocide dosing. Potential over flow of concentrated biocide into waste water tank. Potential over flow of waste water tank T-55001 to sea, potential environmental incident.	Ethylene Glycol		E	3	B	3B		NRV-504	NRV in WTP inlet line				
										NVR-606 / NRV-612	NRV in P-50007A/B discharge				
										55-LI001H	High level alarm on T-55001				
										50-FI020L	Low flow alarm upstream of S-50001				
	5.1.7. High DP on coarse filter A-50003 Failure to initiate cleaning sequence. PDI failed.	5.1.7.1. See Cause: 5.1.6													
	5.1.8. No flow when required through coarse filter drain valve	5.1.8.1. Failure in cleaning sequence with build up of solids in coarse filter. See Cause: 5.1.6								50-XAA50003	General alarm from A-50003 package				
	5.1.9. Inadvertent closure of MV-506	5.1.9.1. See Cause: 5.1.6													
	5.1.10. Internal valve closure within S-50001. Potential failure 50-PDI023	5.1.10.1. See Cause: 5.1.6													
		5.1.10.2. Potential reverse flow through P-50002A/B into T-50006 bypassing sand filter S-50001. High load on cartdrige filters S-50002A/B and S-50003A/B reducing operational lifetime. Operational issue potentially requring early replacement of cartdridge filters.								NRV-512 / NRV-515 / NRV-518	NRV on P-50002A/B discharge				
										50-PDI024H / 50-PDI029H	High DP across S-50002A/B and S-50003A/B				
										50-XAS-50001	General alarm from S-50001 package				

Node: 5. Seawater and Treated Water Systems

Deviation	Cause	Consequence	Hazard Register	SIF Summation - Threat	RAM Score				LOPA?	Barriers			Recommendation	Responsibility	ALARP Determination
					R	S	L	RR		Barrier Tag	Barrier Description	Validity			
	5.1.11. No flow when required through sand filter drain valve. Valve not shown on P&ID	5.1.11.1. Failure in backwash operation with build up of solids in sand filter. See Cause: 5.1.6								50-PDI023H	High DP across S-50001 unit				
		5.1.11.2. Deadheading of P-50002A/B. Potential damage to pumps and asset damage.	Asset Damage to Pump (s)		A	1	C	1C		50-FI020L	Low flow alarm upstream of S-50001				
										50-XAS-50001	General alarm from S-50001 package				
										50-PDI023H	High DP across S-50001 unit				
	5.1.12. High DP on sand filter S-50001. Failure of 50-PDI023 to initiate back wash sequence	5.1.12.1. Failure in backwash operation with build up of solids in sand filter. See Cause: 5.1.6								50-FI020L	Low flow alarm upstream of S-50001				
										50-LI020L	Low level alarm on T-50006				
										50-LI020LL	Low low level trip on T-50006. Trips P-50002A/B and P-50003A/B				
	5.1.13. Inadvertent closure of MV-509	5.1.13.1. Loss of forward flow through sand filter. See Cause: 5.1.6								50-FI020L	Low flow alarm upstream of S-50001				
										50-LI020L	Low level alarm on T-50006				
										50-LI020LL	Low low level trip on T-50006. Trips P-50002A/B and P-50003A/B				
	5.1.14. Inadvertent closure of MV-514 on backwash loop	5.1.14.1. Failure in backwash operation with build up of solids in sand filter and eventual blockage of sand filters. Operational issue								50-FI020L	Low flow alarm upstream of S-50001				
										P-50002A/B	Installed spare				
		5.1.14.2. Loss of NPSH to pumps P-50002A/B resulting in caviation and damage to pumps	Asset Damage to Pump (s)		A	1	C	1C		50-FI020L	Low flow alarm upstream of S-50001				
	5.1.15. P-50002A stopped	5.1.15.1. Failure in backwash operation with build up of solids in sand filter and eventual blockage of sand filters. Operational issue								50-FI020L	Low flow alarm upstream of S-50001				
										P-50002A/B	Installed spare				
	5.1.16. Inadvertent closure of MV-516 on backwash loop	5.1.16.1. Failure in backwash operation with build up of solids in sand filter and eventual blockage of sand filters. Operational issue								50-FI020L	Low flow alarm upstream of S-50001				
										P-50002A/B	Installed spare				
		5.1.16.2. Deadheading of pumps P-50002A/B resulting in damage.	Asset Damage to Pump (s)		A	1	C	1C		50-FI020L	Low flow alarm upstream of S-50001				
	5.1.17. Inadvertent closure of MV-xxx on backwash loop	5.1.17.1. Failure in backwash operation with build up of solids in sand filter and eventual blockage of sand filters. Operational issue								50-FI020L	Low flow alarm upstream of S-50001				
		5.1.17.2. Deadheading of pumps P-50002A&B resulting in damage.	Asset Damage to Pump (s)		A	1	C	1C		50-FI020L	Low flow alarm upstream of S-50001				
	5.1.18. 50-XV021 closed failure in filter change over operation	5.1.18.1. High level in T-50006 potential overflow of tank to sea water caisson. No hazardous consequences.								50-LI020H	High level alarm on T-50006				
		5.1.18.2. Dry running of pumps P-50003A/B and loss of flow to P-50004A/B. Damage to pumps P-50003A/B and P-50004A/B.	Asset Damage to Pump (s)		A	1	C	1C		50-PI025L / 50-PI027L	Low pressure alarm at discharge of P-50003A/B		49. 50-LI020LL should trip P-50004A/B on LL level in T-50006 to prevent pump damage	PSC	
										50-FI022L / 50-FI023L	Low flow alarm at discharge of P-50003A/B				
		5.1.18.3. Loss of pressure to RO units A-50007A/B. No hazardous consequences.								50-PIC030L / 50-PIC032L	Low pressure on discharge of P-50004A/B				
		5.1.18.4. Loss of flow into T-50008. Loss of level in T-50008. Operational issue.								50-LI021L	Low level alarm on T-50008				
										50-LI021LL	Low low level trip on T-50008. Trips P-50009A/B and P-50003A/B when in flushing mode.				
	5.1.19. P-50003A stopped	5.1.19.1. High level in T-50006 potential overflow of tank to sea water caisson. No hazardous consequences.								50-LI020H	High level alarm on T-50006				
					A	1	C	1C		50-PI025L / 50-PI027L	Low pressure alarm at discharge of P-50003A/B			PSC	

Node: 5. Seawater and Treated Water Systems

Deviation	Cause	Consequence	Hazard Register	SIF Summation - Threat	RAM Score				LOPA?	Barriers			Recommendation	Responsibility	ALARP Determination
					R	S	L	RR		Barrier Tag	Barrier Description	Validity			
		5.1.19.2. Loss of pressure at inlet to P-50004A/B. Loss of forward flow through cartdrige filters. Asset damage to pumps and pipework.	Asset Damage to Pump (s)							50-FI022L / 50-FI023L	Low flow alarm at discharge of P-50003A/B		49. 50-LI020LL should trip P-50004A/B on LL level in T-50006 to prevent pump damage		
										50-PIC030L / 50-PIC032L	Low pressure alarm at discharge of P-50004A/B				
		5.1.19.3. Loss of pressure to RO units A-50007A/B. No hazardous consequences.								50-PIC030L / 50-PIC032L	Low pressure on discharge of P-50004A/B				
		5.1.19.4. Loss of flow into T-50008. Loss of level in T-50008. Operational issue.								50-LI021L	Low level alarm on T-50008				
										50-LI021LL	Low low level trip on T-50008. Trips P-50009A/B and P-50003A/B when in flushing mode.				
	5.1.20. MV-527 inadvertently closed Consequence: 5.1.21.1	5.1.20.1. Blocked discharge of P-50003A. Deadhead pressure of pump less than DP of pipework. No LOC. Potential damage to pump.	Asset Damage to Pump (s)		A	1	C	1C		50-PI025L / 50-PI027L	Low pressure alarm at discharge of P-50003A/B				
										50-FI022L / 50-FI023L	Low flow alarm at discharge of P-50003A/B				
		5.1.20.2. Loss of pressure at inlet to P-50004A/B. Loss of forward flow through cartdrige filters. Asset damage to pumps and pipework.	Asset Damage to Pump (s)		A	1	C	1C		50-PI025L / 50-PI027L	Low pressure alarm at discharge of P-50003A/B		49. 50-LI020LL should trip P-50004A/B on LL level in T-50006 to prevent pump damage	PSC	
										50-FI022L / 50-FI023L	Low flow alarm at discharge of P-50003A/B				
										50-PIC030L / 50-PIC032L	Low pressure alarm at discharge of P-50004A/B				
		5.1.20.3. Loss of pressure to RO units A-50007A/B. No hazardous consequences.								50-PIC030L / 50-PIC032L	Low pressure on discharge of P-50004A/B				
		5.1.20.4. Loss of flow into T-50008. Loss of level in T-50008. Operational issue.								50-LI021L	Low level alarm on T-50008				
										50-LI021LL	Low low level trip on T-50008. Trips P-50009A/B and P-50003A/B when in flushing mode.				
	5.1.21. S-50002A / S-50003A fouled	5.1.21.1. Reduced flow to RO cells. Similar but less impact. See Cause: 5.1.20								50-PDI024H / 50-PDI029H	High DP across S-50002A/B and S-50003A/B				
	5.1.22. MV-531 inadvertently closed	5.1.22.1. Blocked discharge of P-50003A. Deadhead pressure of pump less than DP of pipework. No LOC. Potential damage to pump.	Asset Damage to Pump (s)		A	1	C	1C		50-FI022L / 50-FI023L	Low flow alarm at discharge of P-50003A/B				
		5.1.22.2. Loss of pressure at inlet to P-50004A/B. Loss of forward flow through cartdrige filters. Asset damage to pumps and pipework.	Asset Damage to Pump (s)		A	1	C	1C		50-FI022L / 50-FI023L	Low flow alarm at discharge of P-50003A/B		49. 50-LI020LL should trip P-50004A/B on LL level in T-50006 to prevent pump damage	PSC	
										50-PIC030L / 50-PIC032L	Low pressure alarm at discharge of P-50004A/B				
		5.1.22.3. Loss of pressure to RO units A-50007A/B. No hazardous consequences.								50-PIC030L / 50-PIC032L	Low pressure on discharge of P-50004A/B				
		5.1.22.4. Loss of flow into T-50008. Loss of level in T-50008. Operational issue.								50-LI021L	Low level alarm on T-50008				
										50-LI021LL	Low low level trip on T-50008. Trips P-50009A/B and P-50003A/B when in flushing mode.				
	5.1.23. P-50004A stopped	5.1.23.1. Loss of inlet pressure to RO cells and loss of forward flow to T-50008. Operational issue. Forward flow continues through flushing valve and concentrate line. Water discharge to sea water caisson.								50-FI022L / 50-FI023L	Low flow alarm at discharge of P-50003A/B				
										50-PIC030L / 50-PIC032L	Low pressure alarm at discharge of P-50004A/B				
										50-FI024L	Low discharge flow from RO cells.				
	5.1.24. A-50007A fouled	5.1.24.1. Potential over pressure of RO cells with LOC from RO cells or inlet pipework into WTP container. Asset damage.	Asset Damage to Electrical Equipment		A	1	B	1B		50-PIC030	Discharge pressure control of P-50004A				
										50-PSV035	Pressure relief valve on P50004A. Designed for full flow relief				
	5.1.25. MV-xxx inadvertently closed Consequence: 5.1.26.1	5.1.25.1. Potential over pressure of RO cells discharge with LOC from PU pipework into WTP container. Asset damage.	Asset Damage to Electrical Equipment		A	1	B	1B		50-PSV036	Pressure relief valve designed for full flow relief downstream of A-50007A				
										50-FI024L	Low discharge flow from RO cells.				
	5.1.26. 50-XV025 closed	5.1.26.1. See Cause: 5.1.25													
	5.1.27. 50-XV026 fails to open when required. Failure of	5.1.27.1. Potential off spec water fed to Elogen water treatment. Potential fouling of Elogen RO cells and											48. Review the effect of out of spec water fed to Elogen RO cells based on a temperature at the PSC RO cells of 40 degC with the chloride concentration based on this temperature. Identify in the	Rosetti Process / Crosswind / PSC / Elogen	

Node: 5. Seawater and Treated Water Systems

Deviation	Cause	Consequence	Hazard Register	SIF Summation - Threat	RAM Score				LOPA?	Barriers			Recommendation	Responsibility	ALARP Determination
					R	S	L	RR		Barrier Tag	Barrier Description	Validity			
	conductivity control 50-AI024	loss of purified water to electrolysis unit. Operational issue.											Elogen HAZOP if it is credible that chloride is fed through to the electrolysis cells or if this is only an operational impact on RO cell performance (current assumption). If there is adverse impact on the cells, review if LOPA is required for this failure in the Rosetti HAZOP.		
	5.1.28. 50-XV027 closed whilst flushing	5.1.28.1. Low flushing flow through RO cells. Potential degradation of RO cells due to poor flushing. Operational issue. Forward flow continues through flushing valve and concentrate line. Water discharge to sea water caisson.								50-FI022L / 50-FI023L	Low flow alarm at discharge of P-50003A/B				
	5.1.29. MV-550 incorrectly set	5.1.29.1. Potential over pressure of RO cells with LOC from RO cells or inlet pipework into WTP container. Asset damage.	Asset Damage to Electrical Equipment		A	1	B	1B		50-PIC030	Discharge pressure control of P-50004A				
										50-PSV035	Pressure relief valve on P50004A. Designed for full flow relief				
	5.1.30. MV-561 inadvertently closed	5.1.30.1. Blocked inlet to P-50009A/B loss of NPSH to pumps and cavitation with potential for pump damage.	Asset Damage to Pump (s)		A	1	C	1C		50-PI047L	Low pressure alarm at discharge of P-50009A/B				
										50-FI028L	Low flow alarm on outlet of WTP unit				
		5.1.30.2. Loss of forward flow to electrolysis unit. Operational issue. No hazardous consequence.								50-FI028L	Low flow alarm on outlet of WTP unit				
		5.1.30.3. Potential overflow of T-50008 with overflow of fresh water to brine caisson. No hazardous consequences.								50-LI021H	High level alarm on T-50008				
	5.1.31. P-50009A/B not running	5.1.31.1. Loss of forward flow to electrolysis unit. Operational issue. No hazardous consequence.								50-FI026L	Low flow alarm on outlet of WTP unit				
		5.1.31.2. Potential overflow of T-50008 with overflow of fresh water to brine caisson. No hazardous consequences.								50-LI021H	High level alarm on T-50008				
		5.1.31.3. Potential reverse flow from electrolysis unit. Potential overflow of T-50008 with overflow of fresh water to brine caisson. No hazardous consequences.								NRV-562 / NRV-565	Non return valves on discharge of P-50009A/B				
		5.1.31.4. Potential overdose of caustic into fresh water system due to distance between dosing point and PH analysis								P-50005A/B stopped	Interlock of pump running signal with caustic dosing pump P-50005A/B				
	5.1.32. MV-563 / MV-566 inadvertently closed	5.1.32.1. Deadheading of P-50009A/B (7barg) potential overpressure of pump discharge pipe work (DP 6barg). Pump damage and potential LOC of fresh water within WTP container.	Asset Damage to Pump (s)		A	1	C	1C		50-FI026L	Low flow alarm on outlet of WTP unit		52. Determine how overpressure of fresh water system can be prevented should P-50009A/B be isolated on the downstream side as deadhead pressure of these pumps is 7barg and the design pressure of downstream system is 6barg.	PSC	
		5.1.32.2. Potential overflow of T-50008 with overflow of fresh water to brine caisson. No hazardous consequences.								50-LI021H	High level alarm on T-50008				
		5.1.32.3. Loss of forward flow to electrolysis unit. Operational issue. No hazardous consequence.								50-FI026L	Low flow alarm on outlet of WTP unit				
		5.1.32.4. Potential overdose of caustic into fresh water system due to distance between dosing point and PH analysis								None available	Interlock of pump running signal with caustic dosing pump P-50005A/B not a safeguard as pump is still running				
	5.1.33. S-50004 clogging not considered credible														
	5.1.34. MV-569 inadvertently closed Consequence: 5.1.35.1 Consequence: 5.1.36.1	5.1.34.1. Deadheading of P-50009A/B (7barg) potential overpressure of pump discharge pipe work (DP 6barg). Pump damage and potential LOC of fresh water within WTP container.	Asset Damage to Pump (s)		A	1	C	1C		50-FI026L	Low flow alarm on outlet of WTP unit		52. Determine how overpressure of fresh water system can be prevented should P-50009A/B be isolated on the downstream side as deadhead pressure of these pumps is 7barg and the design pressure of downstream system is 6barg.	PSC	
										50-PI046H	High pressure alarm on inlet to S-50004				
		5.1.34.2. Potential overflow of T-50008 with overflow of fresh water to brine caisson. No hazardous consequences.								50-LI021H	High level alarm on T-50008				
		5.1.34.3. Loss of forward flow to electrolysis unit. Operational issue. No hazardous consequence.								50-FI026L	Low flow alarm on outlet of WTP unit				

Node: 5. Seawater and Treated Water Systems

Deviation	Cause	Consequence	Hazard Register	SIF Summation - Threat	RAM Score				LOPA?	Barriers			Recommendation	Responsibility	ALARP Determination
					R	S	L	RR		Barrier Tag	Barrier Description	Validity			
		5.1.34.4. Potential overdose of caustic into fresh water system due to distance between dosing point and PH analysis. Potential overpressure of system due to pressure of caustic dosing pump P-50005A/B. Potential LOC of fresh water / caustic (2% concentration) within WTP container.	Asset Damage to Electrical Equipment		A	1	B	1B		None available	Interlock of pump running signal with caustic dosing pump P-50005A/B not a safeguard as pump is still running				
										50-PI046H	High pressure alarm on inlet to S-50004				
										Multi-function valve downstream of P-50005A/B	Multi-function valve (also acting as relief valve) downstream of P-50005A/B				
	5.1.35. 50-XV031 closed	5.1.35.1. See Cause: 5.1.34													
	5.1.36. BLPH-MV-001 inadvertently closed	5.1.36.1. See Cause: 5.1.34													
5.2. Flow More	5.2.1. P-50009A & B both operating	5.2.1.1. Potential overfill of Elogen WTP-300 and further consequences to be determined in WTP HAZOP.											54. Ensure logic for control of P-50009A/B prevents simultaneous running A & B pumps.	Rosetti Process	
		5.2.1.2. Off spec purified water to Electrolyser leading to permanent damage of Electrolyser stacks. See Elogen HAZOP 1.13.									See Elogen Package for barriers against off spec water from WTP.				
	5.2.2. P-50001A & B both operating	5.2.2.1. High flowrate into T-50006 leading to potential overfill of T-50006 Filtered seawater tank and sending filtered chlorinated water overboard. Operational issue, no hazardous consequences.								50-LIC006A/B	High level alarm on filtered sea water tank.				
		5.2.2.2. Review within Seawater Coarse Filter package HAZOP A-50003 the consequences of high flow through the package when package is in operation.													
		5.2.2.3. Review within Electro-Chlorination package HAZOP A-50002 the consequences of high flow through the package when package is in operation.													
		5.2.2.4. Review within Ultra Filtration package HAZOP A50005 the consequences of high flow through the package when package is in operation.													
	5.2.3. Flow when not required through coarse filter drain valve	5.2.3.1. Loss of forward flow to T-50006. See Consequence: 5.1.5.2 Consequence: 5.1.5.3 Consequence: 5.1.5.4													
		5.2.3.2. Lift pump flow directed to water drain (brine discharge caisson). No significant hazard consequences													
	5.2.4. Flow when not required through sand filter drain valve	5.2.4.1. Loss of forward flow to T-50006. See Consequence: 5.1.5.2 Consequence: 5.1.5.3 Consequence: 5.1.5.4													
		5.2.4.2. Lift pump flow directed to water drain (brine discharge caisson). No significant hazard consequences													
	5.2.5. P-50002A/B running when not required (not on backwash sequence). Failure of back wash sequence	5.2.5.1. Deadheading of pumps P-50002A&B resulting in damage. Dead head pressure of pumps is less than pressure in main flow line from sea water lift pumps	Asset Damage to Pump (s)		A	1	C	1C		None Identified					
	5.2.6. P-50002A&B running when on backwash sequence	5.2.6.1. Higher flow through sand filters. No hazardous consequences								50-FI020H	High flow alarm upstream of sand filter				
	5.2.7. RO stream A and B both running. Not considered														

Node: 5. Seawater and Treated Water Systems

Deviation	Cause	Consequence	Hazard Register	SIF Summation - Threat	RAM Score				LOPA?	Barriers			Recommendation	Responsibility	ALARP Determination
					R	S	L	RR		Barrier Tag	Barrier Description	Validity			
	credible as this would require local override														
	5.2.8. 50-PIC030 failure running P-50004A faster than required	5.2.8.1. Potential over pressure of RO cells with LOC from RO cells or inlet pipe work into WTP container. Asset Damage to Electrical Equipment			A	1	B	1B		50-PSV035	Pressure relief valve on P50004A. Designed for full flow relief				
	5.2.9. MV-550 incorrectly set	5.2.9.1. More flow than required through MV-550. Operational issue. Low forward flow continues through flushing valve and concentrate line. Water discharge to sea water caisson.								50-FI024L	Low flow alarm at RO discharge				
	5.2.10. P-50009A&B running	5.2.10.1. Loss of level in T-50008 with eventual dry running of pumps P-50009A/B and loss of flow to electrolysis unit. Damage to pumps P-50009A/B.	Asset Damage to Pump (s)		A	1	C	1C		50-LI021L	Low level alarm on T-50008		49. 50-LI020LL should trip P-50004A/B on LL level in T-50006 to prevent pump damage	PSC	
										50-LI021LL	Low low level trip on T-50008. Trips P-50009A/B				
5.3. Flow Misdirected	5.3.1. 50-XV002 Driven open on pump discharge	5.3.1.1. Restricted orifice behind valve will minimise flow no significant consequences.													
	5.3.2. 50-XV003 Driven open on offline pump discharge	5.3.2.1. Reduced forward flow with water recycled to offline caisson. Operational issue, no hazardous consequences.								BLPH-NRV-008	NRV restricts reverse flow.				
	5.3.3. 50-SV020 open during backwash sequence	5.3.3.1. Wash water directed to sea via lift pump caissons. Emptying of tank T-50006. Potential dry running of P-50003A/B resulting in damage to pump and asset damage to pump.	Asset Damage to Pump (s)		A	1	C	1C		50-FI020L	Low flow alarm upstream of S-50001				
										50-LI020L	Low level alarm on T-50006				
										50-LI020LL	Low low level trip on T-50006. Trips P-50002A/B and P-50003A/B				
										50-XZAL020	Loss of closed signal from limit switch				
	5.3.4. 50-XV022 open when not required on offline train	5.3.4.1. No significant consequences, insufficient pressure to forward flow of sea water to RO cell. No hazardous consequences. Offline train will be full of (flushing) water.													
	5.3.5. 50-XV026 open when not required	5.3.5.1. Reduced flow to T-50008 with water directed to brine caisson. No hazardous consequences.													
		5.3.5.2. Potential to drain T-50008 and run pumps P-50009A/B dry resulting in pump damage.	Asset Damage to Pump (s)		A	1	C	1C		50-LI021L	Low level alarm on T-50008				
										50-LI021LL	Low low level trip on T-50008. Trips P-50009A/B and P-50003A/B when in flushing mode.				
	5.3.6. 50-XV027 opening when not on flushing cycle	5.3.6.1. Reduced pressure within RO cells and reduced fresh water production. Water directed towards brine caisson. No hazardous consequences.								50-PIC030L	Low discharge pressure on discharge P-50004A		50. Ensure that where multiple trains are implemented within the WTP package remote changeover between trains is available to onshore operators on request.	Rosetti / CRW	
										50-FI024L	Low fresh water flow to T-50008				
										50-XZL027	Loss of closed signal from limit switch				
		5.3.6.2. Potential to drain T-50008 and run pumps P-50009A/B dry resulting in pump damage.	Asset Damage to Pump (s)		A	1	C	1C		50-LI021L	Low level alarm on T-50008				
										50-LI021LL	Low low level trip on T-50008. Trips P-50009A/B and P-50003A/B when in flushing mode.				
	5.3.7. 50-XV023 flushing valve open when not required	5.3.7.1. Linking of T-50006 and T-50008 with potential of contantamination of T-50008 with filtered sea water. Filtered sea water fed forward to electrolysis unit with potential damage to RO unit in electrolysis package.	Asset damage		A	1	C	1C		50-AI026H	High total hardness alarm		51. Add an NRV in the flushing water line between T-50008 and 50-XV023 / 50-XV024 to prevent reverse flow in the flushing line and potential contamination of T-50008 with filtered brine from T-50006.	PSC	
										50-AI026HH	High high total hardness trip diverts RO cell output to brine caisson. Closing 50-XV031 and opening 50-XV032.				
										50-XZL023	Loss of closed signal from limit switch				
	5.3.8. 50-XV032 open when not required. Potential failure of 50-AI026 / 50-AI027	5.3.8.1. Purified water directed to brine caisson. No hazardous consequences. Loss of purified water to electrolysis unit.								50-XZL032	Loss of closed signal from limit switch				
	5.3.9. Drain valve S-50004 package open when not required	5.3.9.1. Purified water directed to brine caisson. No hazardous consequences. Loss of purified water to electrolysis unit.								50-XAS50004	General package alarm				

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	24
Cause:	P-50001A failure
Consequence:	Loss of flow to UV water filter. Loss of flow to electrolyser, leading to unknown consequences within electrolyser. Potential backflow from electrochrlorification unit due to unknown cause.
Safeguards:	Low Pressure alarm on discharge of P- 50009A.Low level alarm on fresh water tank, T-50008. 'LL' trip on fresh water tank , T-50008. Low Pressure alarm on outlet of P-50001A Non return valve Downstream of P-50001A
Actions:	Consider loss of fresh water to electro chlorination package and potential backflow from electrochrlorification unit in package HAZOP.
Assigned Respondent (By)	ROSETTI Mechanical
RESPONSE	Electro chlorination have been replace with non oxidizing biocide unit. This recommendations is superseded
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
F.Mura	
EPC HSE Lead	**Sign**
C.Caracciolo	**CC**
EPC Project Manager	**Sign**
D. Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.09.03 16:18:27 +02'00'

47	**ELECTRO-CHLORINATOR**			**REPLACED WITH NON OXIDIZING BIOCIDE DOSING UNIT** **Detail below according to the proposed solution**	OFFER/TQ

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CROSSWIND

VENDOR IS ALLOWED TO INSERT ADDITIONAL ROWS TO BETTER DETAIL THE DESCRIPTION OF SUPPLY, BY USING **RED COLORAND BOLD CHARACTER**

HOLLANDSE KUST NOORD WIND PARK Project

Discipline: **MEC** | System & Sub-sys:

Document Type: | Equipment Type: **Water Treatment Package** | **Attachment to TBE 123A90-DDL-MAC-TBE-50024**

POS.	DESCRIPTION	UNIT	REQUIREMENT	Bidder: PSC Offer no. OF6739 Revised offer: Rev.03 BIDDER DATA	CLARIFIED WITHIN
48	Quantity		1	Confirmed	OFFER/TQ
49	Media to be treated		Sea Water form Coarse filter	Confirmed	OFFER/TQ
50	~~Brine Supply Flow (Design)~~	~~m^3/h~~	~~6~~	100 Lt tank (with mixer)	OFFER/TQ
51	~~Brine Supply Pressure~~	~~barg~~	~~8,5~~	Tank Material :PP or PE	OFFER/TQ
52	~~Brine Supply Temperature~~	~~°C~~	~~1,3 ÷ 22,6~~	Tank des : Full liquid	OFFER/TQ
53	~~Clorine Capacity~~	~~g/h~~	~~VTA~~	Biocide pumps : dosing type, manual control (10÷100%)	OFFER/TQ
54	~~Hypoclorite Concentration~~	~~mg/l~~	~~VTA~~	2x100% dosing pump to sea water caisson	OFFER/TQ
55	~~Sea Water Flowrate Inlet~~	~~m^3/h~~	~~VTA~~	2x100% to inlet of WT Package	OFFER/TQ
56	~~Design Pressure~~	~~barg~~	~~VTA~~	2x100% dosing pump to waste water tank	OFFER/TQ
57	~~Electrodes Material~~		~~Suitable for Sea Water~~	Pumps Material: membrane PTFE	OFFER/TQ
58	~~Electolyzer absorbed power~~	~~W~~	~~VTA~~	Not applicable	OFFER/TQ
59	Power Supply Required	V/Ph/Hz	VTA	0,37 kW- 400/3/50	OFFER/TQ

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	25
Cause:	Manual valve upstream of electro chlorination coarse package closed
Consequence:	Long term issue due loss of hypochlorite dosing leading to fouling if left undetected.
Safeguards:	
Actions:	Ensure electrochlorification package HAZOP reviews.
Assigned Respondent (By)	ROSETTI Mechanical
RESPONSE	Electrochlorination unit has been replace with non oxidizing biocide unit. This recommendations is superseded.
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
F.Mura	
EPC HSE Lead	**Sign**
C.Caracciolo	**CC**
EPC Project Manager	**Sign**
D.Lo Sterzo	
Client	**Sign**

Digitaal ondertekend door Paul van Rossum
Datum: 2024.09.03 16:18:03 +02'00'

47	**ELECTRO-CHLORINATOR**			**REPLACED WITH NON OXIDIZING BIOCIDE DOSING UNIT** **Detail below according to the proposed solution**	OFFER/TQ

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CROSSWIND

VENDOR IS ALLOWED TO INSERT ADDITIONAL ROWS TO BETTER DETAIL THE DESCRIPTION OF SUPPLY, BY USING **RED COLORAND BOLD CHARACTER**

HOLLANDSE KUST NOORD WIND PARK Project

Discipline: **MEC** | System & Sub-sys:

Document Type: | Equipment Type: **Water Treatment Package** | **Attachment to TBE 123A90-DDL-MAC-TBE-50024**

POS.	DESCRIPTION	UNIT	REQUIREMENT	Bidder: PSC Offer no. OF6739 Revised offer: Rev.03 BIDDER DATA	CLARIFIED WITHIN
48	Quantity		1	Confirmed	OFFER/TQ
49	Media to be treated		Sea Water form Coarse filter	Confirmed	OFFER/TQ
50	~~Brine Supply Flow (Design)~~	~~m^3/h~~	~~6~~	100 Lt tank (with mixer)	OFFER/TQ
51	~~Brine Supply Pressure~~	~~barg~~	~~8,5~~	Tank Material :PP or PE	OFFER/TQ
52	~~Brine Supply Temperature~~	~~°C~~	~~1,3 ÷ 22,6~~	Tank des : Full liquid	OFFER/TQ
53	~~Clorine Capacity~~	~~g/h~~	~~VTA~~	Biocide pumps : dosing type, manual control (10÷100%)	OFFER/TQ
54	~~Hypoclorite Concentration~~	~~mg/l~~	~~VTA~~	2x100% dosing pump to sea water caisson	OFFER/TQ
55	~~Sea Water Flowrate Inlet~~	~~m^3/h~~	~~VTA~~	2x100% to inlet of WT Package	OFFER/TQ
56	~~Design Pressure~~	~~barg~~	~~VTA~~	2x100% dosing pump to waste water tank	OFFER/TQ
57	~~Electrodes Material~~		~~Suitable for Sea Water~~	Pumps Material: membrane PTFE	OFFER/TQ
58	~~Electolyzer absorbed power~~	~~W~~	~~VTA~~	Not applicable	OFFER/TQ
59	Power Supply Required	V/Ph/Hz	VTA	0,37 kW- 400/3/50	OFFER/TQ

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	26
Cause:	Manual valve downstream of filtered sea water tank closed.
Consequence:	LVA will be closed by control system, due to 'High level', leading to potential damage of P- 50001A. Refer to 3.1.2.
Safeguards:	
Actions:	Ensure control system does not create hazard by deadheading P- 50001A/B.
Assigned Respondent (By)	Rosetti Instrumentation Engineer
RESPONSE	This action is superseeded by Hazop Review specifically dedicated to the Water Treatmemt supplier (PSC) Furthermore, in case of P 50001 A/B deadheading the components downstream the pump are protected by a PSV n° 50-PSV-007 (set 7.6 bar). See evidence attached.
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
F.MURA - MECHANICAL PSL	
EPC HSE Lead	**Sign**
C.Caracciolo	CC
EPC Project Manager	**Sign**
D. Lo Sterzo	
Client	**Sign**

Digitaal ondertekend door Paul van Rossum
Datum: 2024.09.03 16:19:06 +02'00'

Serie: 3000W

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PRESSURE RELIEF VALVE CALCULATION SHEET

LIQUIDS IN ABSENCE OF CAVITATION OR FLASHING
(According to EN ISO 4126-1)

$$A = \frac{Q_v}{B_9 F_{dr} K F_V} \sqrt{\frac{G}{P_1 - P_2}}$$

$$Re = B_{14} \frac{Q_m}{\mu \sqrt{A'}}$$

TAI Ref.	Item Ref.	
24/8637	001	
Customer		**Sheet No.**
PCM EUROPE		1 of 1
Order No.		**dated**
Customer Ref.		**dated**
GIAN-392481		29/03/2024

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DIMENSION

01	MEDIUM	Sea Water			15	SPECIFIC VOLUME	**v**	0.00097 [m³/kg]
02	COEFFICIENT B7	**B_7**	---		16	SPECIFIC GRAVITY (H20=1)	**G**	1.03
03	COEFFICIENT B8	**B_8**	---		17	KINEMATIC VISCOSITY	ν	[ctsk]
04	COEFFICIENT B9	**B_9**	0.05091		18	DYNAMIC VISCOSITY	μ	0.9 [cpoise]
05	COEFFICIENT B13	**B_{13}**	---		19	REQUIRED MASS FLOW RATE	**Q_m**	2575 [kg/h]
06	COEFFICIENT B14	**B_{14}**	313.4			REQUIRED VOL. FLOW RATE	**Q_v**	2.5 [m³/h]
07	DISCHARGE COEFFICIENT	**K**	0.87		20	CALCULATED AREA(1)	**A**	22.014 [mm²]
08	DE-RATING FACTOR	**F_{dr}**	0.9		21	QTY. OF VALVES	**n**	1
09	OPERATING PRESSURE			[bar g]	22	SELECTED AREA	**A'**	78.5 [mm²]
10	SET PRESSURE			7.6 [bar g]	23	REYNOLDS NUMBER	**Re**	101204
11	OVERPRESSURE			10 [%]	24	LOW TURB. CORR. FACTOR	**Fv'**	1
12	RELIEVING PRESSURE	**P_1**		8.36 [bar g]	25	Fv' * n * A'/A (OK if >= 1)		3.566
13	BACK PRESSURE	**P_2**		0 [bar g]	26	ORIFICE		D
14	TEMPERATURE AT P1	**T_1**		293.2 [K]	27	CAPACITY		8.915 [m³/h]
		t_1		20.2 [°C]	28			

NOTES

(1) Fv assumed as equal to 1

REV.	DATE	COM / BY	DESCRIPTION
10			
09			
08			
07			
06			
05			
04			
03	06/06/2024	LV	
02	17/04/2024	LV	
01	03/04/2024	LV	First issue

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DIMENSIONAL OUTLINE DRAWING WITH MATERIAL LIST AND VALVE DATA

VALVE DATA

Series	Valve	Size	Spring	Accessories
3000W	3111W	1" X 2"	S	

Orifice	Area [mm²]	Cold differential test pressure [bar g]	Set pressure [bar g]	Overpressure [%]	Total backpressure [bar g]
D	78.5	7.6	7.6	10	0

Superimposed backpressure [bar g]	Relieving temperature [°C]	Minimum temperature [°C]	Maximum temperature [°C]	Service G	L	S	M
0	20.2	-29	100		X		

Inlet connection

Code	Size	Class/PN	Facing	Finish
ASME	1"	150	RF	125 AARH

Outlet connection

Code	Size	Class/PN	Facing	Finish
ASME	2"	150	RF	125 AARH

TAI Ref.	Item Ref.	Quantity
24/8637	001	2
Customer		**Sheet No.**
PCM EUROPE		1 of 1
Order No.		**dated**
Customer Ref.		**dated**
GIAN-392481		29/03/2024

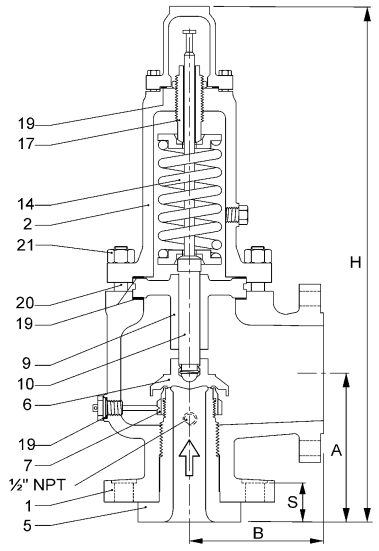
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PARTS AND MATERIAL LIST

Our material class: L1 /11 /30 /X3 /X7 /X9 /X13

001	Body	A352-LCC		020	Body studs	A320-L7 HDG	
002	Bonnet	A352-LCC		021	Body nuts	A194-7 HDG	
005	Nozzle	UNS S32760	/X3		Cap	A352-LCC	/X13
006	Disc	UNS N07718					
007	Blowdown adjusting ring	A351-CF8M					
009	Guide bushing	A351-CF8M					
010	Spindle	UNS N07718	/X7				
014	Spring	AISI 316					
017	Spring adj. screw	UNS N07718	/X9				
019	Set of gaskets	PTFE					

DRAWING



NOTES

Preliminary dimensions [mm] A	B	S	H	Mass [kg]
105	114	33	465	22

REV.	DATE	BY	DESCRIPTION
05			
04			
03	06/06/2024	LV	
02	17/04/2024	LV	
01	03/04/2024	LV	First issue

Printed by: LVarisco
Print date: 06/06/2024 08:46:45
Document: 24/8637-001-DAA R02

BLPH
SHEAMS SIGNATURE FORM

Action No:	**0026**	**Rev:**	1
Action Title:	**HAZOP Study Actions**	**Date:**	25/03/2023
Ref. Doc:	K559-2254-SE-REP-015		
Title:	BLPH HAZOP / LOPA Study		
Node:	1: Hydrogen (including storage)		
Reference Drawings:			
Parameter	Flow	**Deviation**	Flow More
Cause:	PVB or PVA fail open.		
Consequence:	Potential Overpressure of downstream system PVA & PBV. Leading to LOC of hydrogen.		
Safeguards:			
Action:	2 Ensure adequate over protection system for system downstream system of PVA & PVB including fuel cell		
RESPONSE:	**Responsible Discipline: Lead Process Engineer** Pressure Safety Valve (50-PSV-001) has been added to provide over pressure protection for the systems downstream of 25-PV-001A/B including the fuel cell. See P&ID K559-2254-PR-PID-004_001		
Attachments:	None		

Name: Signature: Raise PCN: Yes/No PCN No:

RESPONSE ACCEPTANCE:

Discipline Lead:	Hamant Patel	Signature:	Date: 2023-05-01 | 08:47 CDT
HSE Lead:	Samer Bachir	Signature:	Date: 2023-05-02 | 01:58 CDT
Proj. Manager:	John Schofield	Signature:	Date: 2023-05-02 | 08:06 BST
Client:	Paul Van Rossum	Signature:	Date: 2023-05-15 | 13:02 BST

FUTURE ACTION/CROSS REFERENCE:

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	27
Cause:	Both pumps operating P- 50001A/B
Consequence:	Potential overfill of T-50006, filtered water tank. Leading to overpressure of filtered water tank & upstream overpressured systems.
Safeguards:	
Actions:	Control logic should inhibit dual operation of lift pumps, P-50001A & B.
Assigned Respondent (By)	ROSETTI Instrumentation Engineer
RESPONSE	As per project document "Process Control, Operation, Start-up and Shutdown Philosophy" rev. 01 par. 3.2.1.2, a control logic will be provided to prevent simultaneous running of both pumps P-50001A and P-50001B.
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements

EPC Discipline Lead	**Sign**
L.Calabrese	
EPC HSE Lead	**Sign**
C.Caracciolo	CC
EPC Project Manager	**Sign**
D. Lo Sterzo	
Client	**Sign**

Digitaal ondertekend door Paul van Rossum
Datum: 2024.09.03 16:22:52 +02'00'

Base Load Power Hub (BLPH)

Process Control, Operation, Start-up and Shutdown philosophy

Document Number: 123A90-DDL-PR-RE-80031

Document Class: 1

01	23/04/2024	Issue for Approval (IFA)	CIM	RZI	DLO
00	13/12/2023	Issue for Approval (IFA)	CIM	RZI	DLO
Rev.	Date	Description	Prepared	Reviewed	Approved

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Monitoring and control of BLPH will be remote (shore based control room) and the solar farm, battery and fuel-cell shall act cooperatively so that power from all sources will be combined to export power regardless of the prevailing weather. NOTE: Energy stored as hydrogen will leave only in the form of electricity through the Inter-Array Cable (IAC) connecting BLPH indirectly to a grid sub-station.

Whenever possible the fuel-cell will consume the platform's stored hydrogen prior to discharging the battery to ensure SoC is maintained high for it to react instantly to each demand for power.

From electrically point of view, following operation modes shall be applicable (Ref. [14]):

- Mode 0 = IDLE (power import only)
- Mode 1 = POWER IMPORT (charging)
- Mode 2 = HOT STANBY (power import no export required)
- Mode 3 = POWER EXPORT (Discharging)
- Mode 4 = COLD STANDBY (power export no export possible)
- Mode 4A = EMERGENCY (Island)
- Mode 5 = POWER OUT (black-out)
- Mode 6 = MAINTENANCE
- Mode 7 = RESEARCH

For details about under which above indicate scenario the Fuel Cell and Electrolyser Packages will run, reference shall be made to (Ref. [14]).

3.2 SEA WATER LIFT PUMPS P-50001A/B

(Reference P&ID: Doc. N.123A90-DDL-PR-PID-80021)

3.2.1.1 Main Operating data

The seawater lift pumps are characterized by the following main operating data:

- Normal Operating mass flowrate ~2500 kg/h
- Normal Operating volumetric flowrate ~2.5 m^3/h
- Normal Discharge pressure (min./max) ~4.0 / 5.0 barg
- Normal Discharge temperature ~ 22.4 °C

3.2.1.2 Process Operation and Control Philosophy

Seawater is the raw water to be treated and then electrochemically converted into hydrogen (for energy accumulation purposes) and oxygen (to be continuously vented when the plant runs); thus seawater is lifted by means of 2 x 100% submersible centrifugal pumps P–50001A/B (one running and the other in stand-by mode), and then fed through the water treatment plant to remove the biological and inorganic "pollutants" that shall be eliminated prior to be served to the electrolyser package.

A logic control will be provided to prevent simultaneous running of both pumps A ab B.

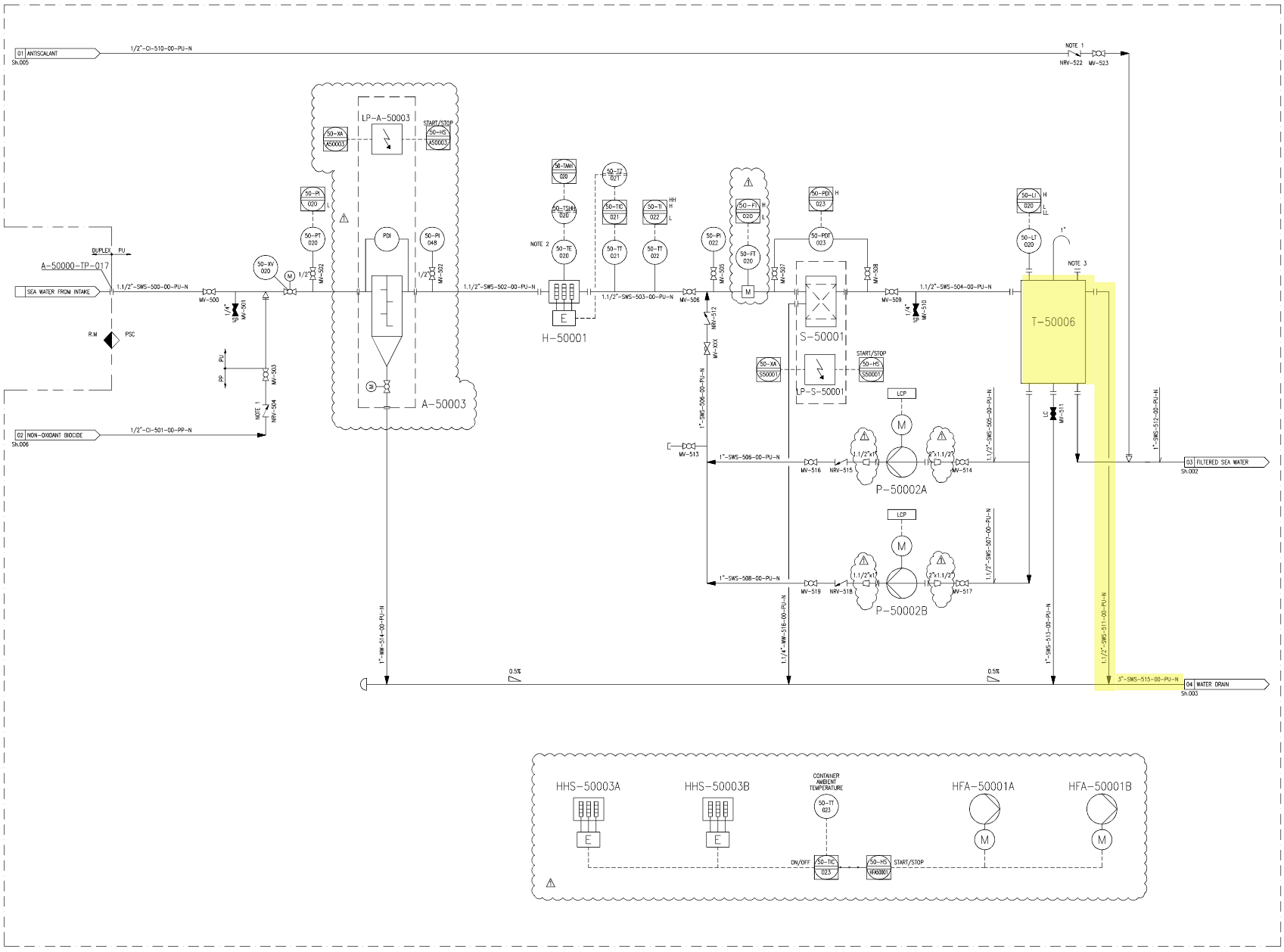
BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	28
Cause:	LVA upstream of filtered water tank open more than required
Consequence:	Potential overfill of & overpressure of tank T-50006
Safeguards:	High level alarm on T- 50006 Local Overflow
Actions:	Ensure local overflow is adequately sized & rooted to a safe location.
Assigned Respondent (By)	ROSETTI Piping & Layouts Engineer
RESPONSE	T-50006 is part of Water treatment package. Overflow has been routed from outside the container, where the water treatment has been installed, to brine caisson.
Attachments:	Item 28-29 Attachment 1 & Attachment 2
Issue Date (dd/mm/yy)	08/08/2024

Approvals / Endorsements

EPC Discipline Lead	**Sign**
C. Bortolin	Carla Bortolin
EPC HSE Lead	**Sign**
C.Caracciolo	CC
EPC Project Manager	**Sign**
D.Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.08.21 08:13:10 +02'00'

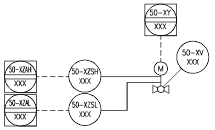
DRAWING No. 1724000448-PR-PID-00013 REV. 1



TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-02	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-03	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-05	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTANK
TP-06	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-07	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

TYPICAL FOR ON/OFF BALL VALVES



ITEM 28-29_ATTACHMENT 1

NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE

A-50003	
SEA WATER COARSE FILTER	
FILTRATION RATE	125 µm
CAPACITY	2.5 m3/h
DES. PRESS.	5 barg
DES. TEMP.	50° C
MATERIAL	PLASTIC MAT.

H-50001	
ELECTRIC HEATER	
POWER	30 kW
CAPACITY	2.5 m3/h
DES. PRESS.	5 barg
DES. TEMP.	40° C
MATERIAL	PVC-TITANIUM

S-50001	
SAND FILTER	
TYPE	PRESSURE,VERTICAL
CAPACITY	2.5 m3/h
DES. PRESS.	7 barg
DES. TEMP.	50° C
MATERIAL	FRP

T-50006	
FILTERED WATER TANK	
VOLUME	3 m3
DES. PRESS.	ATM
DES. TEMP.	50° C
MATERIAL	FRP

P-50002A/B	
BACKWASH PUMP	
TYPE	CENTRIFUGAL
CAPACITY	5 m3/h
HEAD	0.50 barg
DES. TEMP.	50° C
MATERIAL	PP

HHS-50003A/B	
CONTAINER ELECTRICAL HEATER	
POWER	TBD
DES. PRESS.	TBD
DES. TEMP.	TBD
MATERIAL	TBD

HFA-50001A/B	
CONTAINER AIR FAN	
POWER	TBD
DES. PRESS.	TBD
DES. TEMP.	TBD
MATERIAL	TBD

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN.	CHKD	APPD	DESCRIPTION
1	29-MAY-24	CC	WR	RM	ISSUED FOR REVIEW
0	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

ROSETTI MARINO

TITLE : WATER TREATMENT PACKAGE
SEA WATER FINE FILTRATION
P&I DIAGRAM

CONTRACT NO./TITLE | SCALE -

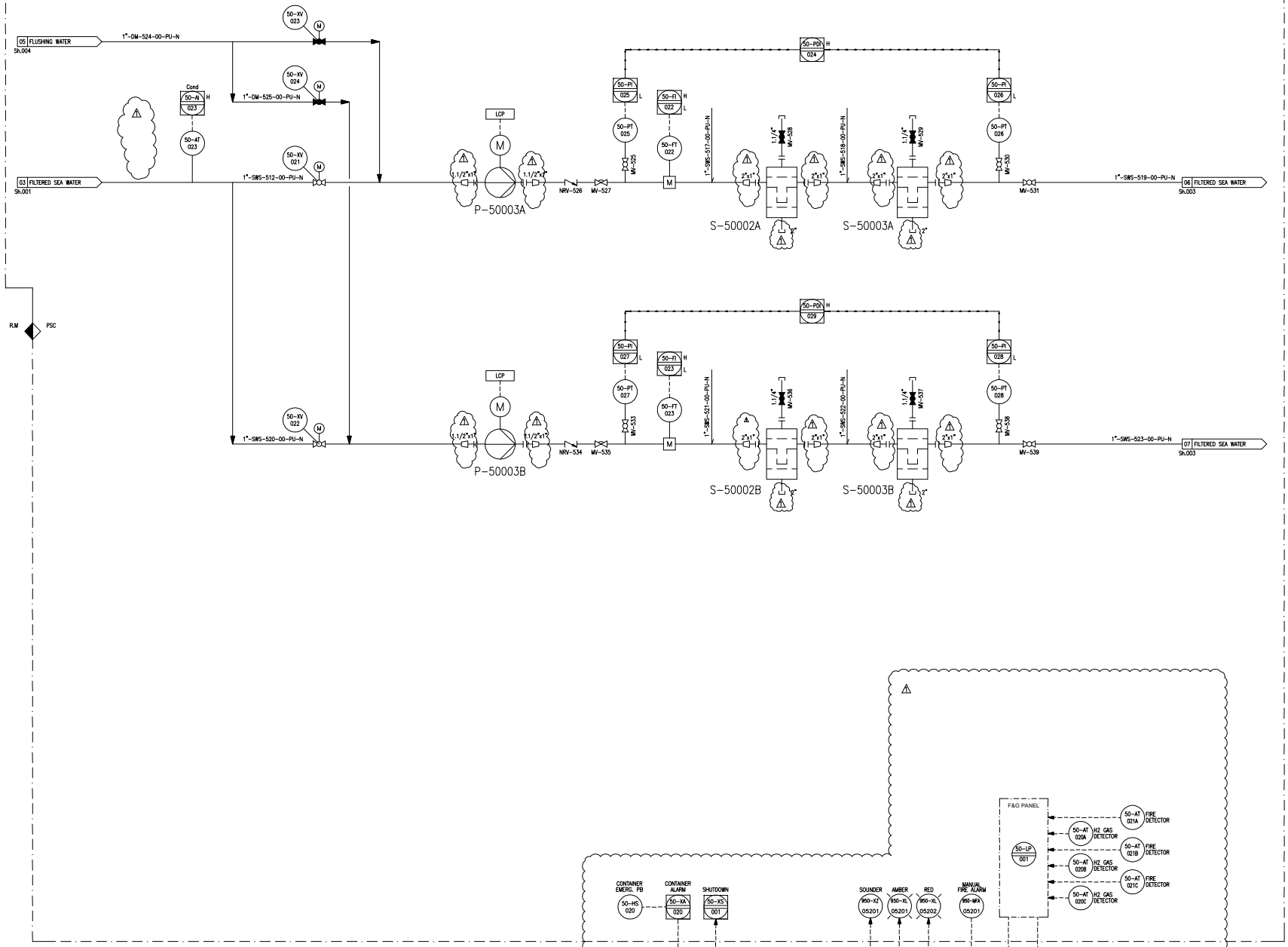
DRAWN CC | CHECKED WR | APPROVED RM | DATE 29/05/24

A1 | DRAWING NO. 1724000448-PR-PID-00013 | SHEET 001 | REV. 1

File Name : 1724000448-PR-PID-00013 Rev01

DRAWING NO. 1724000448-PR-PID-00013

REV. 1



P-50003A/B	
SW BOOSTER PUMP	
TYPE	CENTRIFUGAL
CAPACITY	2 m3/h
HEAD	3 barg
DES. TEMP.	50° C
MATERIAL	PP

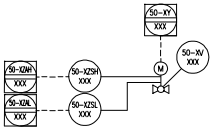
S-50002A/B	
SW 1ST CARTRIDGE FILTER	
FILTRATION RATE	20 µm
CAPACITY	2 m3/h
DES. PRESS.	7 barg
DES. TEMP.	50° C
MATERIAL	PP

S-50003A/B	
SW 2ND CARTRIDGE FILTER	
FILTRATION RATE	5 µm
CAPACITY	2 m3/h
DES. PRESS.	7 barg
DES. TEMP.	50° C
MATERIAL	PP

TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-02	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-03	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-05	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTANK
TP-06	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-07	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

TYPICAL FOR ON/OFF BALL VALVES



NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
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0	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

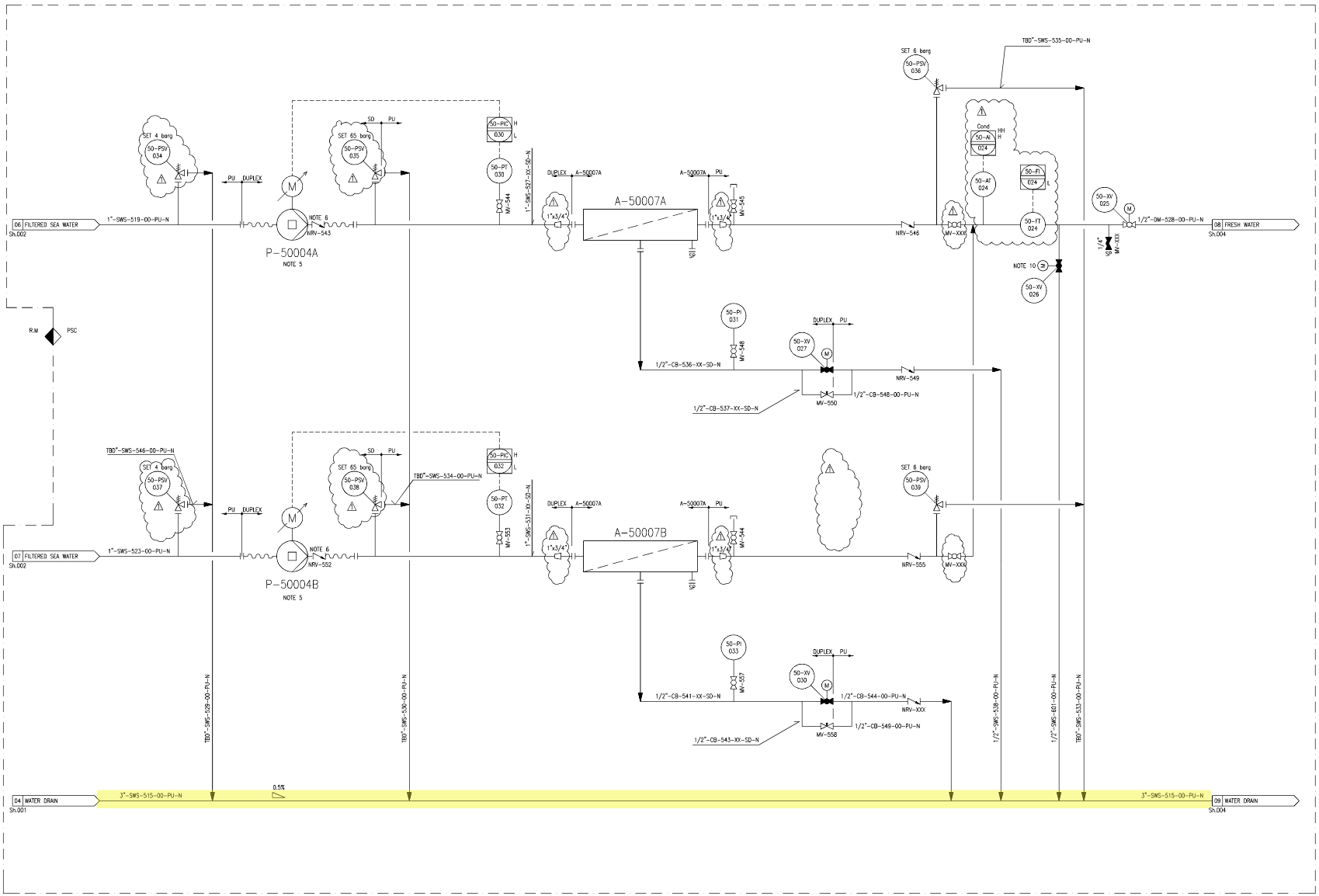
CROSSWIND

ROSETTI MARINO

TITLE : WATER TREATMENT PACKAGE
SEA WATER FINE FILTRATION
P&I DIAGRAM

CONTRACT NO./TITLE			SCALE –
DRAWN GC	CHECKED WR	APPROVED RM	DATE 29/05/24
A1	DRAWING NO. 1724000448-PR-PID-00013	SHEET 002	REV. 1

File Name : 1724000448-PR-PID-00013 Rev01



P-50004A/B	
HP PUMP	
TYPE	AXIAL ROTATING PISTONS
CAPACITY	2 m3/h
HEAD	70 barg
DES. TEMP.	50° C
MATERIAL	SS DUPLEX

A-50007A/B	
SEA WATER REVERSE OSMOSIS UNITS	
CAPACITY	0.8 m3/H
DES. PRESS.	69 barg
DES. TEMP.	50° C
MATERIAL	FRP

TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-01	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-02	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-03	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-05	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTANK
TP-06	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-07	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
1	29-MAY-24	CC	WR	RM	ISSUED FOR REVIEW
0	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

ROSETTI MARINO

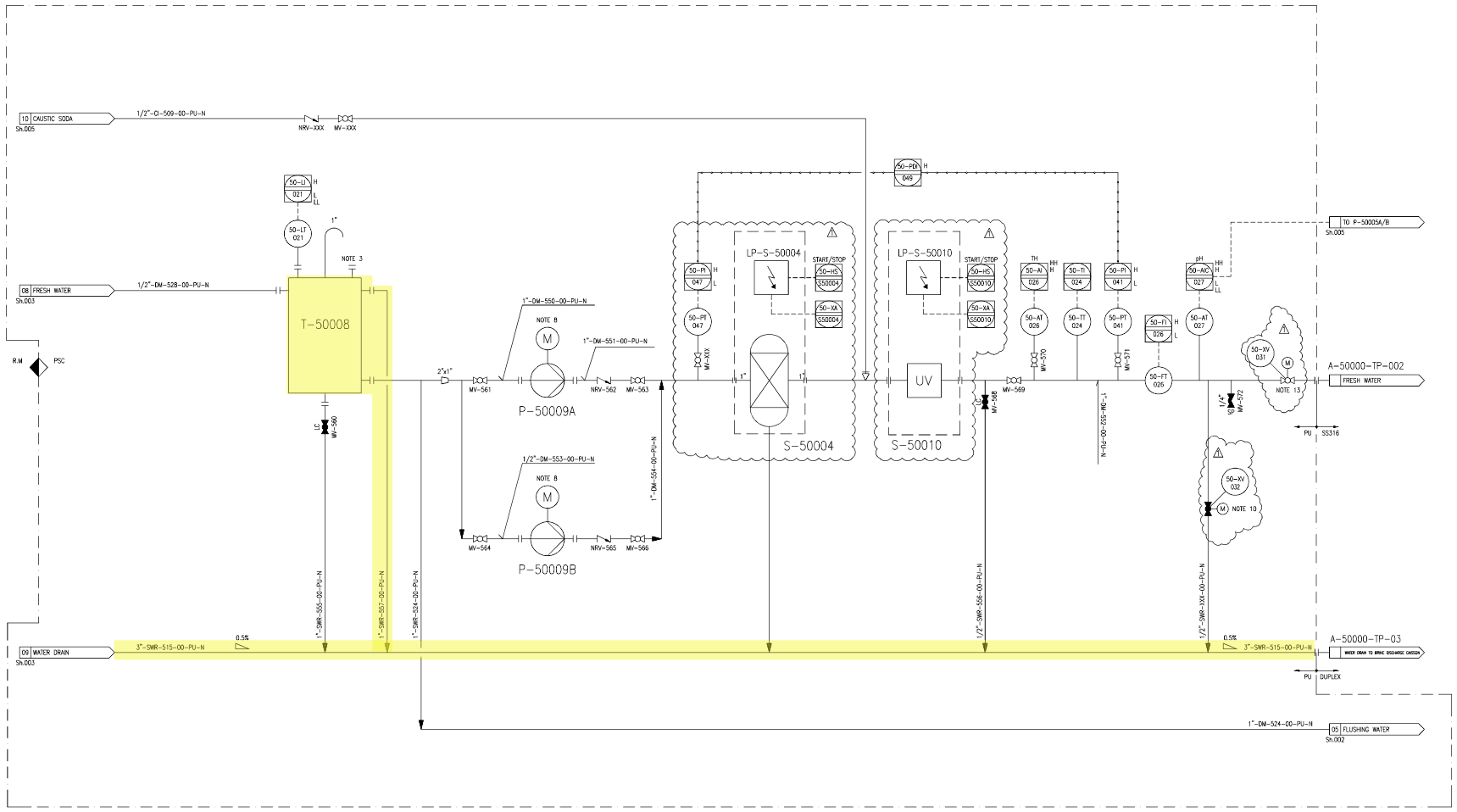
TITLE :
WATER TREATMENT PACKAGE
SEA WATER REVERSE OSMOSIS
P&I DIAGRAM

CONTRACT NO./TITLE			SCALE -
DRAWN CC	CHECKED WR	APPROVED RM	DATE 29/05/24
A1	DRAWING NO. 1724000448-PR-PID-00013		SHEET 003 / REV. 1

DRAWING No. 1724000448-PR-PID-00013 REV. 1

File Name : 1724000448-PR-PID-00013 Rev01

DRAWING NO. 1724000448-PR-PID-00013 REV. 1



T-50008	
FRESH WATER TANK	
VOLUME	2.2 m3
DES. PRESS.	ATM
DES. TEMP.	50° C
MATERIAL	FRP

P-50009A/B	
FRESH WATER PUMP	
TYPE	CENTRIFUGAL
CAPACITY	0.8 m3/h
HEAD NOTE 11	3.1 barg
DES. TEMP.	50° C
MATERIAL	SS 316L

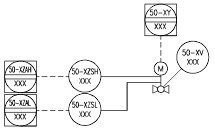
S-50010	
UV STERILIZER	
CAPACITY	0.8 m3/h
DES. PRESS.	5 barg
DES. TEMP.	50° C
MATERIAL	SS 316

S-50004	
SOFTENING FILTER	
CAPACITY	0.8 m3/h
DES. PRESS.	7 barg
DES. TEMP.	50° C
MATERIAL	FRP-PLASTIC

TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-02	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-03	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-05	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTANK
TP-06	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-07	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

TYPICAL FOR ON/OFF BALL VALVES



NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
1	29-MAY-24	CC	WR	RM	ISSUED FOR REVIEW
0	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

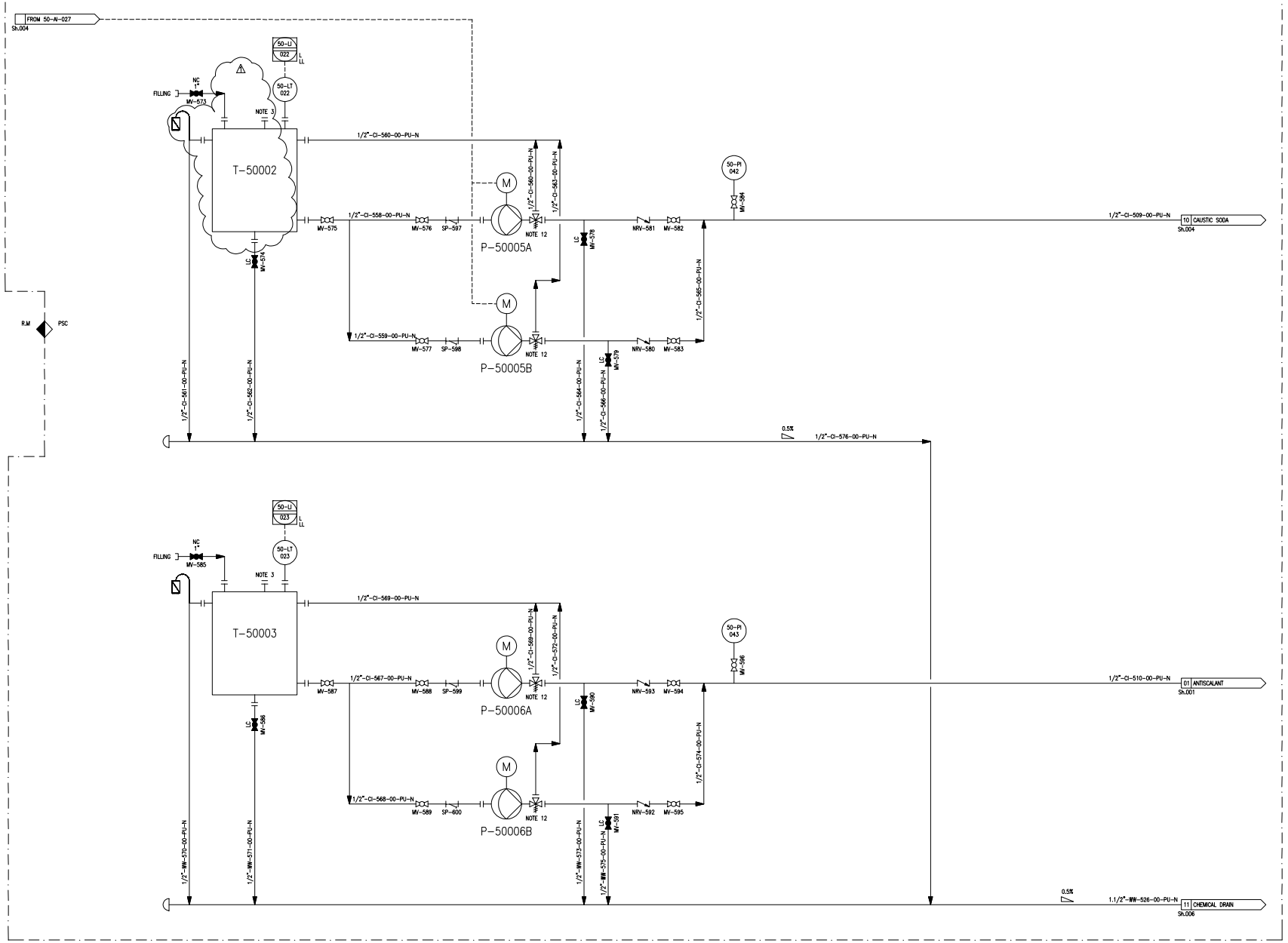
CROSSWIND

ROSETTI MARINO

TITLE :
WATER TREATMENT PACKAGE
FRESH WATER STORAGE
P&I DIAGRAM

CONTRACT NO./TITLE			SCALE -
DRAWN CC	CHECKED WR	APPROVED RM	DATE 29/05/24
A1	DRAWING NO. 1724000448-PR-PID-00013		SHEET 004 REV. 1

File Name : 1724000448-PR-PID-00013 Rev01



T-50002	
CAUSTIC SODA DOSING TANK	
VOLUME	0.05 m3
DES. PRESS.	ATM
DES. TEMP.	45° C
MATERIAL	PE

P-50005A/B	
CAUSTIC SODA DOSING PUMP	
TYPE	METERING DIAPHRAGM
CAPACITY	0.05 l/h
HEAD	2 barg
DES. TEMP.	50° C
MATERIAL	PVC

T-50003	
ANTISCALANT DOSING TANK	
VOLUME	0.05 m3
DES. PRESS.	ATM
DES. TEMP.	45° C
MATERIAL	PE

P-50006A/B	
ANTISCALANT DOSING PUMP	
TYPE	METERING DIAPHRAGM
CAPACITY	0.05 l/h
HEAD	2 barg
DES. TEMP.	50° C
MATERIAL	PVC

TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-02	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-03	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-05	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTANK
TP-06	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-07	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
1	29-MAY-24	GG	WR	RM	ISSUED FOR REVIEW
0	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

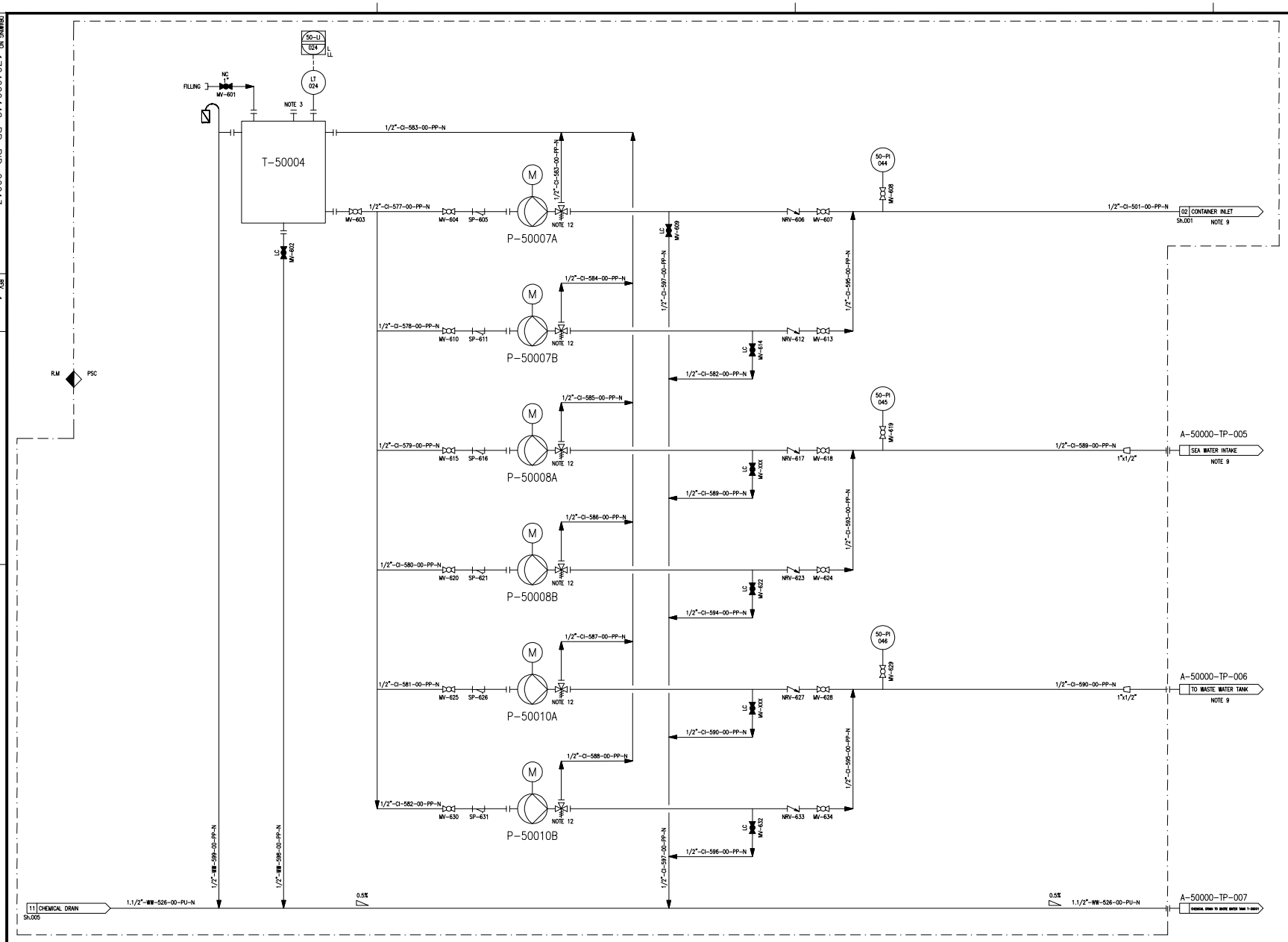
ROSETTI MARINO

TITLE :
WATER TREATMENT PACKAGE
ACID & ANTISCALANT DOSAGES
P&I DIAGRAM

CONTRACT NO./TITLE			SCALE -
DRAWN GC	CHECKED WR	APPROVED RM	DATE 29/05/24
A1	DRAWING NO. 1724000448-PR-PID-00013	SHEET 005	REV. 1

DRAWING NO. 1724000448-PR-PID-00013 REV. 1

File Name : 1724000448-PR-PID-00013 Rev01



TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-02	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-03	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-05	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTANK
TP-06	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-07	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE

T-50004	
NON-OXIDANT BIOCIDE DOSING TANK	
VOLUME	0.1 m3
DES. PRESS.	ATM
DES. TEMP.	45° C
MATERIAL	PE

P-50007A/B	
NON-OXIDANT BIOCIDE DOSING PUMP – CONTAINER INLET	
TYPE	METERING DIAPHRAGM
CAPACITY	0.1 l/h
HEAD	3.5 barg
DES. TEMP.	50° C
MATERIAL	PVC

P-50008A/B	
NON-OXIDANT BIOCIDE DOSING PUMP – SEA WATER INTAKE	
TYPE	METERING DIAPHRAGM
CAPACITY	2 l/h
HEAD	3.5 barg
DES. TEMP.	50° C
MATERIAL	PVC

P-50010A/B	
NON-OXIDANT BIOCIDE DOSING PUMP – WASTE WATER TANK	
TYPE	METERING DIAPHRAGM
CAPACITY	0.5 l/h
HEAD	3.5 barg
DES. TEMP.	50° C
MATERIAL	PVC

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
1	29-MAY-24	GG	WR	RM	ISSUED FOR REVIEW
0	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

ROSETTI MARINO

TITLE :
WATER TREATMENT PACKAGE
BIOCIDE DOSAGE
P&I DIAGRAM

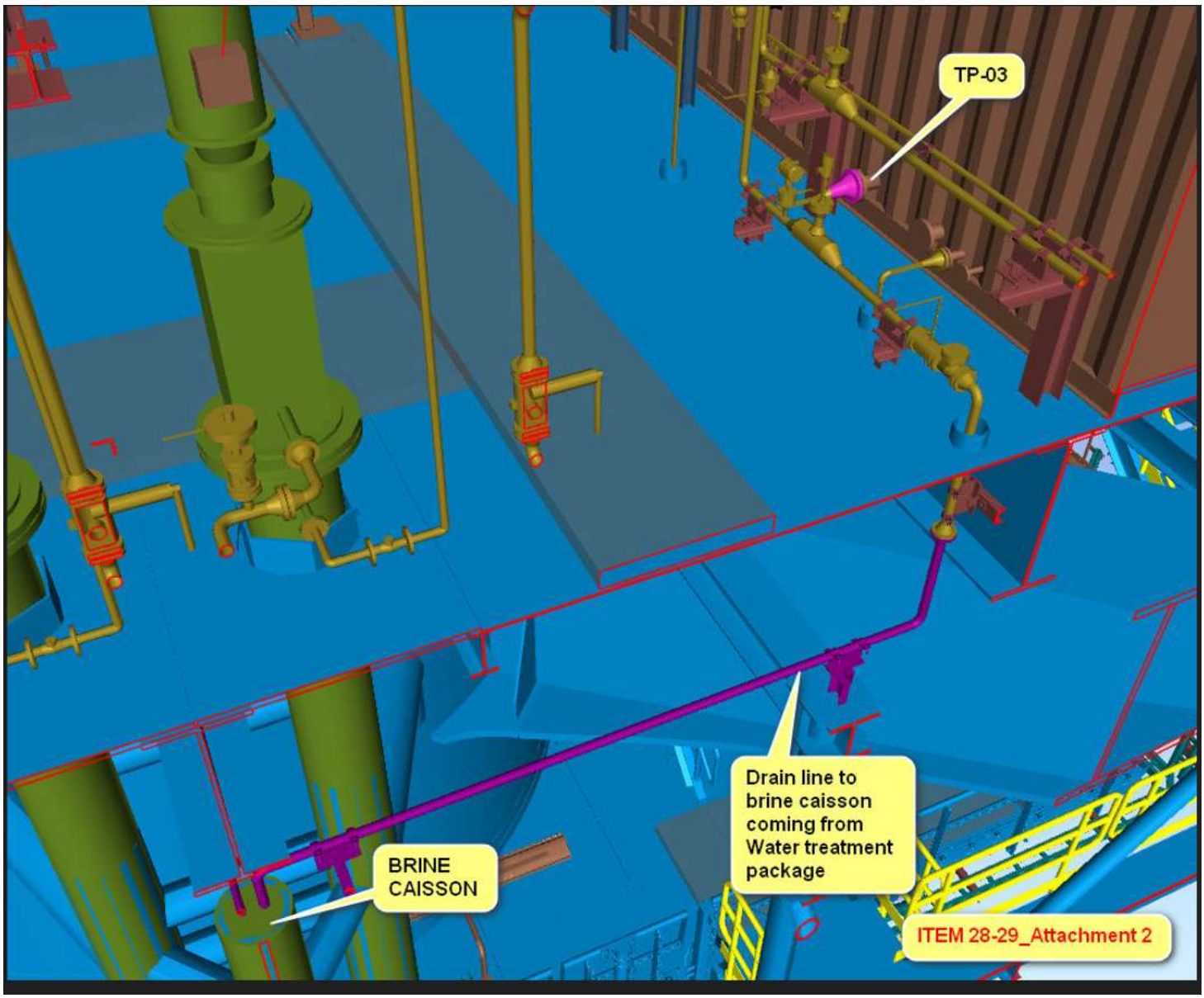
CONTRACT NO./TITLE | SCALE –

DRAWN GC | CHECKED WR | APPROVED RM | DATE 29/05/24

A1 | DRAWING NO. 1724000448-PR-PID-00013 | SHEET 006 | REV. 1

DRAWING NO. 1724000448-PR-PID-00013 REV. 1

File Name : 1724000448-PR-PID-00013 Rev01


TP-03
Drain line to brine caisson coming from Water treatment package
BRINE CAISSON
ITEM 28-29_Attachment 2

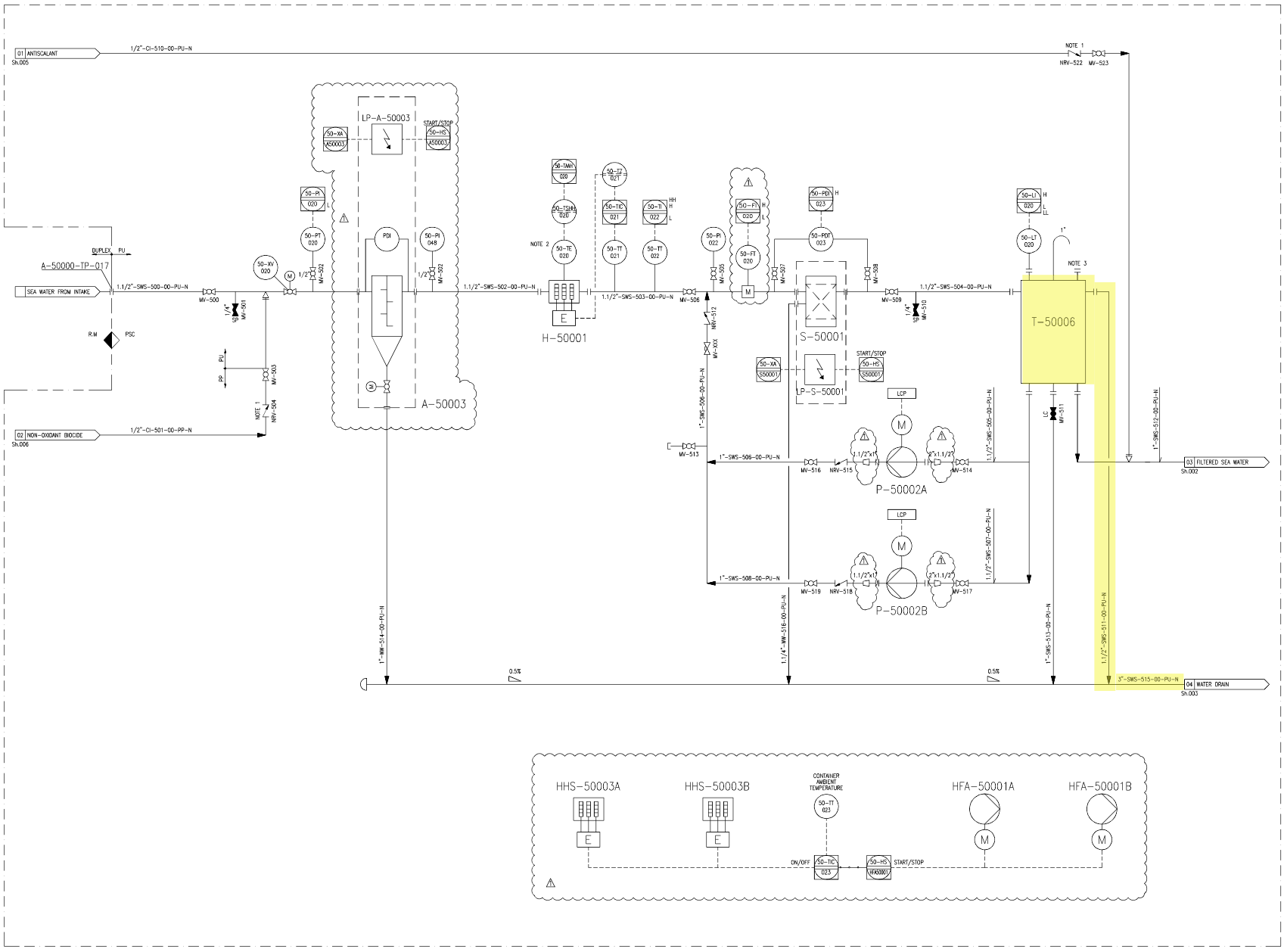
BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	29
Cause:	LVA & LVB Open
Consequence:	Refer to 3.3.4
Safeguards:	High level alarm on T- 50008 Local Overflow
Actions:	Ensure local overflow is adequately sized & rooted to a safe location.
Assigned Respondent (By)	ROSETTI Piping & Layouts Engineer
RESPONSE	T-50008 is part of Water treatment package. Overflow has been routed from outside the container, where the water treatment has been installed, to brine caisson.
Attachments:	Item 28-29 Attachment 1 & Attachment 2
Issue Date (dd/mm/yy)	08/08/2024

Approvals / Endorsements

EPC Discipline Lead	**Sign**
C. Bortolin	Carla Bortolin Autore firma digitale: Carla Bortolin Nome distintivo: CN = Carla Bortolin email = carla.bortolin@rosetti.it C = IT O = Rosetti Marino OU = 8761 Data: 2024.08.09 11:56:05 +02'00'
EPC HSE Lead	**Sign**
C.Caracciolo	CC
EPC Project Manager	**Sign**
D. Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.08.21 08:13:30 +02'00'

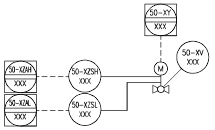
DRAWING No. 1724000448-PR-PID-00013 REV. 1



TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-02	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-03	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-05	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTANK
TP-06	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-07	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

TYPICAL FOR ON/OFF BALL VALVES



ITEM 28-29_ATTACHMENT 1

NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE

A-50003	
SEA WATER COARSE FILTER	
FILTRATION RATE	125 µm
CAPACITY	2.5 m3/h
DES. PRESS.	5 barg
DES. TEMP.	50° C
MATERIAL	PLASTIC MAT.

H-50001	
ELECTRIC HEATER	
POWER	30 kW
CAPACITY	2.5 m3/h
DES. PRESS.	5 barg
DES. TEMP.	40° C
MATERIAL	PVC-TITANIUM

S-50001	
SAND FILTER	
TYPE	PRESSURE,VERTICAL
CAPACITY	2.5 m3/h
DES. PRESS.	7 barg
DES. TEMP.	50° C
MATERIAL	FRP

T-50006	
FILTERED WATER TANK	
VOLUME	3 m3
DES. PRESS.	ATM
DES. TEMP.	50° C
MATERIAL	FRP

P-50002A/B	
BACKWASH PUMP	
TYPE	CENTRIFUGAL
CAPACITY	5 m3/h
HEAD	0.50 barg
DES. TEMP.	50° C
MATERIAL	PP

HHS-50003A/B	
CONTAINER ELECTRICAL HEATER	
POWER	TBD
DES. PRESS.	TBD
DES. TEMP.	TBD
MATERIAL	TBD

HFA-50001A/B	
CONTAINER AIR FAN	
POWER	TBD
DES. PRESS.	TBD
DES. TEMP.	TBD
MATERIAL	TBD

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN.	CHKD	APPD	DESCRIPTION
1	29-MAY-24	CC	WR	RM	ISSUED FOR REVIEW
0	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

ROSETTI MARINO

TITLE : WATER TREATMENT PACKAGE
SEA WATER FINE FILTRATION
P&I DIAGRAM

CONTRACT NO./TITLE | SCALE -

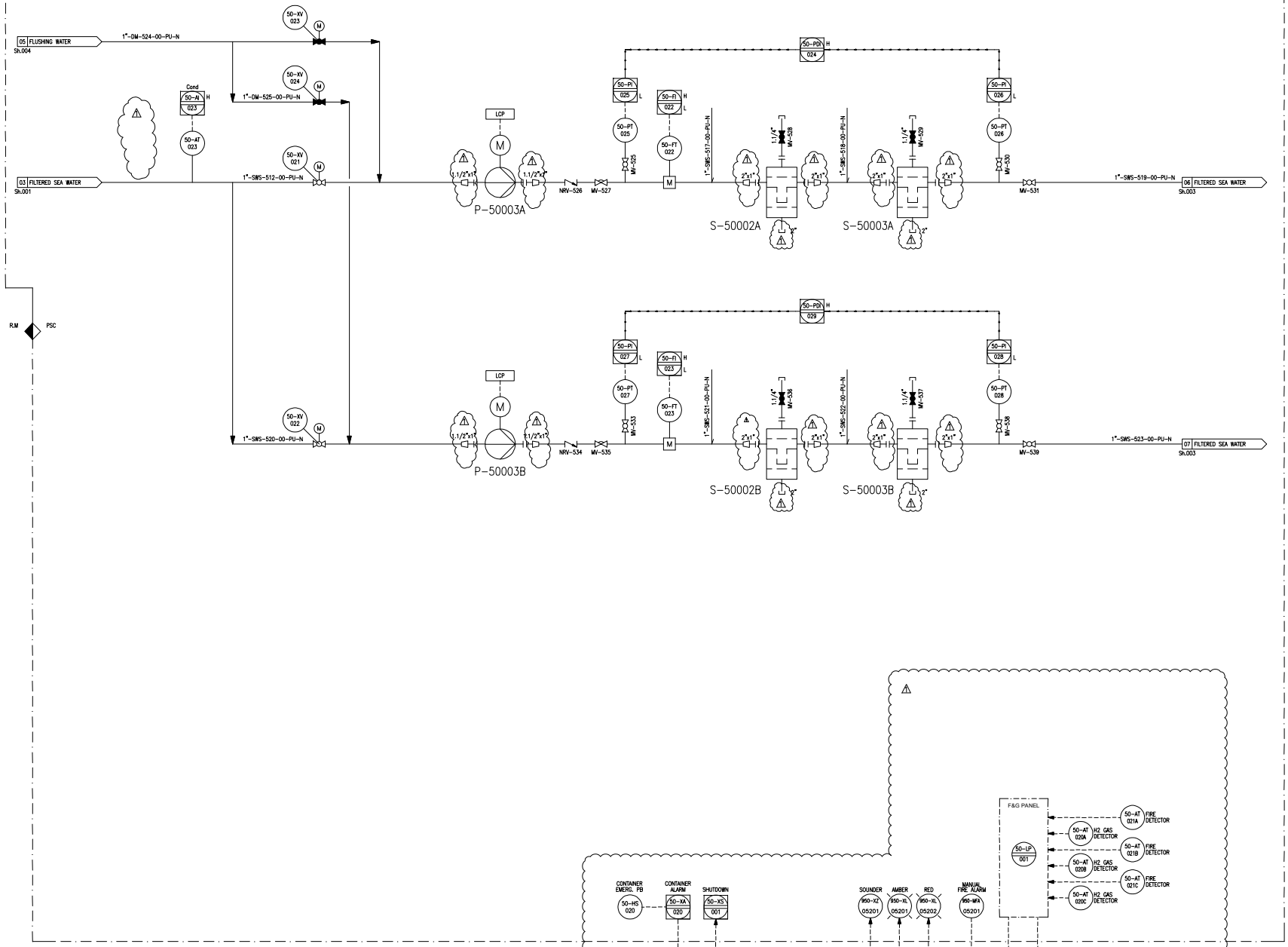
DRAWN CC | CHECKED WR | APPROVED RM | DATE 29/05/24

A1 | DRAWING NO. 1724000448-PR-PID-00013 | SHEET 001 | REV. 1

File Name : 1724000448-PR-PID-00013 Rev01

DRAWING NO. 1724000448-PR-PID-00013

REV. 1



P-50003A/B	
SW BOOSTER PUMP	
TYPE	CENTRIFUGAL
CAPACITY	2 m3/h
HEAD	3 barg
DES. TEMP.	50° C
MATERIAL	PP

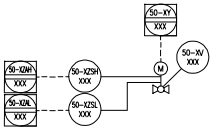
S-50002A/B	
SW 1ST CARTRIDGE FILTER	
FILTRATION RATE	20 µm
CAPACITY	2 m3/h
DES. PRESS.	7 barg
DES. TEMP.	50° C
MATERIAL	PP

S-50003A/B	
SW 2ND CARTRIDGE FILTER	
FILTRATION RATE	5 µm
CAPACITY	2 m3/h
DES. PRESS.	7 barg
DES. TEMP.	50° C
MATERIAL	PP

TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-02	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-03	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-05	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTANK
TP-06	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-07	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

TYPICAL FOR ON/OFF BALL VALVES



NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
1	29-MAY-24	GG	WR	RM	ISSUED FOR REVIEW
0	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

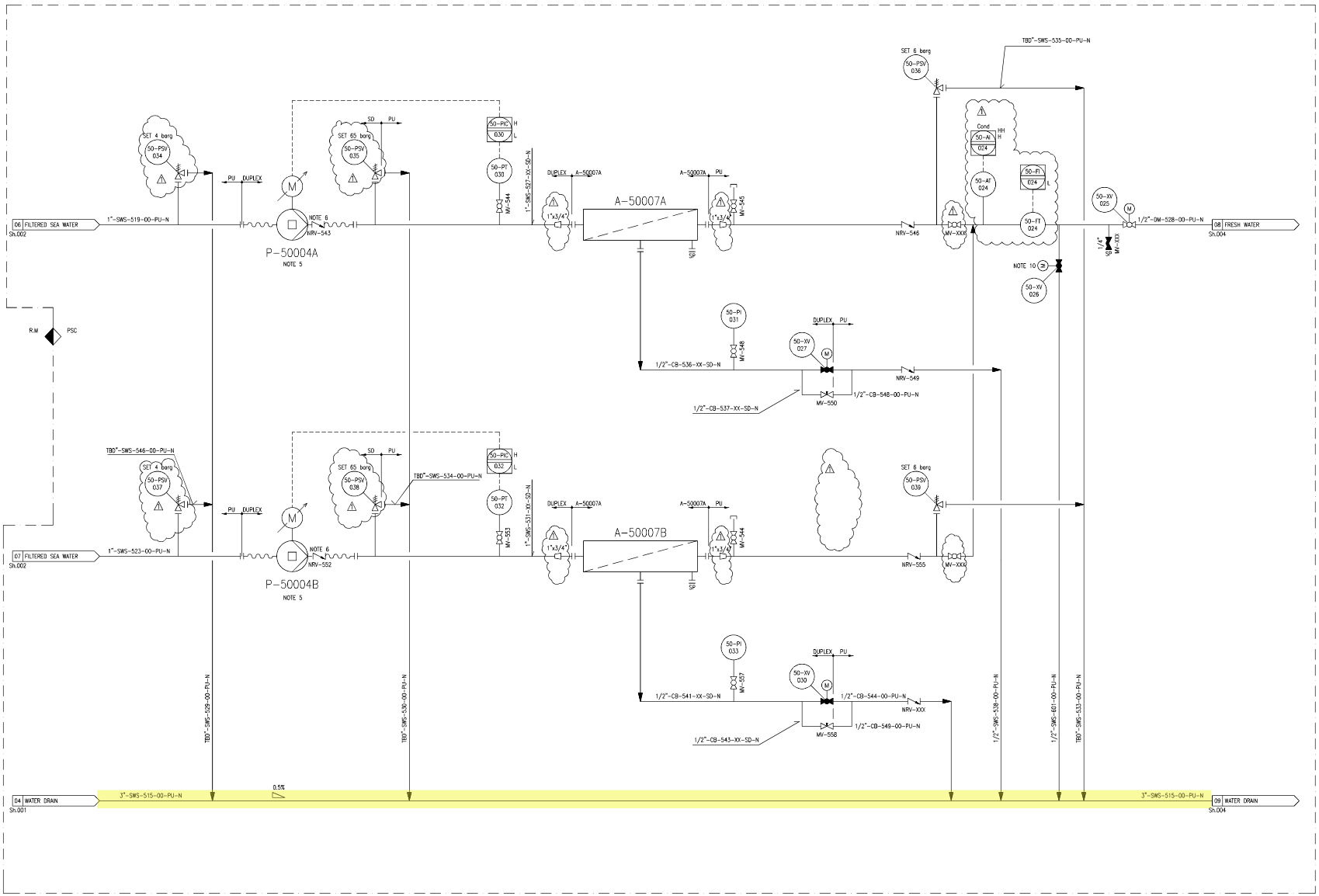
CROSSWIND

ROSETTI MARINO

TITLE : WATER TREATMENT PACKAGE
SEA WATER FINE FILTRATION
P&I DIAGRAM

CONTRACT NO./TITLE			SCALE –
DRAWN GC	CHECKED WR	APPROVED RM	DATE 29/05/24
A1	DRAWING NO. 1724000448-PR-PID-00013	SHEET 002	REV. 1

File Name : 1724000448-PR-PID-00013 Rev01



P-50004A/B	
HP PUMP	
TYPE	AXIAL ROTATING PISTONS
CAPACITY	2 m3/h
HEAD	70 barg
DES. TEMP.	50° C
MATERIAL	SS DUPLEX

A-50007A/B	
SEA WATER REVERSE OSMOSIS UNITS	
CAPACITY	0.8 m3/H
DES. PRESS.	69 barg
DES. TEMP.	50° C
MATERIAL	FRP

TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-01	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-02	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-03	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-05	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTANK
TP-06	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-07	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
1	29-MAY-24	CC	WR	RM	ISSUED FOR REVIEW
0	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

ROSETTI MARINO

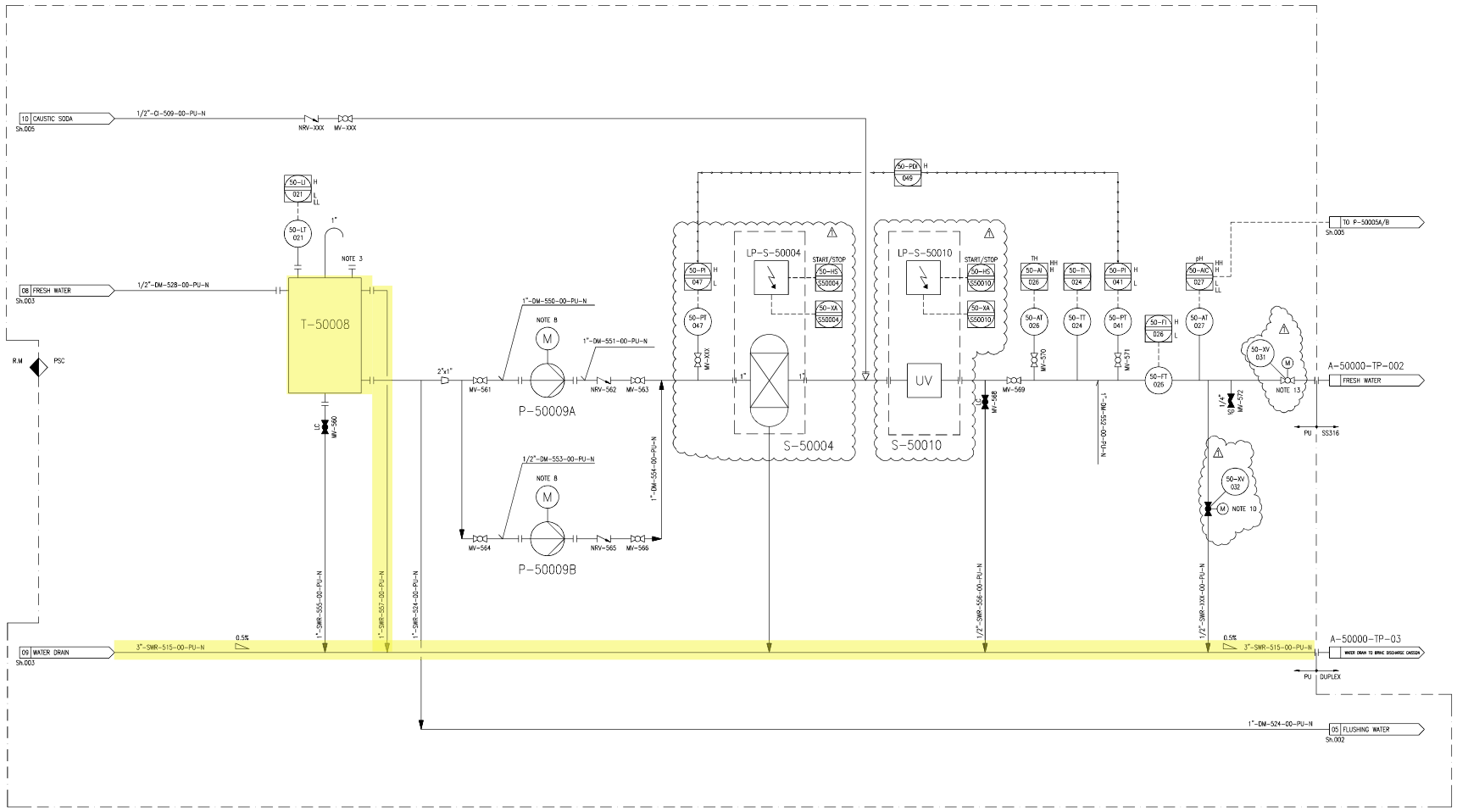
TITLE :
WATER TREATMENT PACKAGE
SEA WATER REVERSE OSMOSIS
P&I DIAGRAM

CONTRACT NO./TITLE			SCALE -
DRAWN CC	CHECKED WR	APPROVED RM	DATE 29/05/24
A1	DRAWING NO. 1724000448-PR-PID-00013		SHEET 003 / REV. 1

DRAWING No. 1724000448-PR-PID-00013 REV. 1

File Name : 1724000448-PR-PID-00013 Rev01

DRAWING NO. 1724000448-PR-PID-00013 REV. 1



T-50008	
FRESH WATER TANK	
VOLUME	2.2 m3
DES. PRESS.	ATM
DES. TEMP.	50° C
MATERIAL	FRP

P-50009A/B	
FRESH WATER PUMP	
TYPE	CENTRIFUGAL
CAPACITY	0.8 m3/h
HEAD NOTE 11	3.1 barg
DES. TEMP.	50° C
MATERIAL	SS 316L

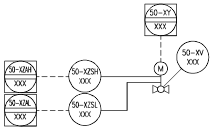
S-50010	
UV STERILIZER	
CAPACITY	0.8 m3/h
DES. PRESS.	5 barg
DES. TEMP.	50° C
MATERIAL	SS 316

S-50004	
SOFTENING FILTER	
CAPACITY	0.8 m3/h
DES. PRESS.	7 barg
DES. TEMP.	50° C
MATERIAL	FRP-PLASTIC

TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-02	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-03	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-05	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTANK
TP-06	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-07	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

TYPICAL FOR ON/OFF BALL VALVES



NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
1	29-MAY-24	CC	WR	RM	ISSUED FOR REVIEW
0	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

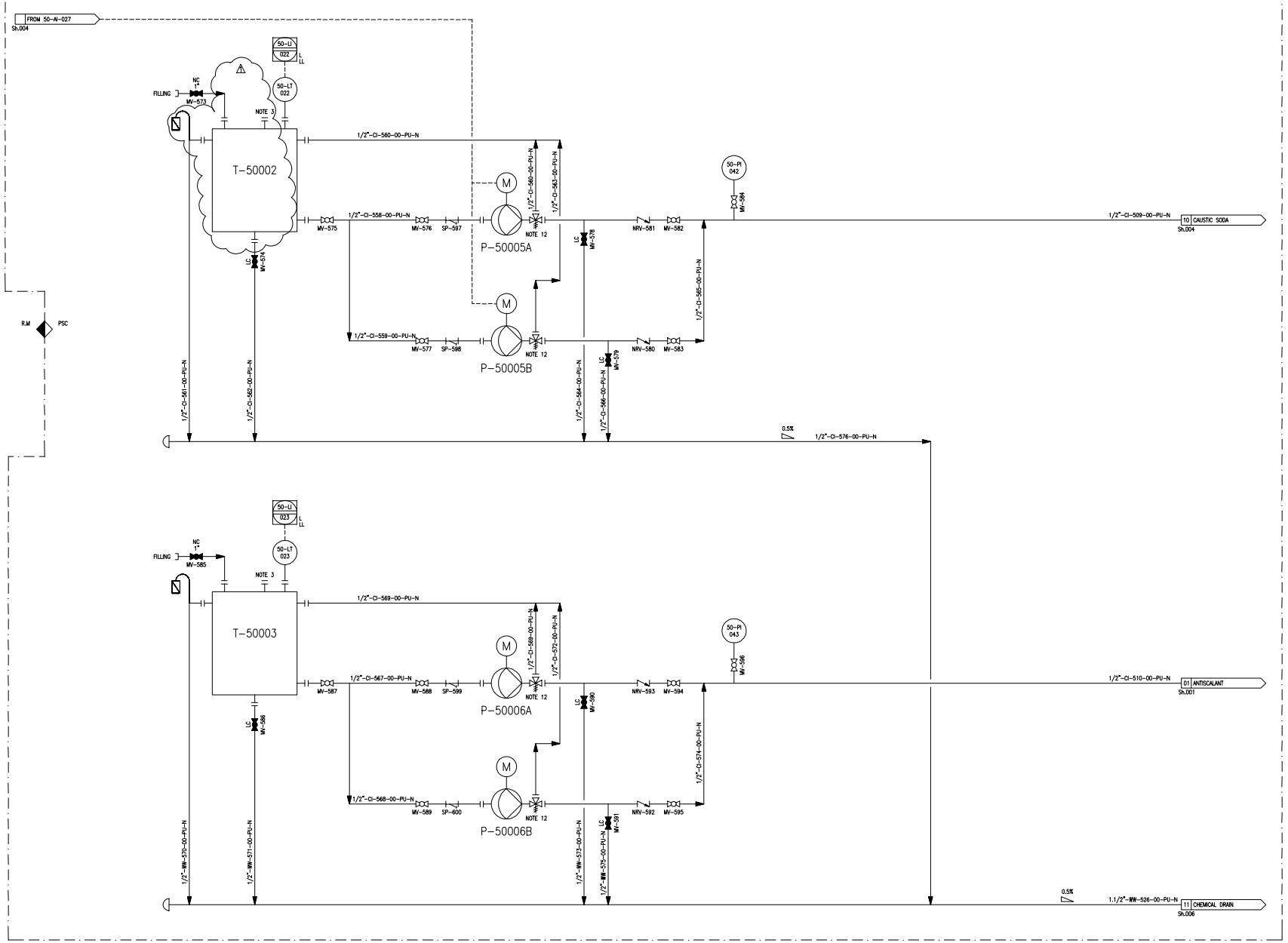
CROSSWIND

ROSETTI MARINO

TITLE :
WATER TREATMENT PACKAGE
FRESH WATER STORAGE
P&I DIAGRAM

CONTRACT NO./TITLE			SCALE -
DRAWN CC	CHECKED WR	APPROVED RM	DATE 29/05/24
A1	DRAWING NO. 1724000448-PR-PID-00013		SHEET 004 REV. 1

File Name : 1724000448-PR-PID-00013 Rev01



T-50002	
CAUSTIC SODA DOSING TANK	
VOLUME	0.05 m3
DES. PRESS.	ATM
DES. TEMP.	45° C
MATERIAL	PE

P-50005A/B	
CAUSTIC SODA DOSING PUMP	
TYPE	METERING DIAPHRAGM
CAPACITY	0.05 l/h
HEAD	2 barg
DES. TEMP.	50° C
MATERIAL	PVC

T-50003	
ANTISCALANT DOSING TANK	
VOLUME	0.05 m3
DES. PRESS.	ATM
DES. TEMP.	45° C
MATERIAL	PE

P-50006A/B	
ANTISCALANT DOSING PUMP	
TYPE	METERING DIAPHRAGM
CAPACITY	0.05 l/h
HEAD	2 barg
DES. TEMP.	50° C
MATERIAL	PVC

TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-02	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-03	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-05	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTANK
TP-06	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-07	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
1	29-MAY-24	GG	WR	RM	ISSUED FOR REVIEW
0	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

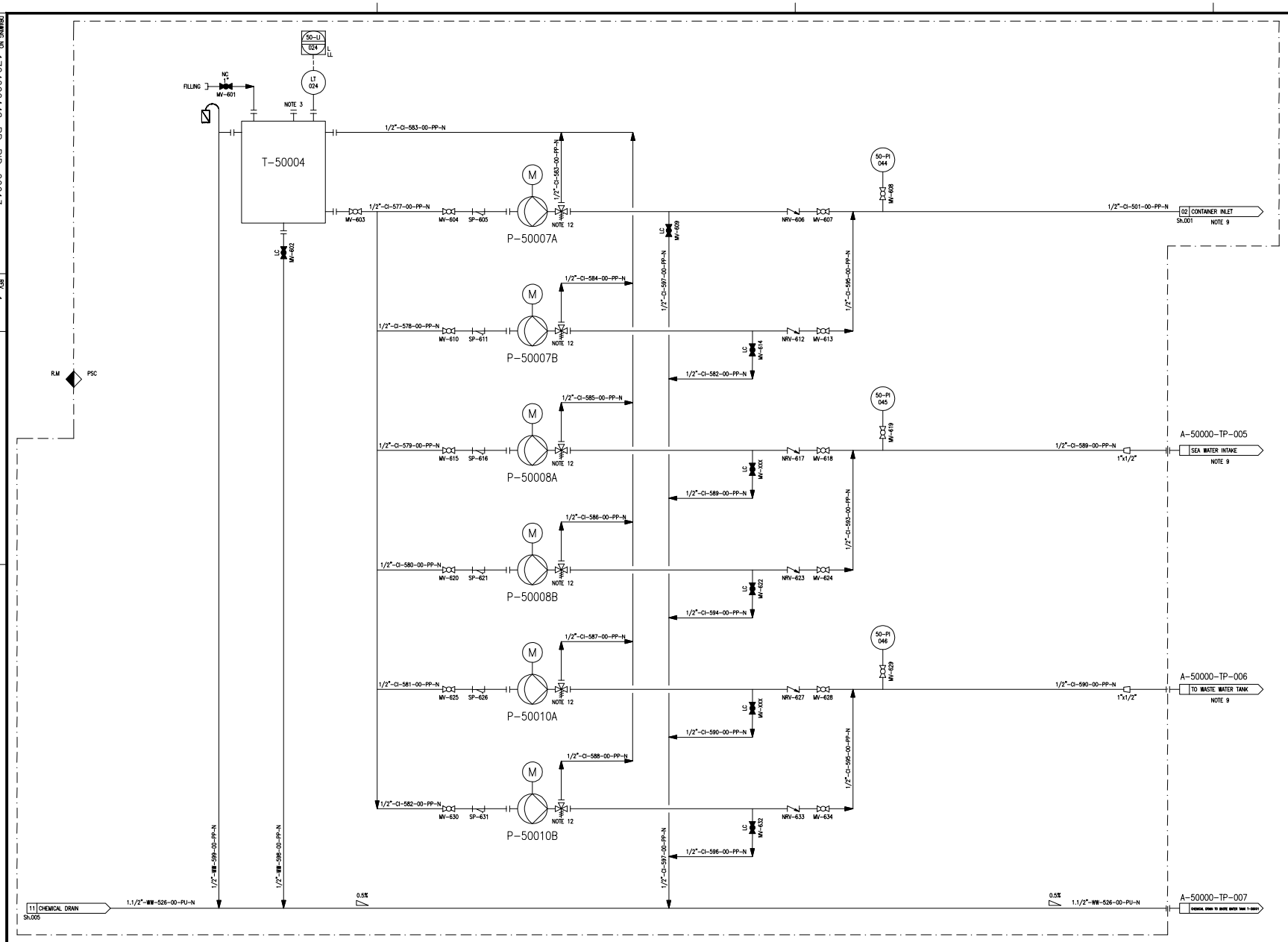
ROSETTI MARINO

TITLE :
WATER TREATMENT PACKAGE
ACID & ANTISCALANT DOSAGES
P&I DIAGRAM

CONTRACT NO./TITLE			SCALE -
DRAWN GC	CHECKED WR	APPROVED RM	DATE 29/05/24
A1	DRAWING NO. 1724000448-PR-PID-00013	SHEET 005	REV. 1

DRAWING NO. 1724000448-PR-PID-00013 REV. 1

File Name : 1724000448-PR-PID-00013 Rev01



TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-02	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-03	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-05	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTANK
TP-06	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-07	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE

T-50004	
NON-OXIDANT BIOCIDE DOSING TANK	
VOLUME	0.1 m3
DES. PRESS.	ATM
DES. TEMP.	45° C
MATERIAL	PE

P-50007A/B	
NON-OXIDANT BIOCIDE DOSING PUMP – CONTAINER INLET	
TYPE	METERING DIAPHRAGM
CAPACITY	0.1 l/h
HEAD	3.5 barg
DES. TEMP.	50° C
MATERIAL	PVC

P-50008A/B	
NON-OXIDANT BIOCIDE DOSING PUMP – SEA WATER INTAKE	
TYPE	METERING DIAPHRAGM
CAPACITY	2 l/h
HEAD	3.5 barg
DES. TEMP.	50° C
MATERIAL	PVC

P-50010A/B	
NON-OXIDANT BIOCIDE DOSING PUMP – WASTE WATER TANK	
TYPE	METERING DIAPHRAGM
CAPACITY	0.5 l/h
HEAD	3.5 barg
DES. TEMP.	50° C
MATERIAL	PVC

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
1	29-MAY-24	GG	WR	RM	ISSUED FOR REVIEW
0	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

ROSETTI MARINO

TITLE :
WATER TREATMENT PACKAGE
BIOCIDE DOSAGE
P&I DIAGRAM

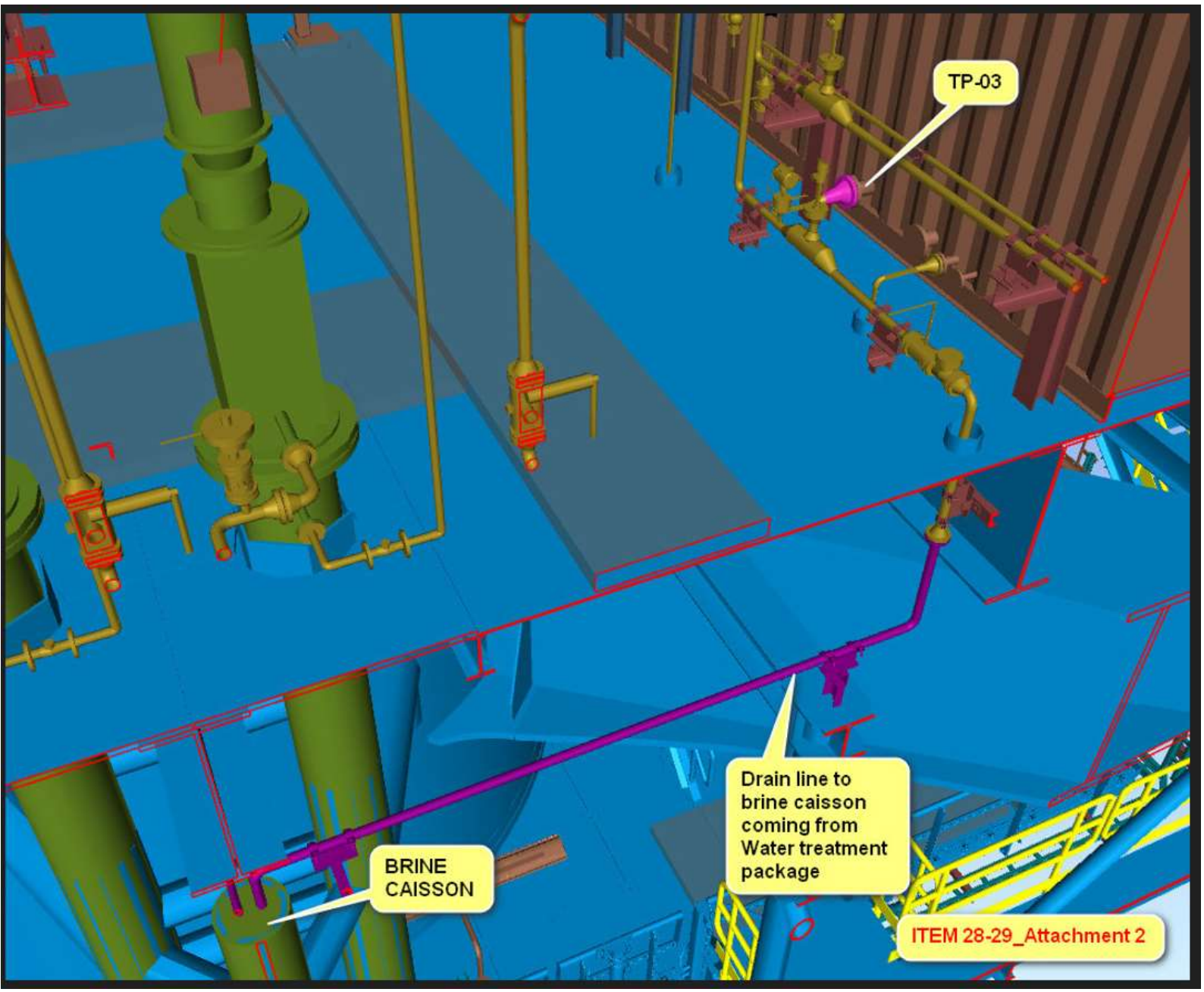
CONTRACT NO./TITLE | SCALE –

DRAWN GC | CHECKED WR | APPROVED RM | DATE 29/05/24

A1 | DRAWING NO. 1724000448-PR-PID-00013 | SHEET 006 | REV. 1

DRAWING NO. 1724000448-PR-PID-00013 REV. 1

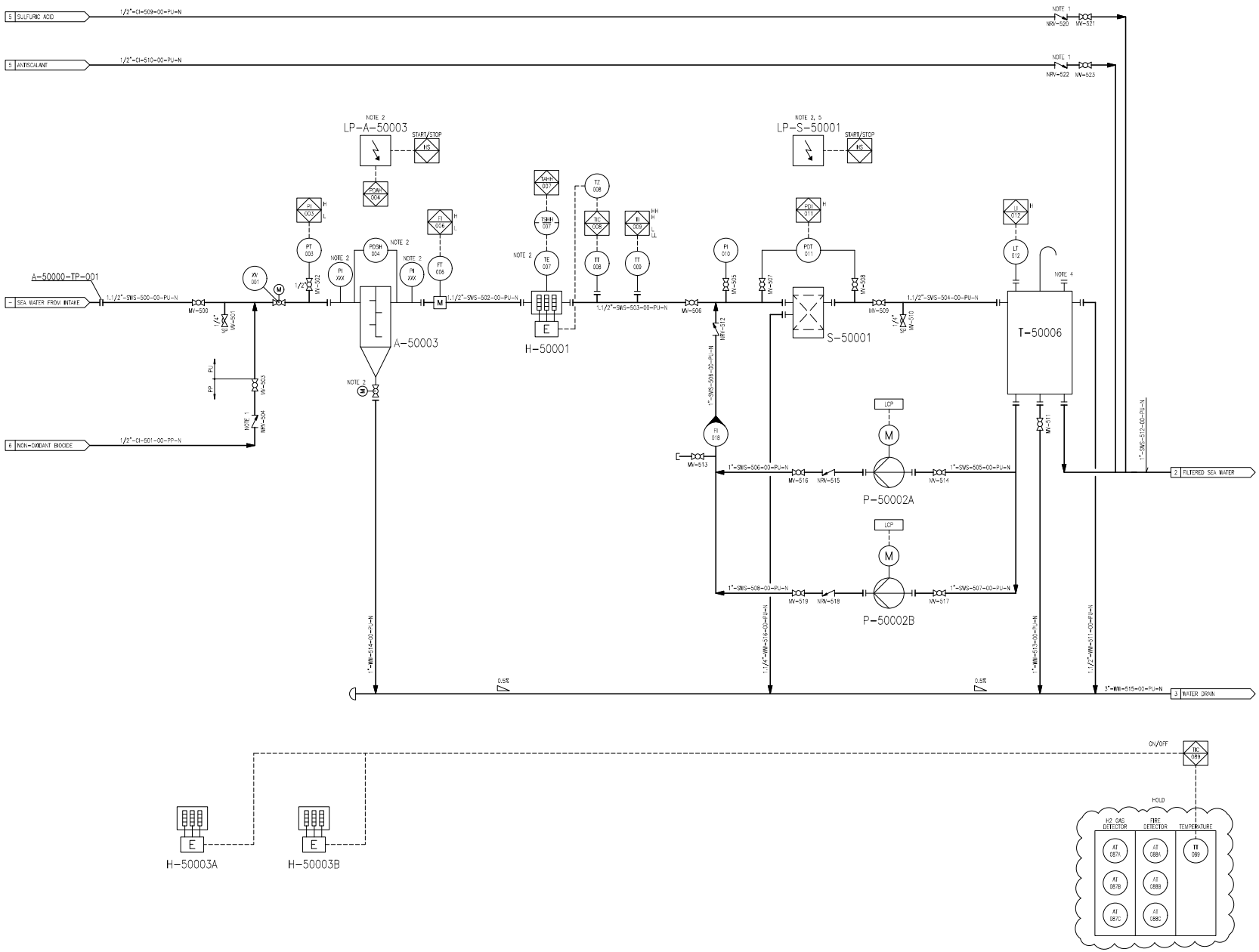
File Name : 1724000448-PR-PID-00013 Rev01


TP-03
Drain line to brine caisson coming from Water treatment package
BRINE CAISSON
ITEM 28-29_Attachment 2

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	31
Cause:	P-50009A & B operating
Consequence:	Unknown consequences for electrolyser package
Safeguards:	
Actions:	Control logic should inhibit dual operation of lift pumps, P-50009A & B.
Assigned Respondent (By)	ROSETTI Instrumentation Engineer
RESPONSE	As per Vendor's document "WATER TREATMENT PACKAGE-PID DIAGRAM" n° 1724000448-PR-PID-00013 Note 9.
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
L.Calabrese	
EPC HSE Lead	**Sign**
C.Caracciolo	**CC**
EPC Project Manager	**Sign**
D. Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.09.03 16:21:25 +02'00'



TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	DESCRIPTION
TP-01	1.1/2"	FLG.	150#	RF	SEA WATER FROM INTAKE PUMPS
TP-02	1"	FLG.	150#	RF	PRODUCT WATER
TP-03	3"	FLG.	150#	RF	SEA WATER DRAIN
TP-04	1"	FLG.	150#	RF	ACID DRAIN
TP-05	1"	FLG.	150#	RF	BIOCIDE TO SEA WATER INTAKE
TP-06	1"	FLG.	150#	RF	BIOCIDE TO WASTE WATER TAKE
TP-07	1.1/2"	FLG.	150#	RF	CHEMICAL DRAIN

NOTES:

1. SPRING LOADED CHECK VALVE.
2. SUPPLIED WITH EQUIPMENT.
3. CONNECTION ONLY DURING CIP CLEANING.
4. INSPECTION COVER.
5. FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
6. PUMP EQUIPPED WITH FLUSHING VALVE.
7. CHECK VALVE SUPPLIED WITH THE PUMP.
8. ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
9. LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEUS RUNNING OF A PUMP A AND B IS PROVIDED.
10. PLEASE NOTE THAT DM FLUIDE CODE IS FRESH WATER AND NOT DEMI WATER.
11. OFF SPEC ON/OFF VALVE

A-50003	
PRE-FILTER	
FILTRATION RATE	125 µm
CAPACITY	2.5 m3/h
DES. PRESS.	6 bar
DES. TEMP.	50° C
MATERIAL	PLASTIC MAT.

H-50001	
ELECTRIC HEATER	
POWER	37 kW
CAPACITY	2.5 m3/h
DES. PRESS.	6 bar
DES. TEMP.	60° C
MATERIAL	S.S. – SUPER DUPLEX

S-50001	
SAND FILTER	
TYPE	PRESSURE,VERTICAL
CAPACITY	2.5 m3/h
DES. PRESS.	6 bar
DES. TEMP.	50° C
MATERIAL	FRP

T-50006	
FILTERED WATER TANK	
VOLUME	3 m3
DES. PRESS.	ATM
DES. TEMP.	50° C
MATERIAL	FRP

P-50002A/B	
BACKWASH PUMP	
TYPE	CENTRIFUGAL
CAPACITY	5 m3/h
DES. PRESS.	1.5 bar
DES. TEMP.	50° C
MATERIAL	HOLD

H-50003A/B	
CONTAINER ELECTRICAL HEATER	
POWER	13 kW
DES. PRESS.	ATM
DES. TEMP.	° C
MATERIAL	–

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
0	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

PSC DOC. REF: PK2885-B-001

CROSSWIND

ROSETTI MARINO

TITLE :

WATER TREATMENT PACKAGE
SEA WATER PRE-TREATMENT
P&I DIAGRAM

CONTRACT NO./TITLE

SCALE : –

DRAWN UR | CHECKED RC | APPROVED RM | DATE 24/04/24

A1

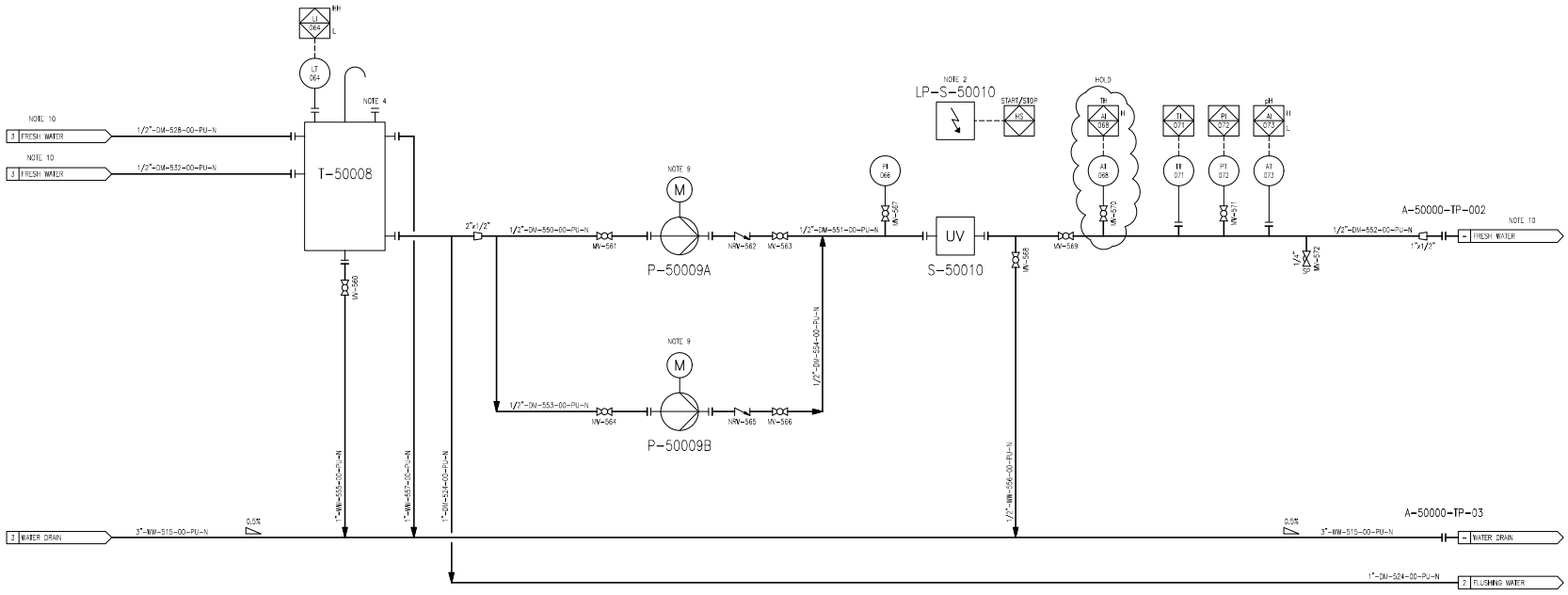
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SHEET 001

REV. 0

File Name : 1724000448-PR-PID-00013 Rev0

DRAWING NO. : 1724000448-PR-PID-00013 REV. 0



T-50008	
FRESH WATER TANK	
VOLUME	2.2 m3
DES. PRESS.	ATM
DES. TEMP.	50° C
MATERIAL	FRP

P-50009A/B	
FRESH WATER PUMP	
TYPE	CENTRIFUGAL
CAPACITY	0.8 m3/h
HEAD	6 bar
DES. TEMP.	50° C
MATERIAL	SS 316L

S-50010	
UV STERILIZER	
CAPACITY	0.8 m3/h
DES. PRESS.	8 bar
DES. TEMP.	50° C
MATERIAL	SS 316

DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
0	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

ROSETTI MARINO

TITLE :
WATER TREATMENT PACKAGE
FRESH WATER STORAGE
P&I DIAGRAM

CONTRACT NO./TITLE | SCALE : -

DRAWN UR | CHECKED RC | APPROVED RM | DATE 24/04/24

A1 | DRAWING NO. 1724000448-PR-PID-00013 | SHEET 004 | REV. 0

DRAWING NO. 1724000448-PR-PID-00013 REV 0

File Name : 1724000448-PR-PID-00013 Rev0

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	33
Cause:	Unknown components from vendor packages Marine Contaminants
Consequence:	Potential for vacuum in sea water supply system due to pump failure, coincidence to blocked discharge on liquid full line.
Safeguards:	
Actions:	Consider duringVendor hazop package
Assigned Respondent (By)	ROSETTI Mechanical
RESPONSE	Case of potential for vacuum in sea water supply system due to pump failure has been considered during WTP HAZOP package. For this topic, nothing critical has been highlighted. Please refer to 123A90-DDL-SAF-RE-30006
Attachments:	
Issue Date (dd/mm/yy)	

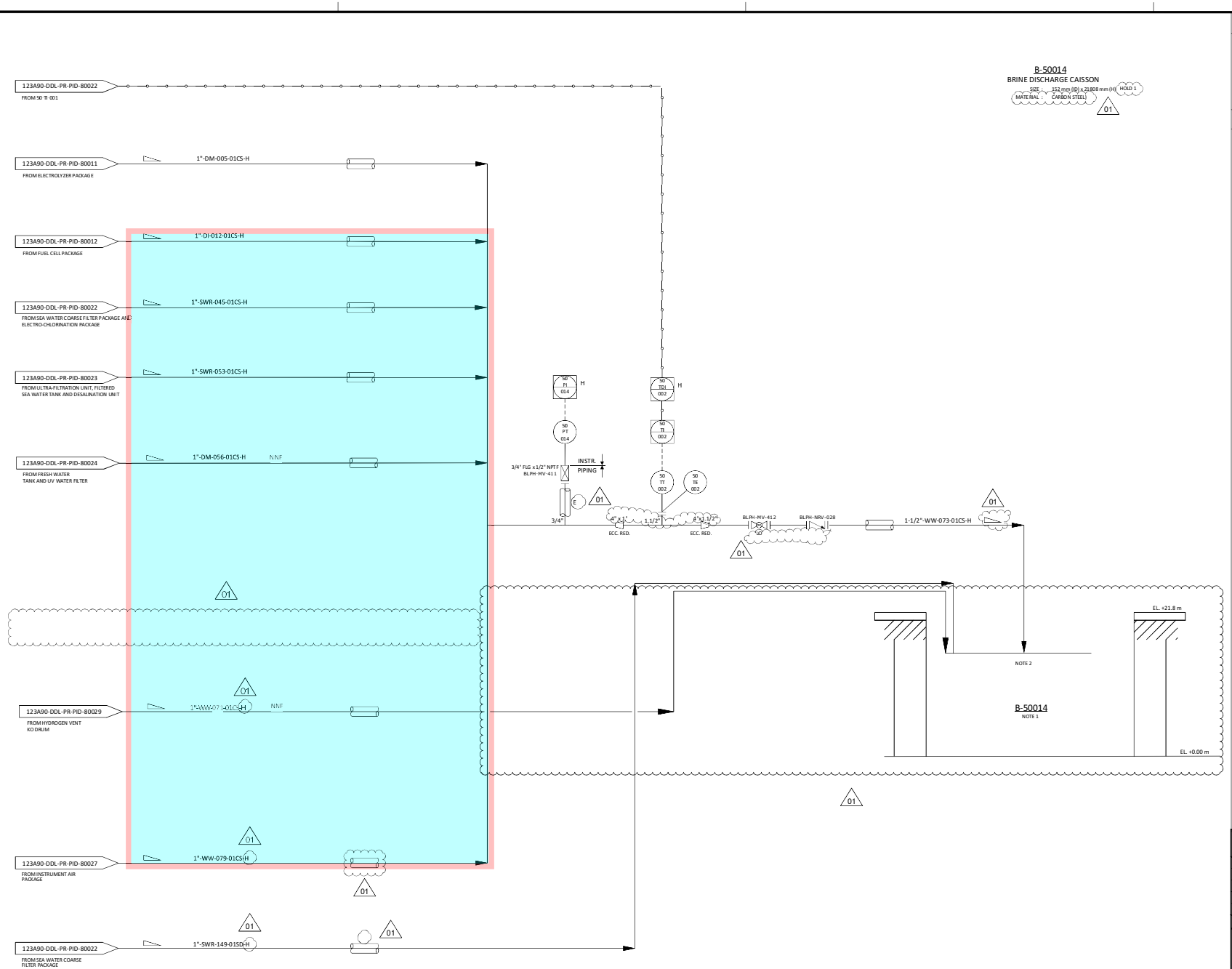
Approvals / Endorsements	
EPC Discipline Lead	**Sign**
F.Mura	
EPC HSE Lead	**Sign**
C.Caracciolo	**CC**
EPC Project Manager	**Sign**
D.Lo Sterzo	
Client	**Sign**

Digitaal ondertekend door Paul van Rossum
Datum: 2024.09.03 16:19:51 +02'00'

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	38
Cause:	Partially closed non- return valve.
Consequence:	Potential backflow into other users of bring discharge.
Safeguards:	
Actions:	Confirm if non return valve is required on individual feed lines into brine disposal manifold.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	It is confirmed that on individual feed lines into brine disposal manifold there is no requirement to have any non-return valve, as per PID 123A90-DDL-PR-PID-80025, attachment 1
Attachments:	
Issue Date	28-02-2024

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice	Ciro Impradice Autore firma digitale: Ciro Impradice Nome distintivo: CN = Ciro Impradice email = ciro.impradice@rosetti.it C = IT O = Rosetti Marino SPA = Process Data: 2024.05.15 14:30:59 02'00'
EPC HSE Lead	**Sign**
C.Caracciolo	CC
EPC Project Manager	**Sign**
D.Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.06.24 08:06:28 +02'00'



NOTES

1. CAISSON IS OPEN TOPPED.
2. ALL OVERBOARD LINES TO TERMINATE APPROXIMATLEY 5000 mm INSIDE CAISSON.

HOLDS

1. BRINE CAISSON INTERNAL DIAMETER. 01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM
WATER DISPOSAL SHEET 1

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK	SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE
A1	DRAWING NO. 123A90-DDL-PR-PID-80025	SHEET 001	REV. 01

DRAWING_NO.

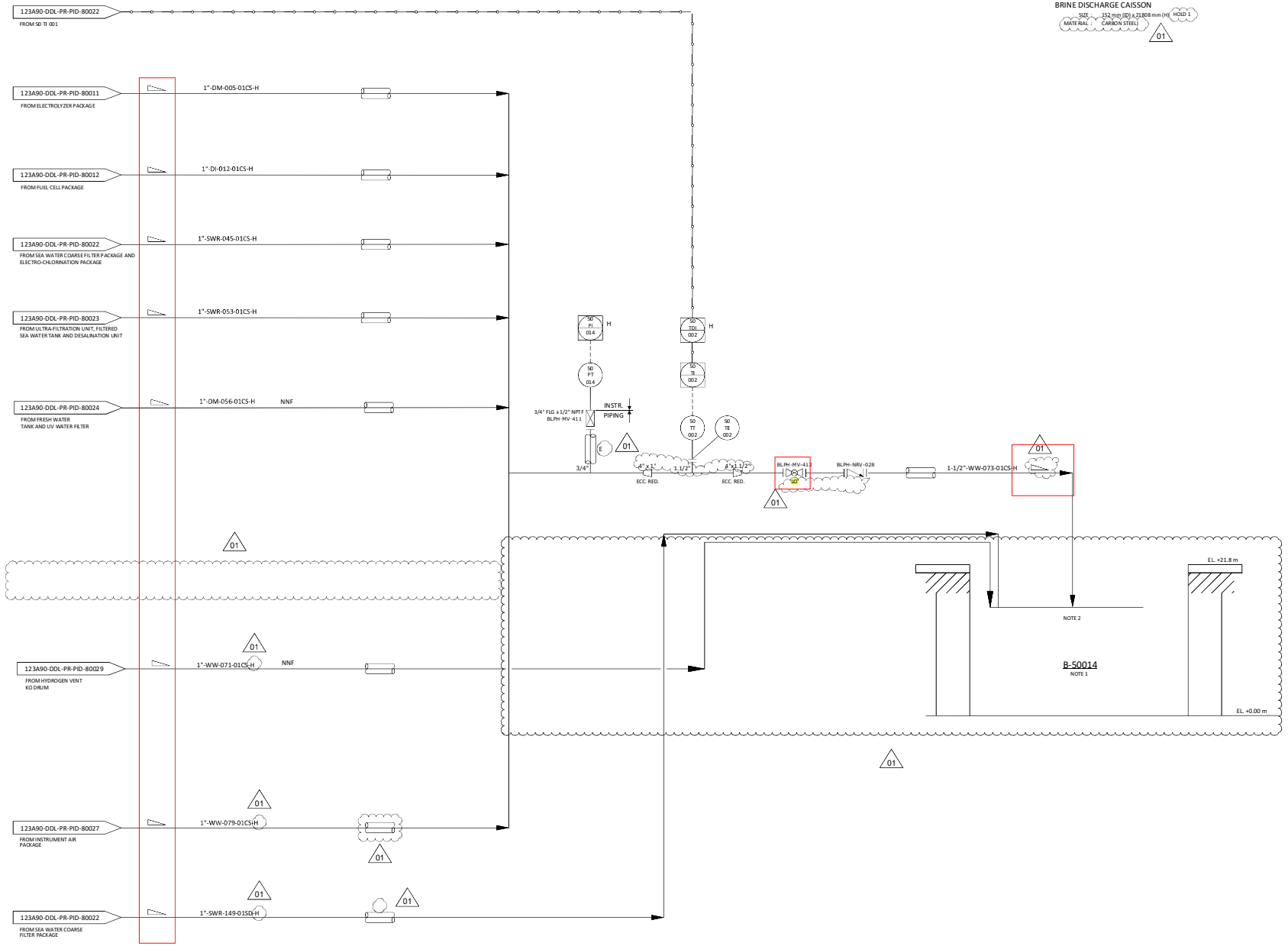
REV.

File Name : FILE_NAME

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	40
Cause:	Low ambient temperature Consequence: 4.10.1.1
Consequence:	Potential freezing
Safeguards:	Insulated line
Actions:	Consider winterization of brine drain line if required
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	Winterization of brine lines entering to the brine discharge caisson has been reviewed and are indicated on the attached PID "123A90-DDL-PR-PID-80025_01". More specifically, there is no requirement to electrically trace the lines entering to the brine discharge caisson, since they are all slope toward the caisson and the only manual valve installed between caisson and equipment/package to drain (valve MV-412) is specified to be locked open ("LO"). Also, the part of line downstream the check valve NRV-028 is sloped. See attachment 1 HAZOP action 40 (FEED).
Attachments:	
Issue Date (28/02/2024)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice	Ciro Impradice
EPC HSE Lead	**Sign**
C.Caracciolo	CC
EPC Project Manager	**Sign**
D.Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.03.22 16:10:02 +01'00'



NOTES

1. CAISSON IS OPEN TOPPED.
2. ALL OVERBOARD LINES TO TERMINATE APPROXIMATLEY 5000 mm INSIDE CAISSON.

HOLDS

1. BRINE CAISSON INTERNAL DIAMETER. 01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM
WATER DISPOSAL SHEET 1

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80025		SHEET 001	REV. 01

DRAWING NO. DRAWING_NO.

REV. REV.

File Name : FILE_NAME

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	44
Cause:	Pump Failure P- 43003
Consequence:	Potential overfill of hydrogen vent. Leading to blockage of hydrogen vent & discharge of water from vent. Potential loss of safeguard, and additional consequences to upstream users & vent systems. Clarification: During a blowdown, the backpressure from V43001 may lead to overpressure of connected low pressure systems (e.g. hydrogensystems rated at 4 barg), leading to a Hydrogen release at grade. Potential for fire / VCE.
Safeguards:	Flow metre downstream of P-43003 with'LL' flow trip. Level 'H' alarm on hydrogen KO drum V- 43001Level 'LY-HH' on hydrogen KO drum vent, leading to system shutdown.
Actions:	Shut down on 'HH' in hydrogen KO drum vent should lead to system shut down but not depressurisation.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	As per TQ 123A90-PML-PM-TQ-00013 and as per point 4.1.15.1 of the EPC HAZOP, which states: QUOTE 4.1.15.1. ... 90 Electrolyser starts/yr, 0.5 hr/start-up, 3.2kg/hr of water(worst credible scenario based on condensation of all water in stream), Platform visited for maintenance 2 times/yr where issue can be identified and rectified. 0.076 m3 of water within 2m3 KO drum overfill of vessel not considered credible. UNQUOTE There is no requirement of having a HH liquid level in the H2 Vent KOD, since overfill of the vessel is not a credible scenario. Therefore, system shut-down in case of HH liquid level is not applicable.
Attachments:	
Issue Date (21/02/24)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice	
EPC HSE Lead	**Sign**
Carolina Caracciolo	CC
EPC Project Engineering Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**

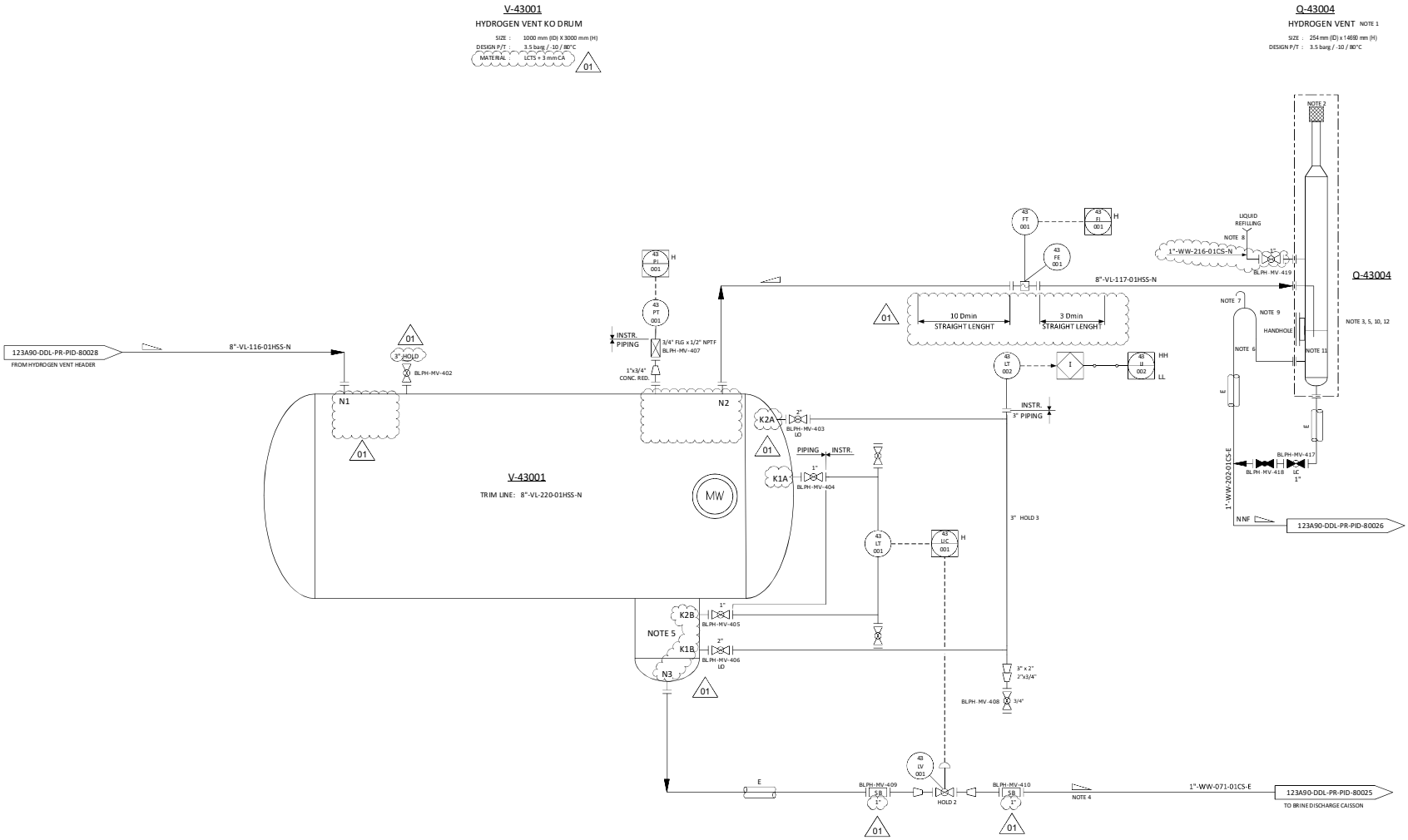
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Datum: 2024.03.14 17:03:29 +01'00'

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	45
Cause:	Pump Failure P- 43003
Consequence:	Potential overfill of hydrogen vent. Leading to blockage of hydrogen vent & discharge of water from vent. Potential loss of safeguard, and additional consequences to upstream users & vent systems. Clarification: During a blowdown, the backpressure from V43001 may lead to overpressure of connected low pressure systems (e.g. hydrogen systems rated at 4 barg), leading to a Hydrogen release at grade. Potential for fire / VCE.
Safeguards:	Flow metre downstream of P-43003 with'LL' flow trip. Level 'H' alarm on hydrogen KO drum V- 43001 Level 'LY-HH' on hydrogen KO drum vent, leading to system shutdown.
Actions:	Asses consequences of loss of safeguard of availability of vent system to upstream users.
Assigned Respondent (By)	ROSETTI Technical Safety Engineer
RESPONSE	Pump 43003, as per PID 123A90-DDL-PR-PID-80029, is not more part of the design, so the action is not more valid.
Attachments:	PID 123A90-DDL-PR-PID-80029
Issue Date	03-05-24

Approvals / Endorsements

EPC Discipline Lead	**Sign**
Carolina Caracciolo	**CC**
EPC HSE Lead	**Sign**
Carolina Caracciolo	
EPC Project Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Nossum Datum: 2024.05.10 12:32:10 +02'00'



NOTES

1. VENT TO SAFE LOCATION SEGREGATED FROM OTHER VENTS.
2. VENT TO BE EQUIPPED WITH FLAME ARRESTOR AND BIRD SCREEN.
3. LIQUID SEAL DRUM IS PART OF THE VENT SYSTEM.
4. LIQUID DRAINLINES TO BE ROUTED TO ENSURE GRAVITY DRAIN.
5. HYDROGEN VENT KO DRUM BOOT AND LIQUID SEAL DRUM TO BE HEAT TRACING.
6. SEAL LEG WILL BE DETERMINATED ON THE MAXIMUM BACK PRESSURE IN THE VENT.
7. SEAL VENT TO BE PLACED INTO A SAFE POSITION.
8. FILLING LINE TO BE PLACED IN AN ACCESSIBLE POSITION.
9. TRACED FOR 1.5 m, INSULATED UP TO THE BEND.
10. LIQUID SEAL DRUM I.D. 590 mm, HEIGHT 2350 mm (T/T). TBC BY H2 VENT VENDOR.
11. INLET DIP LEG SUBMERSION HEIGHT OF 0.2 m.
12. FLUID HEIGHT OF 1.5 m FROM BOTTOM T.L.
13. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 VENT KOD.

01

HOLDS

1. VENT LINES DIAMETER.
2. CONTROL VALVE SIZE (BY VENDOR).
3. STAND PIPE DIAMETER TO BE CONFIRMED.

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	24/11/2023	CIM	RZI	DLO	ISSUE FOR HAZOP (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN VENT DRUM

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80029		SHEET 001	REV. 01

DRAWING NO. DRAWING_NO.

REV. REV

File Name : FILE_NAME

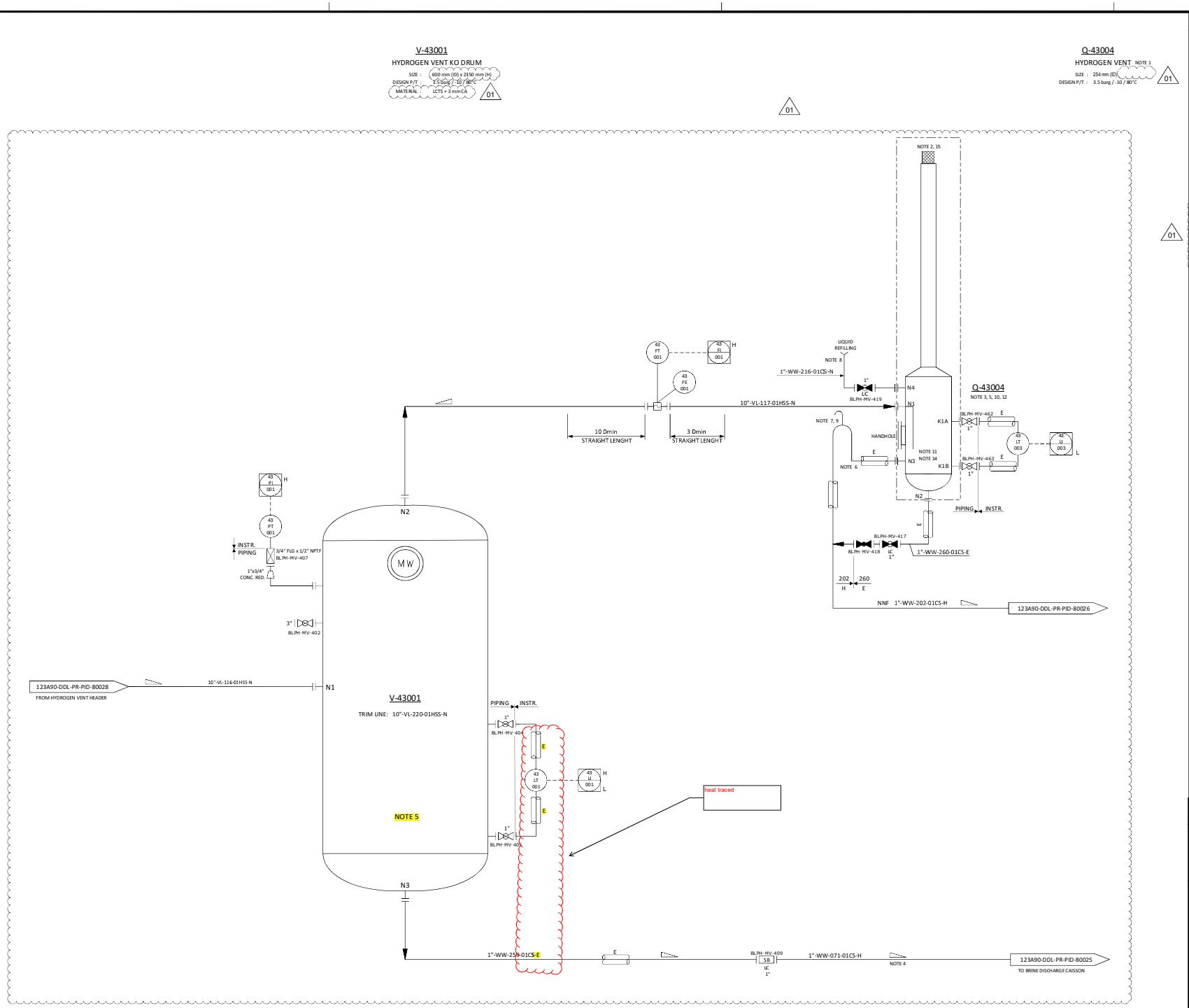
BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	46
Cause:	Low ambient temperature
Consequence:	Freezing of the stagnant water in the pipe or vessel, leading to blocked outlet. Potential overfill of hydrogen vent. Leading to blockage of hydrogen vent & discharge of water from vent. Potential loss of safeguard, and additional consequences to upstream users & vent systems. Clarification: freezing of small bore rundown piping may lead to temporary level build-up. It is not expected to reach high level and block the vent before the line unfreezes again.
Safeguards:	Level 'LY-HH' on hydrogen KO drum vent, leading to system shutdown. 'LIC-H' level alarm on hydrogen KO drum vent Insulation of liquid outlet from KO drum to caisson. Heater H- 43002, 'TIC' for heater & temperature alarm 'High'
Actions:	Review need for winterisation of small bore piping & provide if required.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	As per EPC HAZOP action n47, the maximum expected quantity of liquid that can be accumulated in the H2 Vent KOD over a period of six months is 0.053 m^3. Therefore, in order to avoid freezing of stagnant water, the bottom side of the KOD has been heat traced, together with the liquid exit line and the small-bore piping on the liquid level instrument, as per PID 123A90-DDL-PR-PID-80029_01, attachment 1.
Attachments:	
Issue Date	28-02-2024

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice	Ciro Impradice Autore firma digitale: Ciro Impradice Nome dell'entità: OU = Ciro Impradice email = ciro.impradice@rosetti.it C = IT O = Rosetti Marino OU = Process Data: 2024.05.15 15:26:35 02'00'
EPC HSE Lead	**Sign**
C.Caracciolo	CC
EPC Project Manager	**Sign**
D.Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.06.24 08:07:47 +02'00'

DRAWING NO. DRAWING_NO.

REV. REV



NOTES

1. VENT TO SAFE LOCATION SEGREGATED FROM OTHER VENTS.
2. VENT TO BE EQUIPPED WITH FLAME ARRESTOR AND BIRD SCREEN.
3. LIQUID SEAL DRUM IS PART OF THE VENT SYSTEM.
4. LIQUID DRAINLINES TO BE ROUTED TO ENSURE GRAVITY DRAIN.
5. HYDROGEN VENT KO DRUM BOOT AND LIQUID SEAL DRUM TO BE HEAT TRACING.
6. SEAL LEG WILL BE DETERMINATED ON THE MAXIMUM BACK PRESSURE IN THE VENT.
7. SEAL VENT TO BE PLACED INTO A SAFE POSITION.
8. FILLING LINE TO BE PLACED IN AN ACCESSIBLE POSITION.
9. TRACED FROM NOZZLE N3 UP TO SWAN NECK.
10. LIQUID SEAL DRUM I.D. 590 mm, HEIGHT 2350 mm (T/T). TBC BY H2 VENT VENDOR.
11. INLET DIP LEG SUBMERSION HEIGHT OF 0.2 m (TBC BY VENDOR).
12. FLUID HEIGHT OF 1.5 m FROM BOTTOM T.L. (TBC BY VENDOR).
13. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 VENT KOD.
14. LIQUID INSIDE SEAL DRUM IS A WATER - GLYCOL MIXTURE WITH 40% VOLUME OF GLYCOLE.
15. TOP OF TIP OF H2 VENT SHALL BE AT AS MINIMUM 6.2 m FROM HIGHEST REACHABLE PLATFORM.

01

HOLDS

1. DELETED.
2. DELETED.
3. DELETED.

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN VENT DRUM

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE NTS
DRAWN	CHECKED	APPROVED	DATE
A1	DRAWING NO. 123A90-DDL-PR-PID-80029	SHEET 001	REV. 01

File Name : FILE_NAME

BLPH SHEAMS SIGNATURE FORM

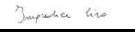
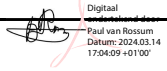
Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	47
Cause:	LIC on V- 43001 failure
Consequence:	Potential for pump to run dry & overheat leading to potential fire.
Safeguards:	LIC-L' level alarm on hydrogen KO drum vent, and 'Level Controller' stopping pump. (not valid, part of IE) Level 'LY-LL' on hydrogen KO drum vent, leading to pump shutdown.
Actions:	Review design of pump with respect to possibility of running dry with hydrogen gas.
Assigned Respondent (By)	ROSETTI Mechanical Engineer
RESPONSE	The pump has been removed from the design. The recommendation is superseded.
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements

EPC Discipline Lead	**Sign**
F. Mura	
EPC HSE Lead	**Sign**
C. Caracciolo	**CC**
EPC Project Manager	**Sign**
D. Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Possum Datum: 2024.09.03 16:17:02 +02'00'

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	48
Cause:	Low ambient temperature
Consequence:	Freezing of the stagnant water in the pipe or vessel, leading to blocked outlet. Potential overfill of hydrogen vent. Leading to blockage of hydrogen vent & discharge of water from vent. Potential loss of safeguard, and additional consequences to upstream users & vent systems. Clarification: freezing of small bore rundown piping may lead to temporary level build-up. It is not expected to reach high level and block the vent before the line unfreezes again.
Safeguards:	Level 'LY-HH' on hydrogen KO drum vent, leading to system shutdown. 'LIC-H' level alarm on hydrogen KO drum vent Insulation of liquid outlet from KO drum to caisson. Heater H- 43002, 'TIC' for heater & temperature alarm 'High'
Actions:	Review necessity for provision of heater within hydrogen vent V- 43001, when information on potential liquid carry over is available.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	Necessity for provision of heater within hydrogen vent V-43001 has been investigated. It has been confirmed by the Electrolyser Package Vendor that no water in liquid phase is expected in the Hydrogen vent line coming from the Electrolyser Package; only water in gaseous phase is expected (see TQ No. 13, Doc. No. 123A90-PML-PM-TQ-00013). This means that liquid water could be accumulated in the Hydrogen vent KOD only in case of condensation of such off-spec stream from Elogen system. Such quantity will be accumulated within the boot of H2 Vent KOD, which is heat traced as well as the downstream discharge line (see BLPH Piping And Instrumentation Diagram - Hydrogen Vent Drum, Doc. No. 123A90-DDL-PR-PID-80029). Therefore, there is no need to install any heater inside the Hydrogen Vent KOD.
Attachments:	
Issue Date (28/02/24)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
C. Impradice (Process)	
EPC HSE Lead	**Sign**
C. Caracciolo	
EPC Project Engineering Manager	**Sign**
D. Lo Sterzo	
Client	**Sign**
	

Digitaal ondertekend door Paul van Rossum
Datum: 2024.03.14 17:04:09 +01'00'

CROSSWIND

ROSETTI MARINO

TECHNICAL QUERY
Hollandse Kust Noord

No. TQ :	123A90-PML-PM-TQ-00013	Rev:	01

Originating Party	Rosetti Marino					
Subject	Vent line					
Author	C. Impradice	TQ Aconex unique number: ROSMA-INN-BPH-TQ-00020				
Interface TQ - from		TQ interface source Aconex unique number:				
Type	Query x			Interface x		
	Deviation			Derogation (SHALL[PS])		
	Note: No deviations nor derogations which have an adverse effect on HSSE will be granted					
Workpackage						
Area(s) of application	Design & Eng.	x	Procurement		Construction	
	Commissioning		Operations		Other	
Issue date	06/09/2023		Urgent reply 5 days	x	Routine reply 10 days	
Close-out date						
Closed-out by			TQ status:		Closed-out	

1. Description

Reference documents / Aconex unique numbers:

Reference is made to P&iD K559-2254-PR-PID-002 "Piping and Instrumentation Diagram Electrolyser Package" :

1) A vent line sent to the Hydrogen Vent KO Drum is shown. Contractor understanding is that this line (2"-VL-003-01HCS) is from an emergency (and/or) a relief system, which are located inside the package. Vendor to confirm ;
2) Vendor to indicate process conditions of this line in terms of: temperature, fluid type, peak mass flow rate (kg/hr);
3) Vendor also to inform RM if this line only contains H2 gas or it can also contain water. If yes Vendor to infor RM about the peak mass flow rate of the liquid phase stream;
4) In general, in order to allow RM di well design the downstream vent system (outside vendor scope), RM needs to receive all discharge scenarious.

2. Response

Reference documents / Aconex unique numbers

Hydrogen vent could be from :

- depressurization of Electrolyser during a normal stop,
- depressurization of Electrolyser during a safety stop,
- analyzed hydrogen to vent (continuous),
- non-compliant hydrogen to vent,

This communication is issued for the recipient's information and to facilitate the obligations of the Parties under the Contract. This communication has no authority to amend or vary the Contract nor relieve either Party of any duties, obligations or responsibilities.

Type	In/Out	Description	Flow (m3/h)	Pressure (Barg)	Temperature (°C)
H2 Vent	Out	Hydrogen	500 Nm3/h	ATM	5-65

No liquid water is expected in Hydrogen vent line.

R01 Rosetti's reply: as per meeting held on 25/10/2023, RM requests stream composition of the H2 vent line. RM understood that the H2 vent stream outgoing from the package is an off-spec stream, therefore a stream with less than 99.9 % of H2. For this reason, RM needs to understand the complete composition of such stream (if more than one scenario is present, RM expects more than one composition will be communicated). Moreover, ELOGEN is requested to indicate if the H2 vent stream outgoing from the package shall be considered as gas-water-saturated stream or not.

ELOGEN Reply:

Elogen confirms that complete composition of H2 vent could be H2, vapor H2O and Nitrogen.
The content and its percentage depends on several details. However, the worst case for vapor H2O content is:

Mass Flowrates	Vapor
H2 [kg/h]	4,50E+01
H2O [kg/h]	3,27E+00

Atmospheric pressure and T=65°C.

For N2 content, it could be from 0 to 100% during venting process.

All the rest scenarios have less vapor water content, for example, non-compliant hydrogen is vented when there is:

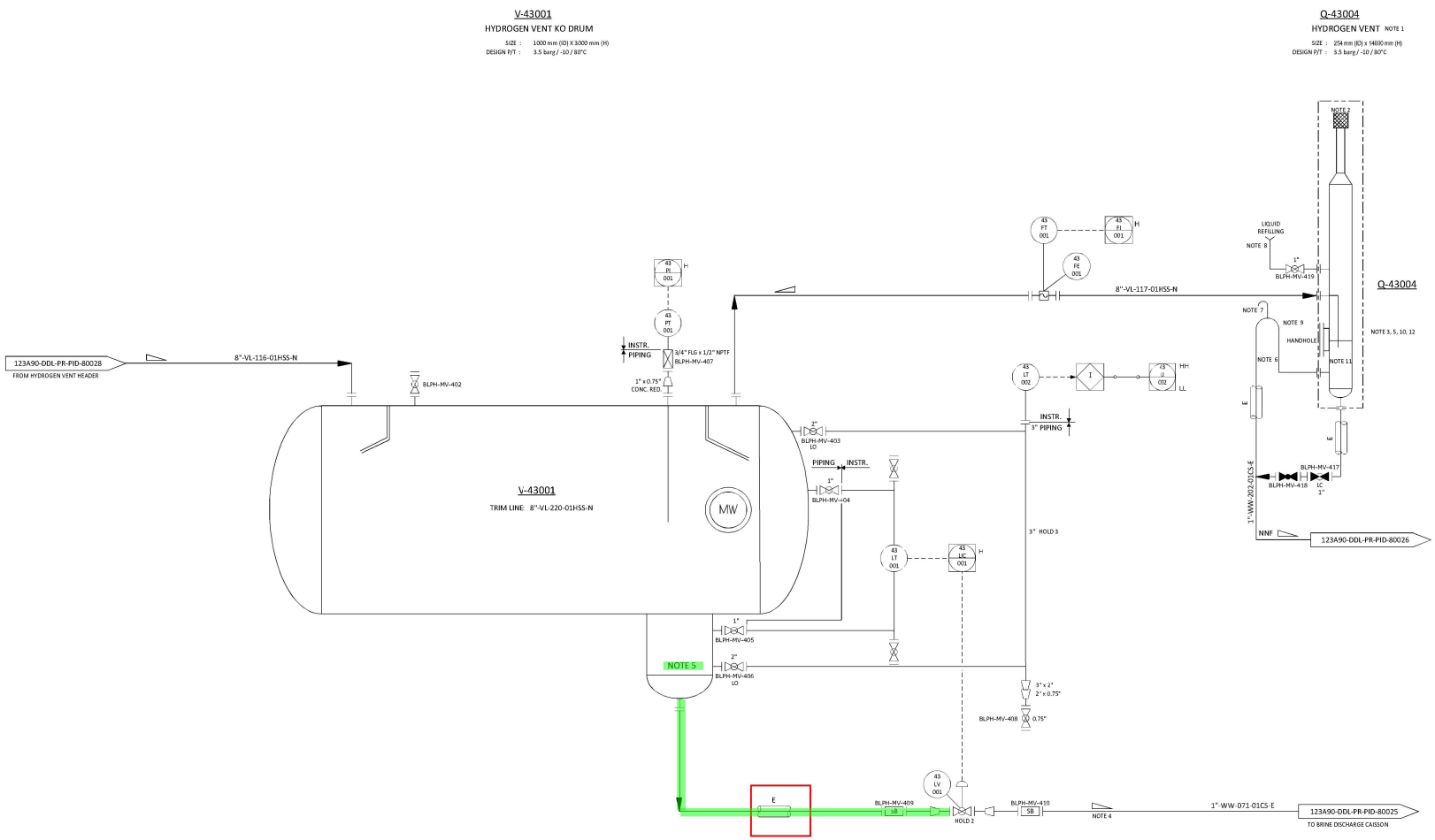
- more than 5 ppm O2 or
- more than 5 ppm N2 or
- more than 5 ppm H2O.

It is confirmed that there is no liquid content, and water is in vapor phase in H2 vent.

This communication is issued for the recipient's information and to facilitate the obligations of the Parties under the Contract. This communication has no authority to amend or vary the Contract nor relieve either Party of any duties, obligations or responsibilities.

DRAWING NO. DRAWING_NO.

REV. REV



NOTES

1. VENT TO SAFE LOCATION SEGREGATED FROM OTHER VENTS.
2. VENT TO BE EQUIPPED WITH FLAME ARRESTOR AND BIRD SCREEN.
3. LIQUID SEAL DRUM IS PART OF THE VENT SYSTEM.
4. LIQUID DRAINLINES TO BE ROUTED TO ENSURE GRAVITY DRAIN.
5. HYDROGEN VENT KO DRUM BOOT AND LIQUID SEAL DRUM TO BE HEAT TRACING.
6. SEAL LEG WILL BE DETERMINATED ON THE MAXIMUM BACK PRESSURE IN THE VENT.
7. SEAL VENT TO BE PLACED INTO A SAFE POSITION.
8. FILLING LINE TO BE PLACED IN AN ACCESSIBLE POSITION.
9. TRACED FOR 1.5 m, INSULATED UP TO THE BEND.
10. LIQUID SEAL DRUM I.D. 590 mm, HEIGHT 2350 mm (T/T). TBC BY H2 VENT VENDOR.
11. INLET DIP LEG SUBMERSION HEIGHT OF 0,2 m.
12. FLUID HEIGHT OF 1.5 m FROM BOTTOM T.L.

HOLDS

1. VENT LINES DIAMETER.
2. CONTROL VALVE SIZE (BY VENDOR).
3. TO BE CONFIRMED.

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
00	23/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN VENT DRUM

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK	SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE
A1	DRAWING NO. 123A90-DDL-PR-PID-80029	SHEET 001	REV. 00

File Name : FILE_NAME

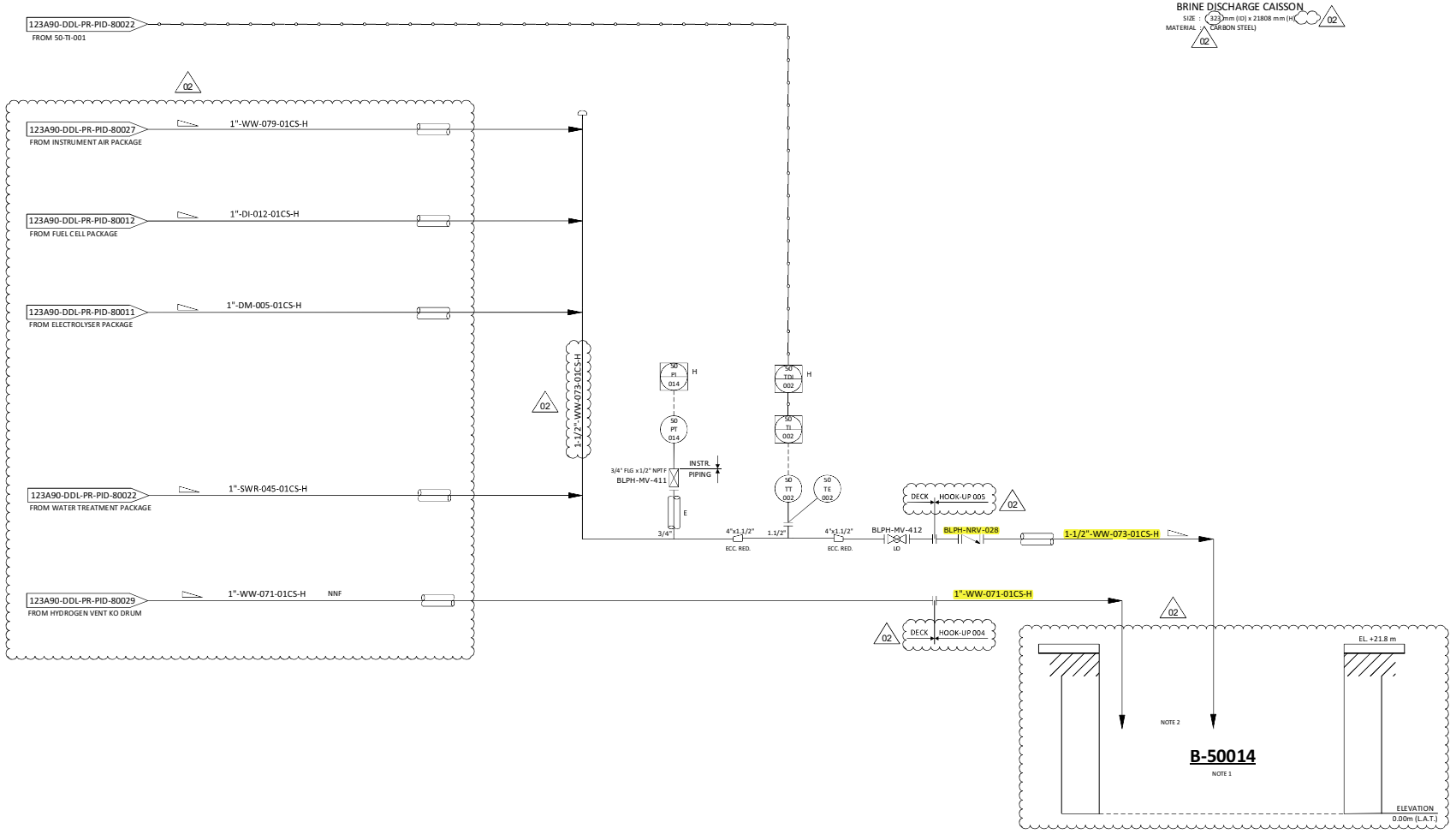
BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	49
Cause:	LIC on V- 43001 failure
Consequence:	7.3.1.2. Potential for oxygen ingress into liquid brine vent system.
Safeguards:	
Actions:	Determine credibility of ingress of oxygen into liquid brine vent system. Leading to potential backflow into other cross connected systems & discharge from vent of brine caisson. If credible provide suitable mitigation.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	Ingress of oxygen into liquid brine vent system, leading to potential backflow into other cross connected systems & discharge from vent of brine caisson, is not credible since: 1) On the first inlet line 1-1/2"-WW-073-01CS-H there is a check valve BLPH-NRV-028 to prevent backflow (see aattachment1); 2) On the second inlet line 1"-WW-071-01CS-H there is a manual valve always closed to prevent backflow (see attachment 2).
Attachments:	
Issue Date	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
C. Impradice	Ciro Impradice Autore firma digitale: Ciro Impradice Nome distintivo: CN = Ciro Impradice email = ciro.impradice@rosetti.it C = IT O = Rosetti Marino OU = Process Data: 2024.06.28 16:10:54 +02'00'
EPC HSE Lead	**Sign**
C.Caracciolo	CC
EPC Project Manager	**Sign**
D.Lo.Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.08.21 08:13:52 +02'00'

DRAWING NO. DRAWING_NO.

REV. REV.



NOTES

1. CAISSON IS OPEN TOPPED.
2. ALL LINES TO TERMINATE APPROXIMATLEY 0.00 mm BELOW SEAWATER LEVEL (LAT) 02

HOLDS

1. DELETED 02

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	12/06/2024	CIM	RZI	DLO	ACCEPTED FOR CONSTRUCTION (AFC)
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
WATER DISPOSAL SHEET 1

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80025		SHEET 001	REV. 02

File Name : FILE_NAME

DRAWING NO. DRAWING_NO.

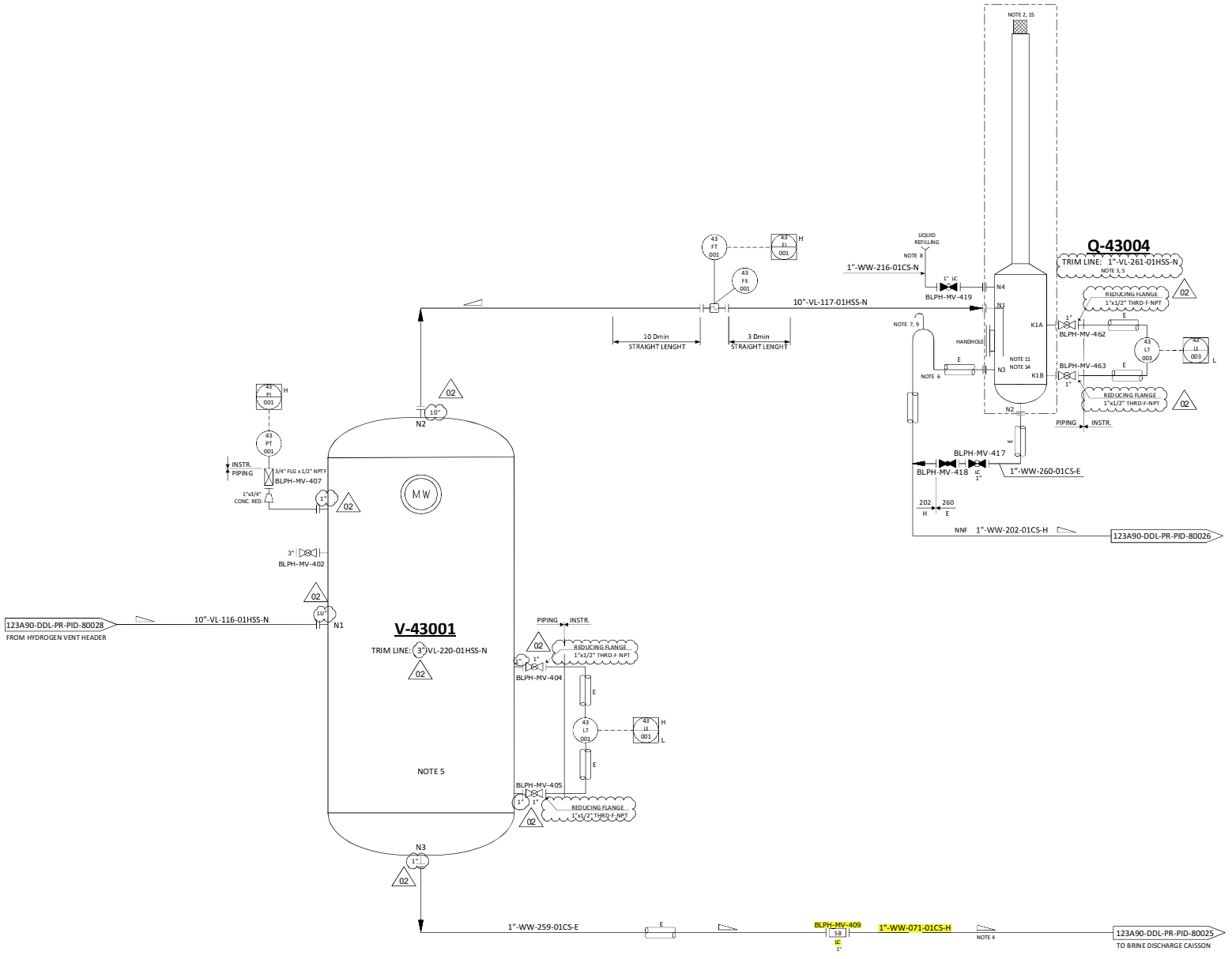
REV. REV

V-43001
HYDROGEN VENT KO DRUM

SIZE : 600 mm (ID) x 2350 mm (H)
DESIGN P/T : 3.5 barg / -10 / 80°C
MATERIAL : LTCS + 1 mm CA 02

Q-43004
HYDROGEN VENT NOTE 1

SIZE : 254 mm (ID)
DESIGN P/T : 3.5 barg / -10 / 80°C
MATERIAL : LTCS + 3 mm CA 02



NOTES

1. VENT TO SAFE LOCATION SEGREGATED FROM OTHER VENTS.
2. VENT TO BE EQUIPPED WITH FLAME ARRESTOR AND BIRD SCREEN.
3. LIQUID SEAL DRUM IS PART OF THE VENT SYSTEM.
4. LIQUID DRAIN LINES TO BE ROUTED TO ENSURE GRAVITY DRAIN.
5. HYDROGEN VENT KO DRUM AND LIQUID SEAL DRUM TO BE HEAT TRACING.
   - V-43001 HEAT TRACED FROM B.T.L. UP TO 600 mm, BOTTOM HEAD ALSO TO BE HEAT TRACED.
6. SEAL LEG WILL BE DETERMINATED ON THE MAXIMUM BACK PRESSURE IN THE VENT. 02
7. SEAL VENT TO BE PLACED INTO A SAFE POSITION.
8. FILLING LINE TO BE PLACED IN AN ACCESSIBLE POSITION.
9. TRACED FROM NOZZLE N3 UP TO SWAN NECK.
10. DELETED. 02
11. INLET DIP LEG SUBMERSION HEIGHT OR 0.6 m. 02
12. DELETED. 02
13. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 VENT KOD.
14. LIQUID INSIDE SEAL DRUM IS A WATER - GLYCOL MIXTURE WITH 40% VOLUME OF GLYCOL.
15. TOP OF TIP OF H2 VENT SHALL BE AT AS MINIMUM 6.2 m FROM HIGHEST REACHABLE PLATFORM.

HOLDS

1. DELETED.
2. DELETED.
3. DELETED.

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	12/06/2024	CIM	RZI	DLO	ACCEPTED FOR CONSTRUCTION (AFC)
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN VENT DRUM

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE NTS
DRAWN	CHECKED	APPROVED	DATE
A1	DRAWING NO. 123A90-DDL-PR-PID-80029	SHEET 001	REV. 02

File Name : FILE_NAME

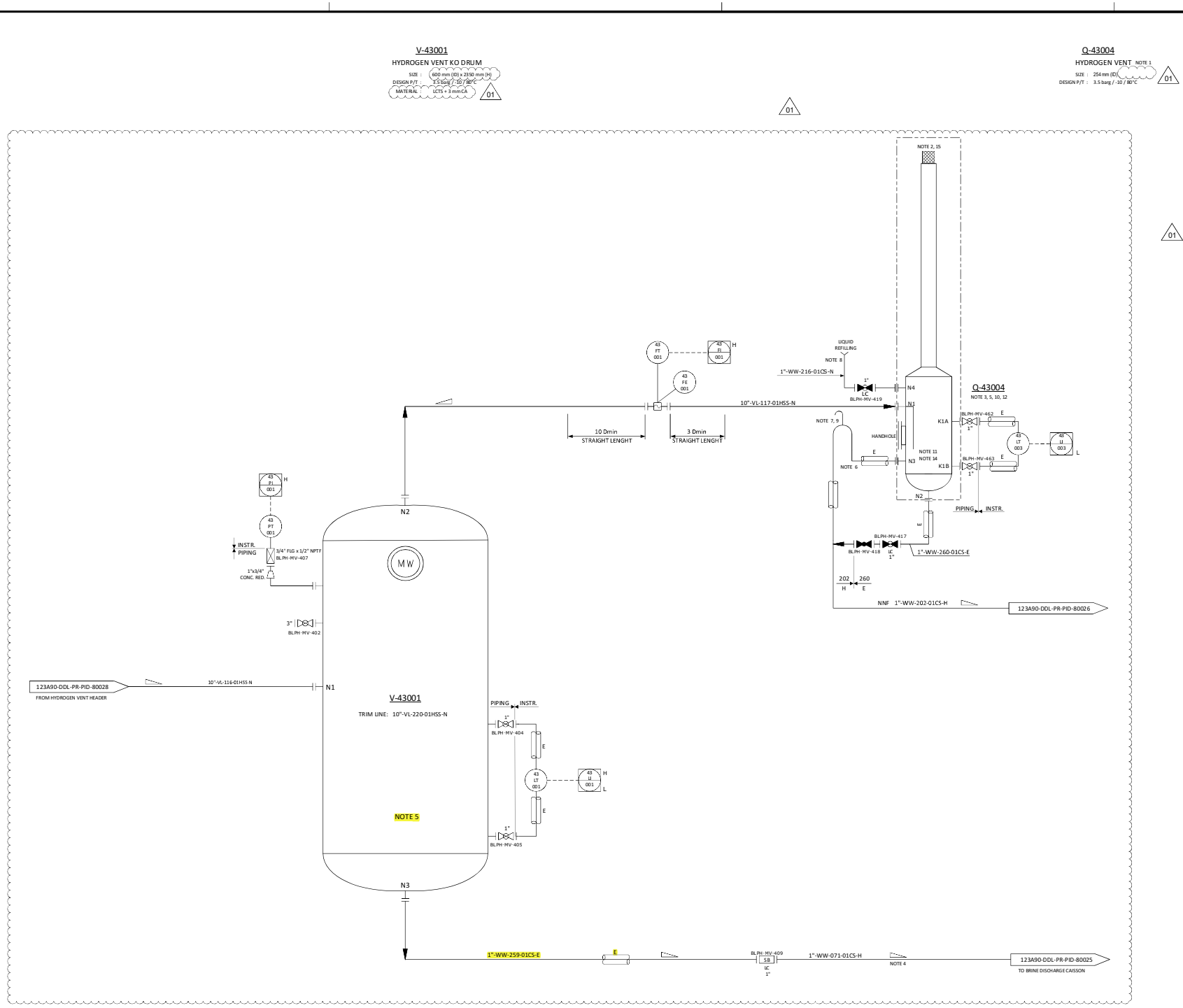
BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	51
Cause:	Low ambient temperature
Consequence:	Freezing of the stagnant water in the pipe or vessel, leading to blocked outlet. Potential overfill of hydrogen vent. Leading to blockage of hydrogen vent & discharge of water from vent. Potential loss of safeguard, and additional consequences to upstream users & vent systems. Clarification: freezing of small bore rundown piping may lead to temporary level build-up. It is not expected to reach high level and block the vent before the line unfreezes again.
Safeguards:	Level 'LY-HH' on hydrogen KO drum vent, leading to system shutdown. 'LIC-H' level alarm on hydrogen KO drum vent Insulation of liquid outlet from KO drum to caisson. Heater H- 43002, 'TIC' for heater & temperature alarm 'High'
Actions:	Review scenario of freezing of small bore rundown piping from V- 43001, which may lead to temporary level build-up. It is not expected to reach high level and block the vent before the line unfreezes again, this assumption should be confirmed. If assumption is incorrect, re- assess the scenario.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	The assumption that is not expected to reach high level and block the vent before the line unfreezes again is confirmed since it is not credible to have high liquid level inside the KOD (see EPC HAZOP action n44). Moreover, the very small quantity of liquid that can be accumulated over a period of six months will not freeze since the bottom side of the KOD is heat traced (see attachment 1-123A90-DDL-PR-PID-80029). Also, the liquid discharge line from the bottom side of the KOD is heat traced too, therefore up to the first manual valve BLPH-MV-409 (“LC”) liquid freezing is not a credible scenario
Attachments:	
Issue Date	28-02-2024

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice	Ciro Impradice Autore firma digitale: Ciro Impradice Nome distintivo: CN = Ciro Impradice email = ciro.impradice@rosetti.it C = IT O = Rosetti Marino OU = Process Date: 2024.06.06 23:02:07
EPC HSE Lead	Sign
C.Caracciolo	CC
EPC Project Manager	Sign
D.Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.06.24 08:14:30 +02'00'

DRAWING NO. DRAWING_NO.

REV. REV



NOTES

1. VENT TO SAFE LOCATION SEGREGATED FROM OTHER VENTS.
2. VENT TO BE EQUIPPED WITH FLAME ARRESTOR AND BIRD SCREEN.
3. LIQUID SEAL DRUM IS PART OF THE VENT SYSTEM.
4. LIQUID DRAINLINES TO BE ROUTED TO ENSURE GRAVITY DRAIN.
5. HYDROGEN VENT KO DRUM BOOT AND LIQUID SEAL DRUM TO BE HEAT TRACING.
6. SEAL LEG WILL BE DETERMINATED ON THE MAXIMUM BACK PRESSURE IN THE VENT.
7. SEAL VENT TO BE PLACED INTO A SAFE POSITION.
8. FILLING LINE TO BE PLACED IN AN ACCESSIBLE POSITION.
9. TRACED FROM NOZZLE N3 UP TO SWAN NECK.
10. LIQUID SEAL DRUM I.D. 590 mm, HEIGHT 2350 mm (T/T). TBC BY H2 VENT VENDOR.
11. INLET DIP LEG SUBMERSION HEIGHT OF 0.2 m (TBC BY VENDOR).
12. FLUID HEIGHT OF 1.5 m FROM BOTTOM T.L. (TBC BY VENDOR).
13. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 VENT KOD.
14. LIQUID INSIDE SEAL DRUM IS A WATER - GLYCOL MIXTURE WITH 40% VOLUME OF GLYCOLE.
15. TOP OF TIP OF H2 VENT SHALL BE AT AS MINIMUM 6.2 m FROM HIGHEST REACHABLE PLATFORM.

01

HOLDS

1. DELETED.
2. DELETED.
3. DELETED.

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN VENT DRUM

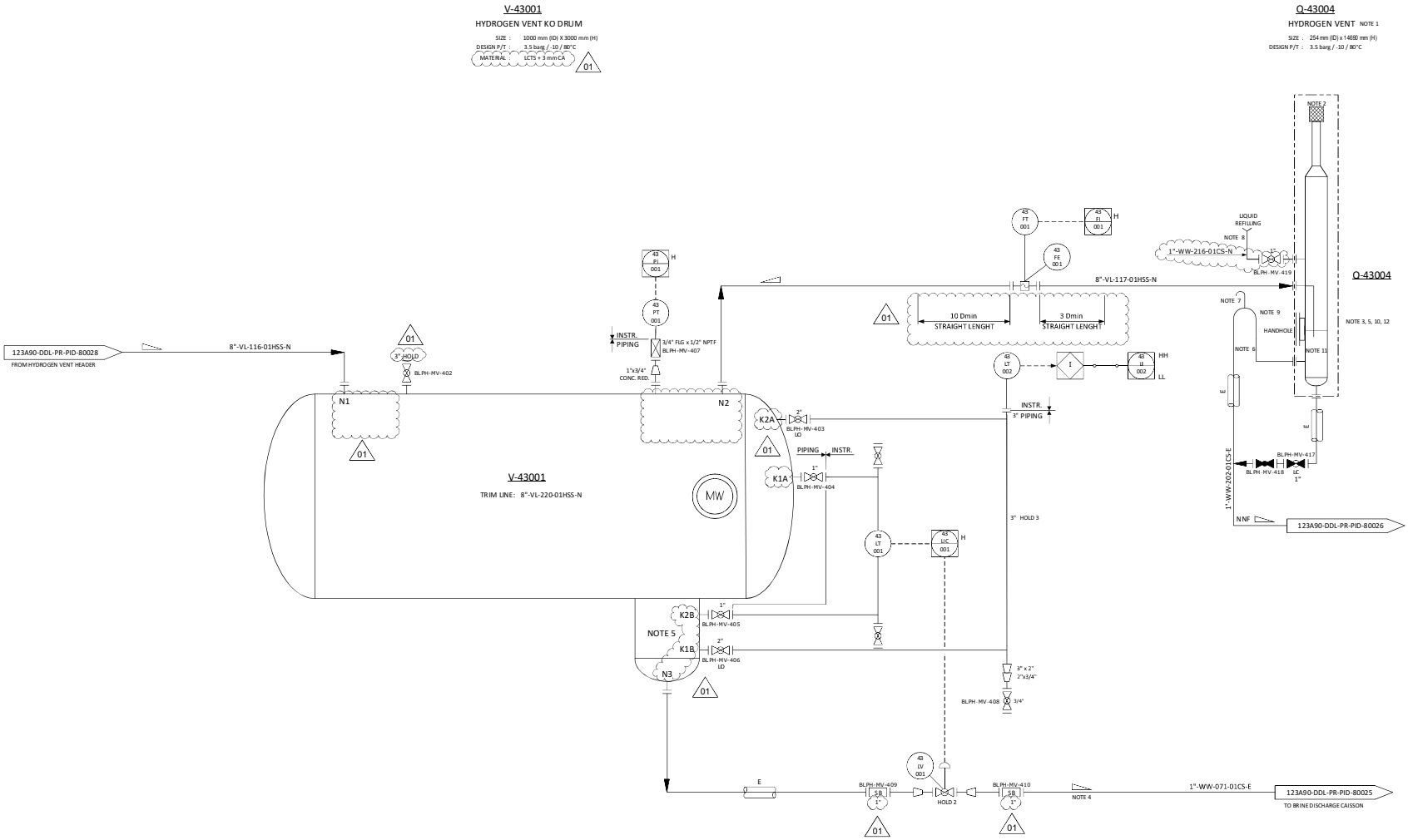
CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK			SCALE NTS
DRAWN	CHECKED	APPROVED	DATE
A1	DRAWING NO. 123A90-DDL-PR-PID-80029		SHEET 001 / REV. 01

File Name : FILE_NAME

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	52
Cause:	Pump Failure P- 43003
Consequence:	Potential overfill of hydrogen vent. Leading to blockage of hydrogen vent & discharge of water from vent. Potential loss of safeguard, and additional consequences to upstream users & vent systems. Clarification: During a blowdown, the backpressure from V43001 may lead to overpressure of connected low pressure systems (e.g. hydrogen systems rated at 4 barg), leading to a Hydrogen release at grade. Potential for fire / VCE.
Safeguards:	Flow metre downstream of P-43003 with'LL' flow trip. Level 'H' alarm on hydrogen KO drum V- 43001 Level 'LY-HH' on hydrogen KO drum vent, leading to system shutdown.
Actions:	Ensure Level 'LY- HH' on hydrogen KO drum vent achieves a RRF of 120.
Assigned Respondent (By)	ROSETTI Technical Safety Engineer
RESPONSE	Pump 43003, as per PID 123A90-DDL-PR-PID-80029, is not more part of the design, so the action is not more valid.
Attachments:	PID 123A90-DDL-PR-PID-80029
Issue Date	03-05-24

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Carolina Caracciolo	**CC**
EPC HSE Lead	**Sign**
Carolina Caracciolo	
EPC Project Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.05.10 12:36:29 +02'00'



NOTES

1. VENT TO SAFE LOCATION SEGREGATED FROM OTHER VENTS.
2. VENT TO BE EQUIPPED WITH FLAME ARRESTOR AND BIRD SCREEN.
3. LIQUID SEAL DRUM IS PART OF THE VENT SYSTEM.
4. LIQUID DRAINLINES TO BE ROUTED TO ENSURE GRAVITY DRAIN.
5. HYDROGEN VENT KO DRUM BOOT AND LIQUID SEAL DRUM TO BE HEAT TRACING.
6. SEAL LEG WILL BE DETERMINATED ON THE MAXIMUM BACK PRESSURE IN THE VENT.
7. SEAL VENT TO BE PLACED INTO A SAFE POSITION.
8. FILLING LINE TO BE PLACED IN AN ACCESSIBLE POSITION.
9. TRACED FOR 1.5 m, INSULATED UP TO THE BEND.
10. LIQUID SEAL DRUM I.D. 590 mm, HEIGHT 2350 mm (T/T). TBC BY H2 VENT VENDOR.
11. INLET DIP LEG SUBMERSION HEIGHT OF 0.2 m.
12. FLUID HEIGHT OF 1.5 m FROM BOTTOM T.L.
13. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 VENT KOD.

01

HOLDS

1. VENT LINES DIAMETER.
2. CONTROL VALVE SIZE (BY VENDOR).
3. STAND PIPE DIAMETER TO BE CONFIRMED.

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	24/11/2023	CIM	RZI	DLO	ISSUE FOR HAZOP (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN VENT DRUM

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80029		SHEET 001	REV. 01

DRAWING NO. DRAWING_NO.

REV. REV

File Name : FILE_NAME

BLPH SHEAMS SIGNATURE FORM

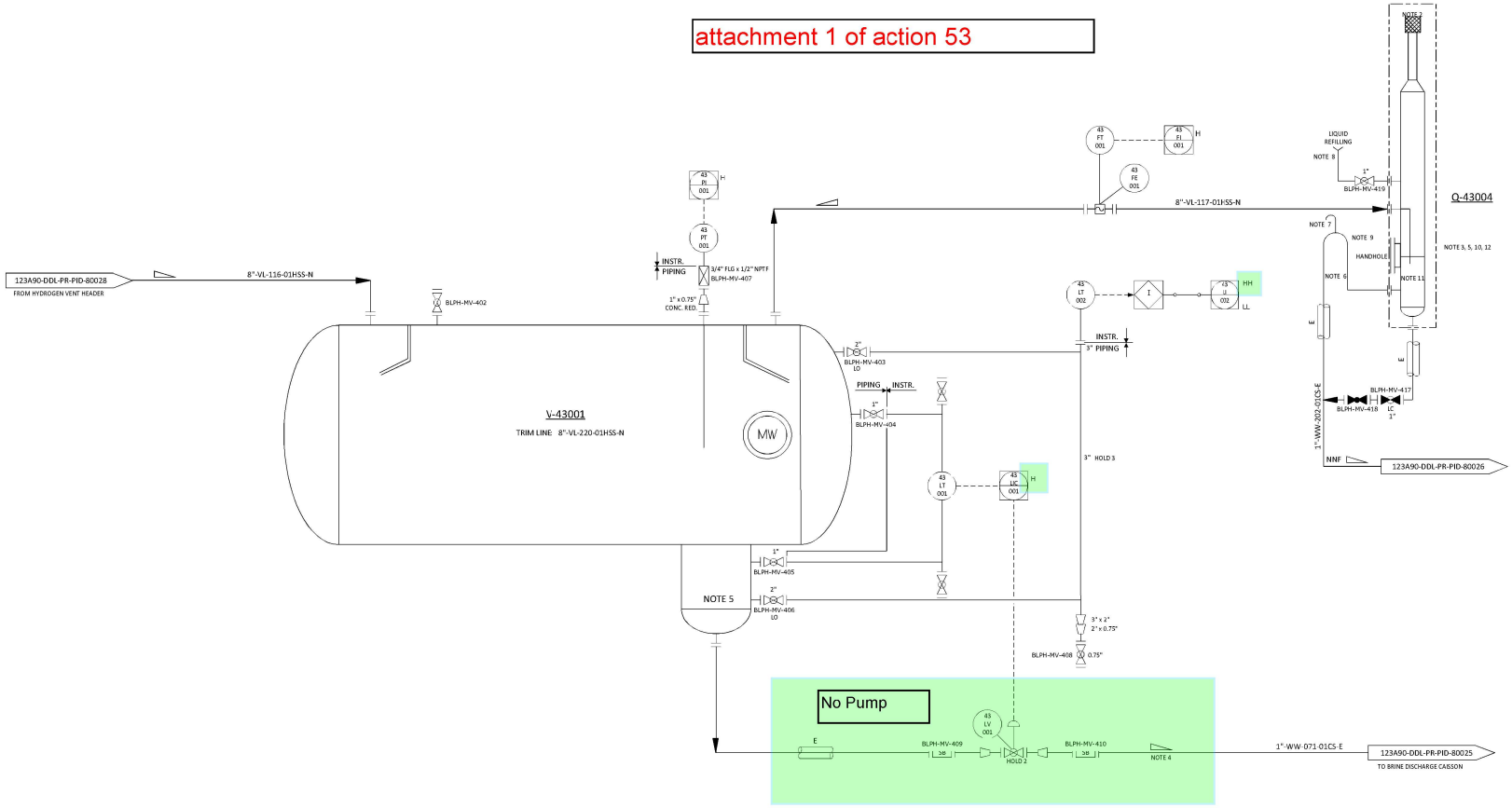
Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	53
Cause:	Pump Failure P- 43003
Consequence:	Potential overfill of hydrogen vent. Leading to blockage of hydrogen vent & discharge of water from vent. Potential loss of safeguard, and additional consequences to upstream users & vent systems.
Safeguards:	Flow metre downstream of P- 43003 with'LL' flow trip. Level 'H' alarm on hydrogen KO drum V- 43001 Level 'LY-HH' on hydrogen KO drum vent, leading to system shutdown.
Actions:	Assess the requirement for flow meter downstream P- 43003 with'LL' flow trip and evaluate if this needs to be DCS or SIS.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	The scenario of pump failure has been superseded since pump downstream the H2 Vent KOD has been deleted on the last revision of the FEED P&iD. This is also confirmed by the EPC P&iD “123A90-DDL-PR-PID-80029”.
Attachments:	
Issue Date (19-01-24)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice (Process)	
EPC HSE Lead	**Sign**
Carolina Caracciolo	CC
EPC Project Engineering Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door [illegible] Datum: 2024.08.21 08:14:37 +02'00'

DRAWING NO. DRAWING_NO.

REV. REV

attachment 1 of action 53



NOTES

1. VENT TO SAFE LOCATION SEGREGATED FROM OTHER VENTS.
2. VENT TO BE EQUIPPED WITH FLAME ARRESTOR AND BIRD SCREEN.
3. LIQUID SEAL DRUM IS PART OF THE VENT SYSTEM.
4. LIQUID DRAINLINES TO BE ROUTED TO ENSURE GRAVITY DRAIN.
5. HYDROGEN VENT KO DRUM BOOT AND LIQUID SEAL DRUM TO BE HEAT TRACING.
6. SEAL LEG WILL BE DETERMINATED ON THE MAXIMUM BACK PRESSURE IN THE VENT.
7. SEAL VENT TO BE PLACED INTO A SAFE POSITION.
8. FILLING LINE TO BE PLACED IN AN ACCESSIBLE POSITION.
9. TRACED FOR 1.5 m, INSULATED UP TO THE BEND.
10. LIQUID SEAL DRUM I.D. 590 mm, HEIGHT 2350 mm (T/T). TBC BY H2 VENT VENDOR.
11. INLET DIP LEG SUBMERSION HEIGHT OF 0,2 m.
12. FLUID HEIGHT OF 1.5 m FROM BOTTOM T.L.

HOLDS

1. VENT LINES DIAMETER.
2. CONTROL VALVE SIZE (BY VENDOR).
3. TO BE CONFIRMED.

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
00	23/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN VENT DRUM

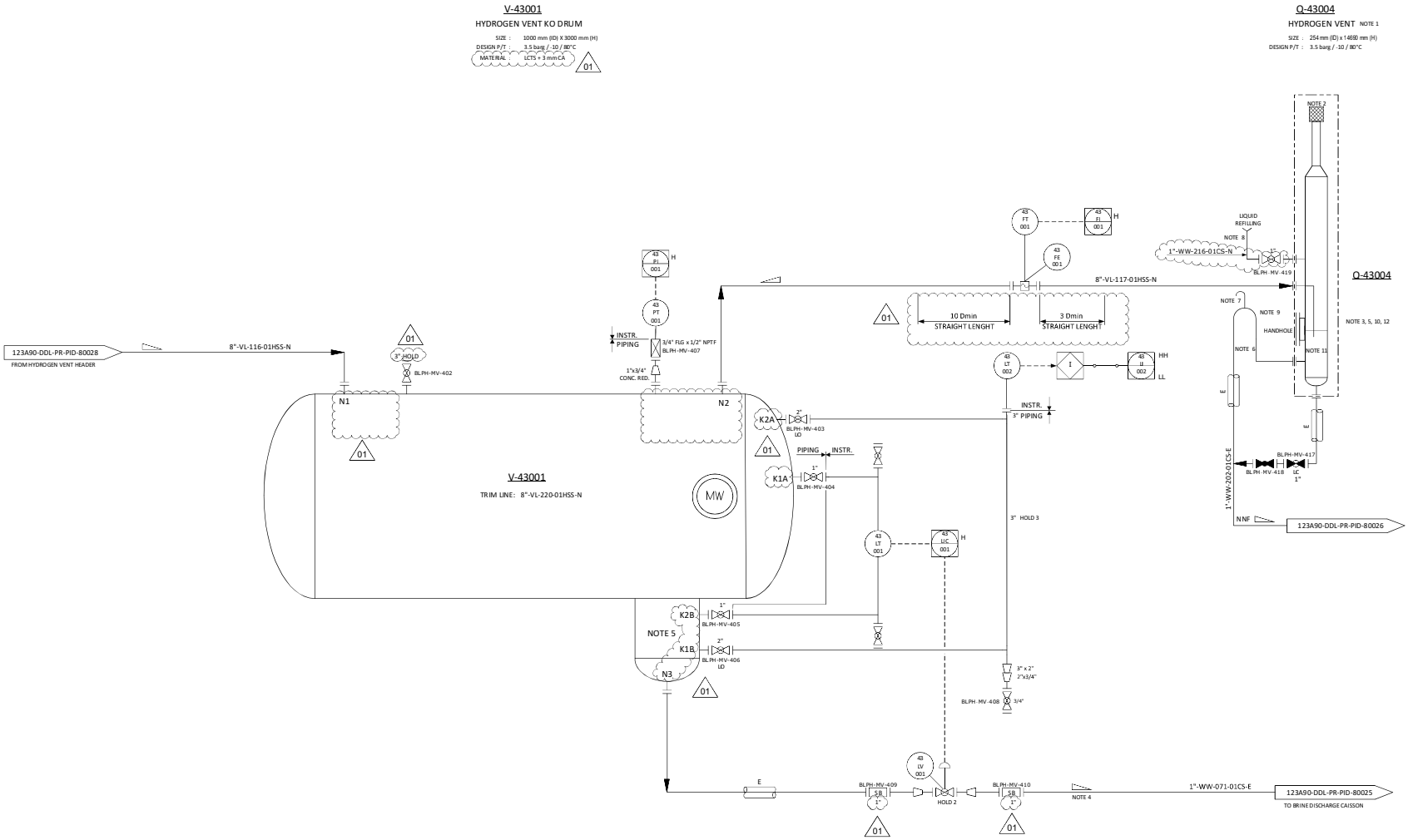
CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK	SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE
A1	DRAWING NO. 123A90-DDL-PR-PID-80029	SHEET 001	REV. 00

File Name : FILE_NAME

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	58
Cause:	Pump Failure P- 44003
Consequence:	Potential overfill of oxygen vent. Leading to blockage of oxygen vent & discharge of water from vent. Potential loss of safeguard, and additional consequences to electrolyser. Unknown impact on electrolyser package
Safeguards:	Flow meter downstream of P-44003 with'LL' flow trip. Level 'H' alarm on oxygen KO drum V-44001 Level 'LY-HH' on oxygen KO drum vent, leading to system shutdown.
Actions:	Ensure Level 'LY- HH' on Oxygen KO drum vent achieves a RRF of 120.
Assigned Respondent (By)	ROSETTI Technical Safety Engineer
RESPONSE	Pump 43003, as per PID 123A90-DDL-PR-PID-80029, is not more part of the design, so the action is not more valid.
Attachments:	PID 123A90-DDL-PR-PID-80029
Issue Date	03-05-24

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Carolina Caracciolo	**CC**
EPC HSE Lead	**Sign**
Carolina Caracciolo	
EPC Project Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.05.10 12:32:50 +02'00'



NOTES

1. VENT TO SAFE LOCATION SEGREGATED FROM OTHER VENTS.
2. VENT TO BE EQUIPPED WITH FLAME ARRESTOR AND BIRD SCREEN.
3. LIQUID SEAL DRUM IS PART OF THE VENT SYSTEM.
4. LIQUID DRAINLINES TO BE ROUTED TO ENSURE GRAVITY DRAIN.
5. HYDROGEN VENT KO DRUM BOOT AND LIQUID SEAL DRUM TO BE HEAT TRACING.
6. SEAL LEG WILL BE DETERMINATED ON THE MAXIMUM BACK PRESSURE IN THE VENT.
7. SEAL VENT TO BE PLACED INTO A SAFE POSITION.
8. FILLING LINE TO BE PLACED IN AN ACCESSIBLE POSITION.
9. TRACED FOR 1.5 m, INSULATED UP TO THE BEND.
10. LIQUID SEAL DRUM I.D. 590 mm, HEIGHT 2350 mm (T/T). TBC BY H2 VENT VENDOR.
11. INLET DIP LEG SUBMERSION HEIGHT OF 0.2 m.
12. FLUID HEIGHT OF 1.5 m FROM BOTTOM T.L.
13. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 VENT KOD.

01

HOLDS

1. VENT LINES DIAMETER.
2. CONTROL VALVE SIZE (BY VENDOR).
3. STAND PIPE DIAMETER TO BE CONFIRMED.

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	24/11/2023	CIM	RZI	DLO	ISSUE FOR HAZOP (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN VENT DRUM

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80029		SHEET 001	REV. 01

DRAWING NO. DRAWING_NO.

REV. REV

File Name : FILE_NAME

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	59
Cause:	Pump Failure P- 44003
Consequence:	Potential overfills of oxygen vent. Leading to blockage of oxygen vent & discharge of water from vent. Potential loss of safeguard, and additional consequences to electrolyser. Unknown impact on electrolyser package
Safeguards:	Flow meter downstream of P-44003 with'LL' flow trip. Level 'H' alarm on oxygen KO drum V-44001 Level 'LY-HH' on oxygen KO drum vent, leading to system shutdown.
Actions:	Assess the requirement for flow meter downstream P- 44003 with'LL' flow trip and evaluate if this needs to be DCS or SIS.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	The scenario of pump failure has been superseded since pump downstream the Oxygen Vent KO drum (and the Oxygen Vent KO drum itself) has been deleted. The HAZOP action is no longer applicable; FEED drawing reference K559-2254-PR-PID-014, Revision 2 (see attachment 1).
Attachments:	
Issue Date	28-02-2024

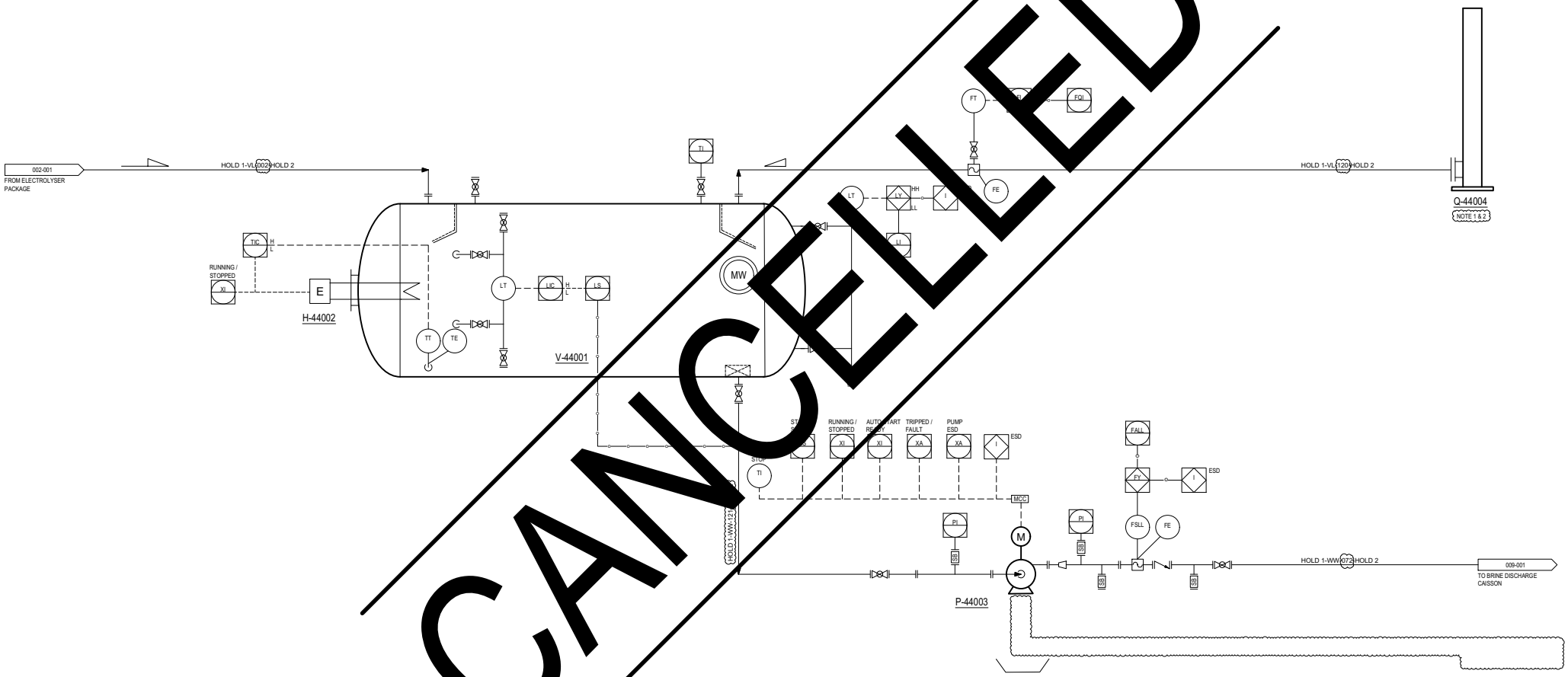
Approvals / Endorsements	
EPC Discipline Lead	Sign
Ciro Impradice	Ciro Impradice Autore firma digitale: Impradice Nome distintivo: CN = Ciro Impradice email = ciro.impradice@rosetti.it C = IT O = Rosetti Marino OU = Process Data: 2024.05.16 14:15:45 +02'00'
EPC HSE Lead	Sign
C.Caracciolo	CC
EPC Project Manager	Sign
D.Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.08.21 08:15:04 +02'00'

H-44002
OXYGEN VENT KO DRUM
HEATER
DUTY : HOLD 4

V-44001
OXYGEN VENT KO DRUM
SIZE : HOLD 4
DESIGN P/T : HOLD 4
MATERIAL : HOLD 4
OPERATING P/T : HOLD 4

P-44003
OXYGEN VENT DRUM PUMP
RATED FLOW : HOLD 4
A/P : HOLD 4
MOTOR : HOLD 4
RATED BHP : HOLD 4
TYPE : CENTRIFUGAL

Q-44004
OXYGEN VENT
SIZE : HOLD 4
TIP : HOLD 4
CAPACITY : HOLD 4
DESIGN P/T : HOLD 4
MATERIAL : HOLD 4
OPERATIONAL P/T : HOLD 4



CANCELLED

NOTES:

1. VENT TO SAFE LOCATION SEGREGATED FROM OTHER VENTS.
2. VENT TO BE EQUIPPED WITH FLAME ARRESTOR AND BIRD SCREEN.

HOLDS:

1. LINE SIZES.
2. PIPING SPECIFICATION.
3. VALVE SIZES.
4. EQUIPMENT SPECIFICATIONS.
5. INSTRUMENT TAGGING.
6. HEAT TRACING AND INSULATION REQUIREMENTS FOR WINTERISATION.

REFERENCE DRAWINGS

REV	DATE	DESCRIPTIONS	ORG'D	CHK'D	APPR'D
2	24/03/2023	ISSUE FOR CANCELLATION	TS	HVP	JS
1	24/01/2023	ISSUE FOR HAZOP	TS	AD	HVP
0	06/01/2023	ISSUE FOR CLIENT REVIEW	AD	TS	HVP

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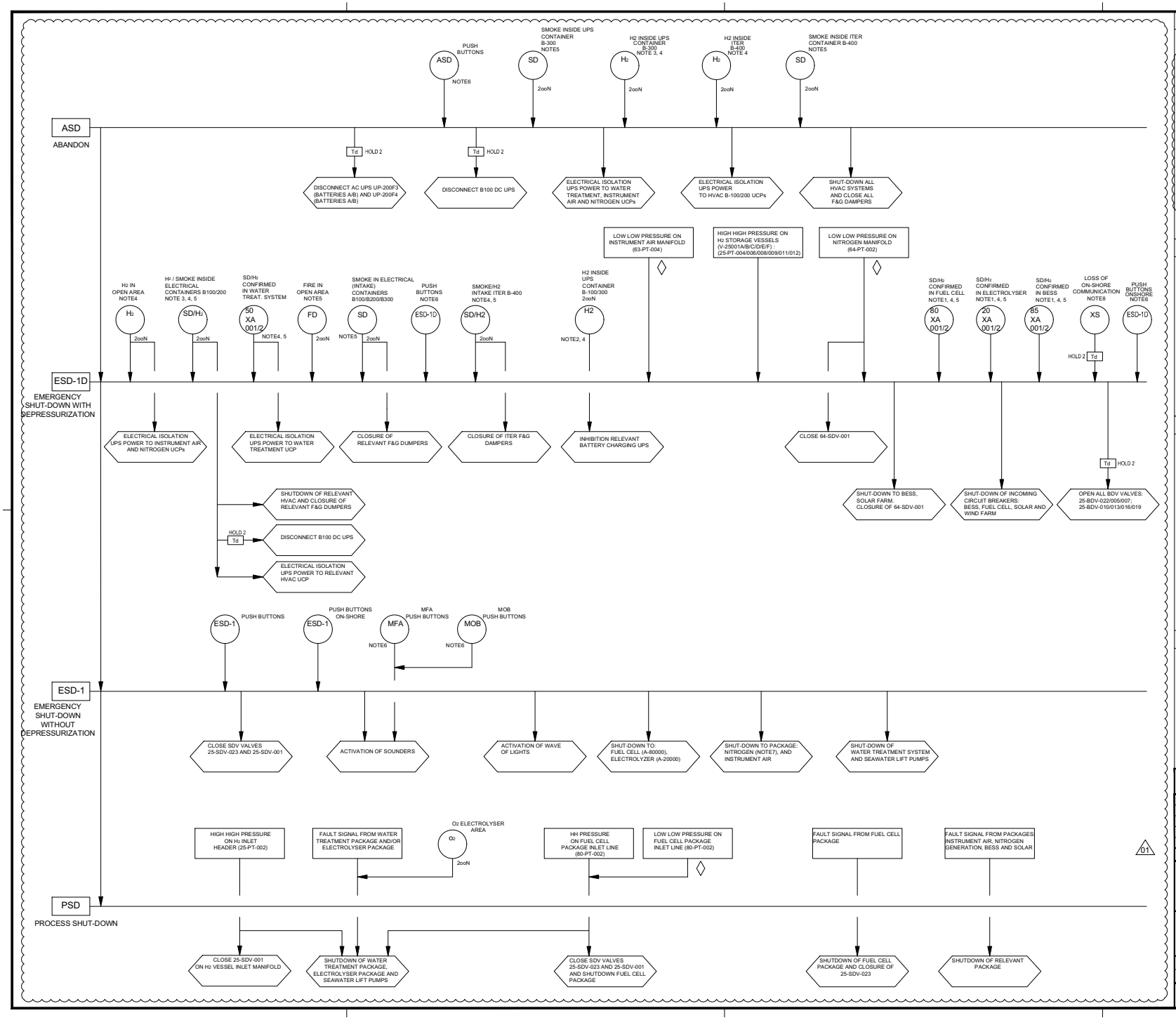
SHELL BLPH FEED
PIPING AND INSTRUMENTATION DIAGRAM
OXYGEN VENT DRUM

SCALE	1:100	DWG NO.:	SHEET	REV
FORMAT	A1	K559-2254-PR-PID-014	001	2

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	60
Cause:	Multiple causes of loss of pressure
Consequence:	
Safeguards:	Immediate release of hydrogen from storage to vent.
Actions:	Consider installation of individual air reservoirs for blowdown valve's to enable hydrogen storage to be retained for sufficient time to allow intervention.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	The action is superseded since during HAZOP EPC no multiple causes of loss of pressure (within the H2 inventory) have been identified whose consequence is the opening of the blowdown valves. All scenarios that determine the opening of the blowdown valves are per doc. N. 123A90-DDL-PR-DG-80000 (see attachment 1). Therefore, there, is no any requirement of individual air reservoirs for blowdown valve's to enable hydrogen storage to be retained for sufficient time to allow intervention.
Attachments:	
Issue Date (dd/mm/yy)	16/07/24

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice	Ciro Impradice
EPC HSE Lead	**Sign**
Carolina Caracciolo	
EPC Project Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul Van Rossum Datum: 2024.08.21 08:15:24 +02'00'



NOTES

1. F&G LOGIC VOTING IS MANAGED BY RELEVANT UCP (BESS, FUEL CELL AND ELECTROLYSER PACKAGES).
2. LOGIC ACTIVATION ONLY IN CASE OF 2ooN H2 CONFIRMED IS CAUSED BY H2 DETECTORS INSIDE UPS CONTAINERS (B-100/300) AND ALL THE OTHERS PLATFORM H2 DETECTORS SHALL NOT BE ALARMED/FAILED.
3. LOGIC ACTIVATION ONLY IN CASE OF 2ooN H2 CONFIRMED IS CAUSED BY H2 DETECTORS INSIDE UPS CONTAINERS (ONLY FOR B-100 OR B-300) AND AT LEAST ONE OF PLATFORM H2 DETECTORS (EXCLUDED INSIDE UPS CONTAINERS B-100/300) IS ALARMED/FAILED.
4. ACTIVATION OF AMBER BEACONS (H2).
5. ACTIVATION OF RED BEACONS (FIRE).
6. ACTIVATION OF BOTH AMBER AND RED BEACONS.
7. SHUTDOWN OF NITROGEN PACKAGE WILL BE PERFORMED ONLY AFTER THE ELECTROLYSER PACKAGE HAS BEEN SAFELY SHUTDOWN (IF IT IS ON LINE).
8. IN CASE OF LOSS OF ON-SHORE COMMUNICATION THE ESD-1D LOGIC WILL BE ACTIVATED DUE TO THE IMPOSSIBILITY OF REMOTE CONTROL DEPRESSURIZATION.

01

LEGEND

HOLDS

01

1. DELETED
2. TIME DELAY TO BE DEFINED.

LEGEND

◇ = START-UP INHIBIT

01

ABBREVIATIONS

FC: Fuel Cell (A-80000)
BESS: Battery Energy Storage System
Electrolyser Package (A-200000)

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	19/03/24	RZI	CIM	DLO	ACCEPTED FOR CONSTRUCTION (AFC)
00	10/11/23	RZI	CIM	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BASE LOAD POWER HUB (BLPH)
Process Safety Cause & Effect
Block Diagram

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE N/A
DRAWN	CHECKED	APPROVED	DATE

A1	DRAWING NO. 123A90-DDL-PR-DG-80000	SHEET 001	REV. 01

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	61
Cause:	Multiple causes of loss of pressure
Consequence:	
Safeguards:	Loss of utilities
Actions:	Examine failure modes of local equipment rooms upon loss of instrument air and provide suitable mitigation to allow these to continue to operate electrical systems.
Assigned Respondent (By)	ROSETTI Instrumentation Engineer
RESPONSE	Loss of instrument air has not impact to the shelter pressurization because it's not used to pressurize the shelter. Each local equipment room has redounded HVAC system (2x100%), each system able to provide pressurization needed. Upon loss of one HVAC system, the stand-by system will start immediately. Only in case of loss of both HVAC systems the pressurization will be lost. Anyway, the electrical systems keep continue to operate and in case of high temperature a high temperature alarm will be sent to alert the operator in control room. See project doc. "Supply Specification for HV (66kV-6.6kV) Switchroom B-100" n° 123A90-DDL-AR-SP-10000 rev.01 (the same philosophy is applied for containers B-200/300/400)
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
L.Calabrese	
EPC HSE Lead	**Sign**
C.Caracciolo	**CC**
EPC Project Manager	**Sign**
D.Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.09.03 17:10:46 +02'00'

Base Load Power Hub (BLPH)

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

Document Number: 123A90-DDL-AR-SP-10000

Document Class: 2

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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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.

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BLPH SHEAMS SIGNATURE FORM

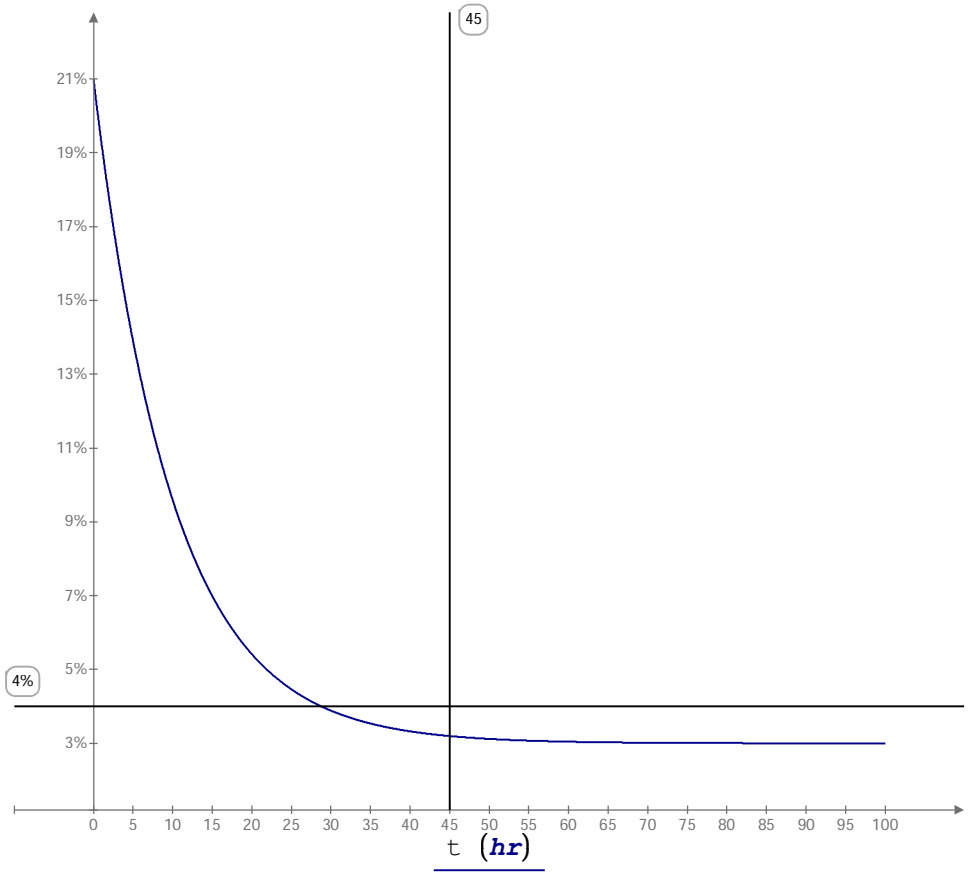
Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	62
Cause:	Requirement to depressure and gas free hydrogen storage vessels for maintenance
Consequence:	Significant volume of nitrogen required to pressure purge hydrogen storage vessels. Which may be impractical to store on platform.
Safeguards:	
Actions:	Investigate practical means of providing sufficient volume of nitrogen for pressure purging hydrogen pressure storage vessels.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	The current design is to provide Nitrogen via the Nitrogen Generation Package (A-64000), configured as 1 x 100%. The design capacity is based on: 1) continuous purge of Hydrogen Vent system (see Attachment 1); 2) peak demand by: a) the electrolyser package, see Attachment 1; b) H2 Storage vessel purging, see Attachment 1. To be noted that the two above peak demand are not coincident. The design capacity is 60 Nm3/h, see Attachment 2. Also see P&iD 123A90-DDL-PR-PID-80027, rev02
Attachments:	
Issue Date	19-06-2024

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice (PROCESS)	Ciro Impradice Autore firma digitale: Ciro Impradice Nome distintivo: CN = Ciro Impradice email = ciro.impradice@rosetti.it C = IT O = Rosetti Marino OU = Process Data: 2024.06.19 16:11:24 +02'00'
EPC HSE Lead	**Sign**
Carolina Caracciolo	CC
EPC Project Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.08.21 08:15:44 +02'00'

$x_{O2}(t) := x_{O2in} - (x_{O2in} - x_{O2s}) \cdot e^{\frac{-k \cdot M \cdot (Ncm)^{-1}}{N_{tot} \cdot \left(\frac{mol}{22.4 \cdot 10^{-3}}\right)^{-1}} \cdot t}$ Model equation

$t := 0{,}1\ min .. 100\ hr$

$x_{O2}(45\ hr) = 3.2\%$ time required to obtain x_{O2} lower than 4%



1.5.1.B) CASE (B): REMOVAL OF LOW PRESSURE HYDROGEN INSIDE THE VESSEL(planned SHUTDOWN)

Similarly to the above theory, making a mass balance on H2 one can obtain the time required to obtain a molar fraction of :

$x_{H20} := 100\%$ initial mole fraction of H2 inside the vessel

$M = 42.5\ \frac{Ncm}{hr}$ assumed molar flowrate of purging gas (**comp.97%N2; 3%O2**)

$P = 1.2\ bar$ operating pressure during purging activity

$T = 20\ °C$ operating temperature during purging activity

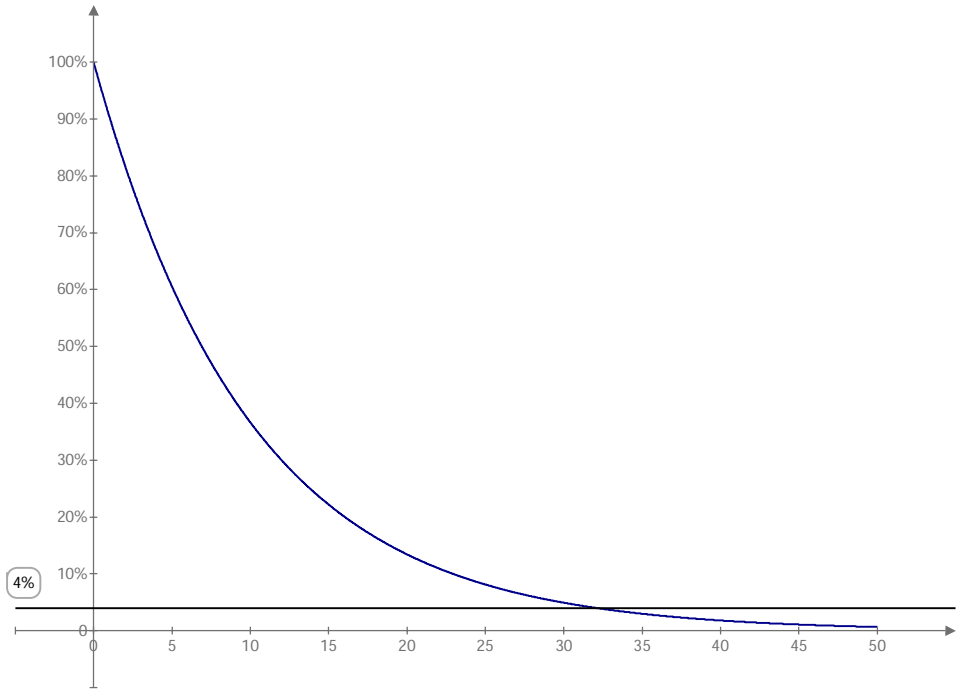
$V = 96\ m^3$ total vessel volume

$k = 0.25$ mixing coefficient (to account for mixing inefficiency)

$N_{tot} = 4726.4\ mol$ moles of gas inside the vessel during purging

$$x_{H2}(t) := x_{H20} \cdot e^{\frac{-k \cdot M \cdot (Ncm)^{-1}}{N_{tot} \cdot \left(\frac{mol}{22.4 \cdot 10^{-3}}\right)^{-1}} \cdot t}$$ Model equation

$x_{H2}(35\ hr) = 2.98\%$ time required to obtain a residual concentration of H2 lower than 4%



$x_{H2}(t)$

In order to estimate the final mole fraction of N2,O2 and H2 at the end of 35 hours, one can solve the following system of linear equations:

Guess Values

$X_{O2} := 1\%$ $X_{N2} := 1\%$ $X_{H2} := 1\%$

Constraints

$X_{O2} + X_{H2} + X_{N2} = 1$

$\frac{X_{O2}}{X_{N2}} = \frac{3\%}{97\%}$

$X_{H2} = x_{H2}(35\ hr)$

Solver

$\begin{bmatrix} a \\ b \\ c \end{bmatrix} := \mathbf{find}(X_{O2}, X_{N2}, X_{H2})$

Thus, the final concentration will be as follows:

$a = 2.91\%$ final mole fraction of O2

$b = 94.11\%$ final mole fraction of N2

$c = 2.98\%$ final mole fraction of H2

$Q_{N2V} := M = 42.5 \frac{Ncm}{hr}$ Assumed Nitrogen flowrate for purging

$Ha := 2.5$ Nitrogen generator "Air Factor" (**HOLD1**)

$F_{N1} := Ha \cdot M = 106.3 \frac{Ncm}{hr}$ Air demand for Nitrogen generator

Thus, as per the above executions (A) and (B), one obtains the time for purging (**considering the reasonable size and then the limitation of the nitrogen generation size being nearly 52.7 Scm/hr**):

$time_A := 45\ hr$ to purge n.1 vessel (say O2 "displacement")

$time_B := 35\ hr$ to purge n.1 vessel (say H2 "displacement")

By considering a "back to back" philosophy it will take the following total time for purging (excluding any "dead time"):

$6 \cdot time_A = 11.25\ day$ to purge n.6 vessel (O2 "displacement")

$6 \cdot time_B = 8.75\ day$ to purge n.6 vessel (H2 "displacement")

1.5.2) ELECTROLYZER PURGING DEMAND

The electrolyzer has a nitrogen demand as follows (Ref.[3]):

$Q_{N2E} := 36 \frac{Ncm}{hr}$ Nitrogen flowrate required for purging of electrolyzer (Ref.[3])

$Ha := 2.5$ Nitrogen generator "Air Factor" (**HOLD1**)

$F_{N2} := Ha \cdot Q_{N2E} = 90 \frac{Ncm}{hr}$ Air demand for Nitrogen generator

1.5.3) PURGE GAS RATE (HUSA's correlation)

The purge gas rate for continuous purge requirements in open flare/vent without the effect of buoyancy seal is given by Husa correlation(Ref.[4]):

$O_2 := 3\%$ Acceptable O2 volume fraction

$C_0 := 98\%$ Volume fraction of N2

$K_0 := 1.707$ Constant for N2

$C_1 := 2\%$ Volume fraction of H2

$K_1 := 5.783$ Constant for N2

$ID := 0.254\ m$ Assumed internal diameter for stack

$y := min(7.62\ m, 10 \cdot ID) = 2.54\ m$ Distance down the stack

$$Q := 190.8 \cdot \left(\left(\frac{ID}{m}\right)^{3.46}\right) \cdot \left(\frac{1}{\left(\frac{y}{m}\right)} \cdot \ln\left(\frac{20.9}{O_2}\right)\right) \cdot \sum_{i=0}^{1} C_i^{0.65} \cdot K_i \ \frac{Ncm}{hr} = 9.2 \frac{Ncm}{hr}$$ Purge gas consumption

Base Load Power Hub (BLPH)

NITROGEN GENERATION PACKAGE
EQUIPMENT DATA SHEETS
INCLUDING PSA, ETC.

Document Number: 1724000437-MAC-DS-00011

Document Class: 2

01	08/05/2024	Issue for Review (IFR)	GT	MC	TM
00	28/03/2024	Issue for Review (IFR)	GT	MC	TM
Rev.	Date	Description	Prepared	Reviewed	Approved

COES

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coes	CLIENTE CUSTOMER	:	ROSETTI MARINO	COMM: JOB:	:	167/24	
	RIFERIMENTO REFERENCE	:	CROSSWIND	UNITA' ITEM	:	/	
	IMPIANTO DRYING UNIT	:	NITROGEN GENERATION PACKAGE	FOGLIO N° SHEET	:	1	DI : 3 OF

FOGLIO DATI PER IMPIANTO GENERATORE AZOTO
NITROGEN GENERATOR DATA SHEET

DATI GENERALI
GENERAL DATA

1	QUANTITA' QUANTITY	:	1	
2	ITEM TAG	:	C-64001A/B	
3	SERVIZIO SERVICE	:	NITROGEN GENERATOR	
4	RIGENERAZIONE REGENERATION	:	PSA	

DATI PROGETTO MECCANICO
MECHANICAL DESIGN DATA

5	PRESSIONE PROGETTO SERBATOI VESSELS DESIGN PRESSURE	:	12 barg	TEMPERATURA PROGETTO SERBATOI VESSELS DESIGN TEMPERATURE	:	-29 / +80°C	
6	MATERIALE SERBATOI VESSELS MATERIAL	:	LTCS	SOVRASPESS. CORROSIONE SERBATOI VESSELS CORROSION OVER-THICKNESS	:	3 mm	
7	NORMATIVA PROGETTO SERBATOI VESSELS DESIGN CODE	:	ASME VIII DIV.1	NORMATIVA COLLAUDO SERBATOI VESSELS INSPECTION CODE	:	2014/68/EU PED	
8							

DATI FUNZIONALI
FUNCTIONAL DATA

9	PORTATA ARIA IN INGRESSO INLET AIR FLOWRATE	:	150	Nm3/h	
10	PRESSIONE DI ESERCIZIO OPERATING PRESSURE	:	9	barg	
11	TEMPERATURA DI ESERCIZIO OPERATING TEMPERATURE	:	35	°C	
12	PUNTO DI RUGIADA IN INGRESSO INLET DEW POINT	:	-40	°C	
13	TIPO MATERIALE ADSORBENTE DESICCANT MATERIAL TYPE	:	CARBON MOLECULAR SIEVE		
14	QUANTITA' ADSORBENTE PER TORRE DESICCANT QUANTITY/EACH TOWER	:	200	kg	
15	PORTATA AZOTO IN USCITA OUTLET NITROGEN FLOWRATE	:	60	Nm3/h	
16	PUREZZA AZOTO IN USCITA OUTLET NITROGEN PURITY	:	97	%	
17	POTENZA TOTALE INSTALLATA TOTAL DEMANDE RATE	:	0.05	kW	
18	PERDITA DI CARICO PRESSURE DROP	:	0.5	bar	
19	DURATA CICLO LENGHT OF CYCLE	:	1+1	min	
20	CONSUMO kWh PER RIGENERAZIONE kWh CONSUMPTION/EACH REGENERATION	:	/		
21	TENSIONE DI ALIMENTAZIONE SUPPLY VOLTAGE	:	24	VDC	AUX.
22	GRADO DI PROTEZIONE PROTECTION DEGREE	:	IP 65		
23	CLASSIFICAZIONE AREA AREA CLASSIFICATION	:	SAFE		
24	RADIOGRAFIE RT TEST	:	☐ YES	☒ NO	
25	VERNICIATURA PAINTING	:	☒ EXTERNAL	☐ INTERNAL	
26	ZINCATURA GALVANIZING	:	☐ YES	☒ NO	
27	RUMOROSITA' NOISE LEVEL	:	85dB(A) max PRESSURE LEVEL at 1 m		
28					
29	Notes: - details of nozzle are included into equipment sectional drawing				

REV. REV.	DESCRIZIONE DESCRIPTION	EMESSO ISSUED	APPROVATO APPROVED	DATA DATE
01	ISSUE FOR REVIEW	GT	TM	08-mag-24
00	ISSUE FOR REVIEW	GT	TM	28-mar-24

coes	CLIENTE CUSTOMER	:	ROSETTI MARINO	COMM: JOB:	:	167/24	
	RIFERIMENTO REFERENCE	:	CROSSWIND	UNITA' ITEM	:	/	
	IMPIANTO DRYING UNIT	:	NITROGEN GENERATION PACKAGE	FOGLIO N° SHEET	:	2	DI : 3 OF

FOGLIO DATI PER SERBATOIO
PRESSURE VESSEL DATA SHEET

DATI PROGETTO MECCANICO
MECAHNICAL DESIGN DATA

1	QUANTITA' QUANTITY	:	1			
2	ITEM TAG	:	V-64001			
3	SERVIZIO SERVICE	:	SERBATOIO AZOTO NITROGEN TANK			
4	TIPO TYPE	:	VERTICALE VERTICAL			
5	MATERIALE MATERIAL	:	LTCS			
6	NORMATIVA PROGETTO DESIGN CODE	:	ASME VIII DIV.1	NORMATIVA COLLAUDO INSPECTION CODE	:	2014/68/EU PED
7	MATERIALE MATERIAL	:	LTCS	SOVRASPESS. CORROSIONE CORROSION OVER-THICKNESS	:	3 mm
8	PRESSIONE PROGETTO DESIGN PRESSURE	:	12 barg	TEMPERATURA PROGETTO DESIGN TEMPERATURE	:	-29 / +80 °C
9	DIAMETRO ESTERNO EXTERNAL DIAMETER	:	2000 mm	LUNGHEZZA T/T T/T LENGHT	:	2900 mm
10	VOLUME VOLUME	:	11 m3			
11	RADIOGRAFIE RT TEST	:	☒ YES SPOT	☐ NO		
12	VERNICIATURA PAINTING	:	☒ EXTERNAL	☐ INTERNAL		
11	ZINCATURA GALVANIZING	:	☐ YES	☒ NO		
12						
13	Notes: - details of nozzle are included into equipment sectional drawing					
14						

ELENCO CONNESSIONI
NOZZLES LIST

	SIGLA TAG	DIAMETRO DIAMETER	TIPO TYPE	SERIE RATING	SERVIZIO SERVICE	NOTE REMARKS
15						
16	N1	1"	WN	ANSI 150	PROCESS INLET/OUTLET	
17	N2	1"	WN	ANSI 150	SAFETY VALVE	
18	N3	1/2"	NPT	3000#	PRESSURE GAUGE	HALF COUPLING
19	N4	1/2"	NPT	3000#	PRESSURE TRANSMITTER	HALF COUPLING
20	N5	1"	WN	ANSI 150	DRAIN	
21	N6	16"	WN	ANSI 150	MAN HOLE	
22						
23						

STRUMENTI - ACCESSORI
INSTRUMENTS - ACCESSORIES

24	☒	VALVOLA DI SICUREZZA SAFETY VALVE
25	☒	MANOMETRO PRESSURE GAUGE
26	☒	TRASMETTITORE DI PRESSIONE PRESSURE TRANSMITTER
27	☒	VALVOLA DI DRENAGGIO MANUALE MANUAL DRAIN VALVE
28	☐	SCARICATORE DI CONDENSA DRAIN TRAP
29		

REV. REV.	DESCRIZIONE DESCRIPTION	EMESSO ISSUED	APPROVATO APPROVED	DATA DATE
01	ISSUE FOR REVIEW	GT	TM	08-mag-24
00	ISSUE FOR REVIEW	GT	TM	28-mar-24

coes	CLIENTE / CUSTOMER	:	ROSETTI MARINO	COMM: / JOB:	:	167/24	
	RIFERIMENTO / REFERENCE	:	CROSSWIND	UNITA' / ITEM	:	/	
	IMPIANTO / DRYING UNIT	:	NITROGEN GENERATION PACKAGE	FOGLIO N° / SHEET	:	3	DI / OF : 3

FOGLIO DATI PER FILTRO
FILTER DATA SHEET

DATI GENERALI
GENERAL DATA

1	QUANTITA' / QUANTITY	:	2				
2	ITEM / TAG	:	S-64001A/B				
3	SERVIZIO / SERVICE	:	DUST REMOVING				
4							

DATI PROGETTO CALDARERIA
VESSELS DESIGN DATA

5	PRESSIONE PROGETTO / DESIGN PRESSURE	:	12 barg	TEMPERATURA PROGETTO / DESIGN TEMPERATURE	:	-29 / +80 °C	
6	MATERIALE / MATERIAL	:	LTCS	SOVRASPESS. CORROSIONE / CORROSION OVER-THICKNESS	:	3 mm	
7	NORMATIVA PROGETTO / DESIGN CODE	:	ASME VIII DIV.1	NORMATIVA COLLAUDO / INSPECTION CODE	:	2014/68/EU PED	
8							

DATI FUNZIONALI
FUNCTIONAL DATA

9	GAS DA TRATTARE / GAS TO BE TREATED	:	NITROGEN 97%	PORTATA IN INGRESSO / INLET FLOWRATE	:	60 Nm3/h	
10	PRESSIONE DI ESERCIZIO / OPERATING PRESSURE	:	8.5 barg	TEMPERATURA DI ESERCIZIO / OPERATING TEMPERATURE	:	35 °C	
11	PERDITA DI CARICO/FILTRO PULITO / PRESSURE DROP/CLEAN FILTER	:	0,1 bar	PERDITA DI CARICO/FILTRO SPORCC / PRESSURE DROP/DIRTY FILTER	:	0.3 bar	
12	EFFICIENZA / EFFICIENCY	:	99.9 %	GRADO DI FILTRAZIONE / FILTRATION DEGREE	:	1 µm	
13	OLIO RESIDUO / RESIDUAL OIL	:	N/A				
14							

CARATTERISTICHE ELEMENTI FILTRANTI
FILTRATION ELEMENTS DATA

15	TIPO ELEMENTO FILTRANTE / FILTRATION ELEMENT TYPE	:	CARTRIDGE	MATERIALE / MATERIAL	:	COALESCING MICROFIBER	
16	N° CARTUCCE PER FILTRO / No. OF ELEMENTS/EACH FILTER	:	1	MODELLO / MODEL	:	30A	
17							

STRUMENTI - ACCESSORI
INSTRUMENTS - ACCESSORIES

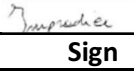
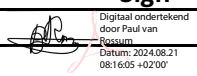
18	☐ BY-PASS FILTRO / FILTER BY-PASS					
19	☒ TUBAZIONE DI RACCORDO FILTRO / CONNECTION PIPE TO FILTER					
20	☒ VALVOLE INTERCETTAZIONE / ON/OFF VALVES	☒ 2 VIE / 2-WAY	☐ 3 VIE / 3-WAY	☐ AUTOMATICHE / AUTOMATIC		
21	☐ MANOMETRO DIFFERENZIALE / DIFFERENTIAL PRESSURE GAUGE					
22	☒ TRASMETTITORE DI PRESSIONE DIFFERENZIALE / DIFFERENTIAL PRESSURE TRANSMITTER	AS PER P&ID NO. 1724000437-PR-PID-00018				
23	☒ VALVOLA DI DRENAGGIO / DRAIN VALVE					
24	☐ SCARICATORE DI CONDENSA / STEAM TRAP		☐ AUTOMATICO / AUTOMATIC	☐ GALLEGGIANTE / FLOATING		
25	☐ VALVOLE DI SICUREZZA / SAFETY VALVES					

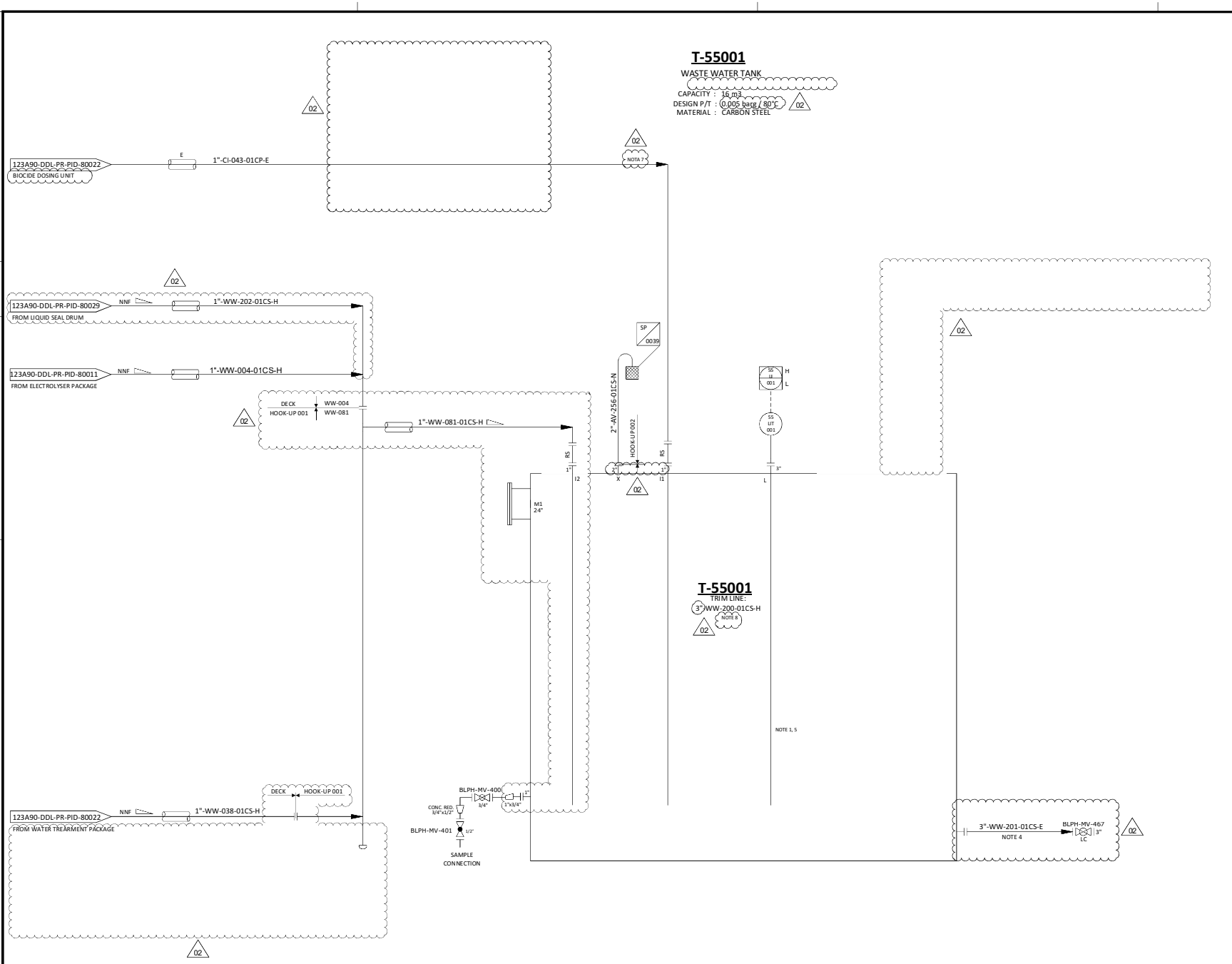
NOTE / REMARKS :

REV. / REV.	DESCRIZIONE / DESCRIPTION	EMESSO / ISSUED	APPROVATO / APPROVED	DATA / DATE
01	ISSUE FOR REVIEW	GT	TM	08-mag-24
00	ISSUE FOR REVIEW	GT	TM	28-mar-24

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	67
Cause:	Loss of liquid level within T-55001. (Likely cause would be control loop failure of level control T-55001)
Consequence:	T-55001 could become dry after an extended period, leading to potential air ingress into piping that contains hydrogen. Leading to potential for ignition/explosion & risk to personnel.
Safeguards:	Low level alarm (Not valid, part of IE) 'Low Low 'liquid level alarm (trip enunciation).
Actions:	Consider requirements for liquid seal within main drain line system.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	The recommendation has been superseded since the identified cause (during FEED HAZOP SESSION), "*Loss of liquid level within T-55001. (Likely cause would be control loop failure of level control T-55001)*" is not applicable and valid. As per EPC P&iD doc. N. "123A90-DDL-PR-PID-80026" (see attachment 1), the level control loop is not present. It is worth to note here that the same liquid control loop was already deleted on the last revision of FEED P&iD (see attachment 2).
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
C. Impradice	
EPC HSE Lead	**Sign**
C.Caracciolo	CC
EPC Project Manager	**Sign**
D. Lo Sterzo	
Client	**Sign**
	



NOTES

1. ALL STILLING TUBES AND DIP PIPES SHALL BE SUPER DUPLEX.
2. DELETED.
3. DELETED. 02
4. DRAIN LINE TO SHIP DISPOSAL.
5. PERFORATED STILLING TUBE.
6. DELETED. 02
7. FOR PERIODIC DOSING OF THE WASTE WATER TANK.
8. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR WASTE WATER TANK - T-55001, DOC. N. "123A90-DDL-MAC-DS-50008"

HOLDS

1. DELETED.
2. DELETED.
3. DELETED. 02
4. DELETED.
5. DELETED.

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	12/06/2024	CIM	RZI	DLO	ACCEPTED FOR CONSTRUCTION (AFC)
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

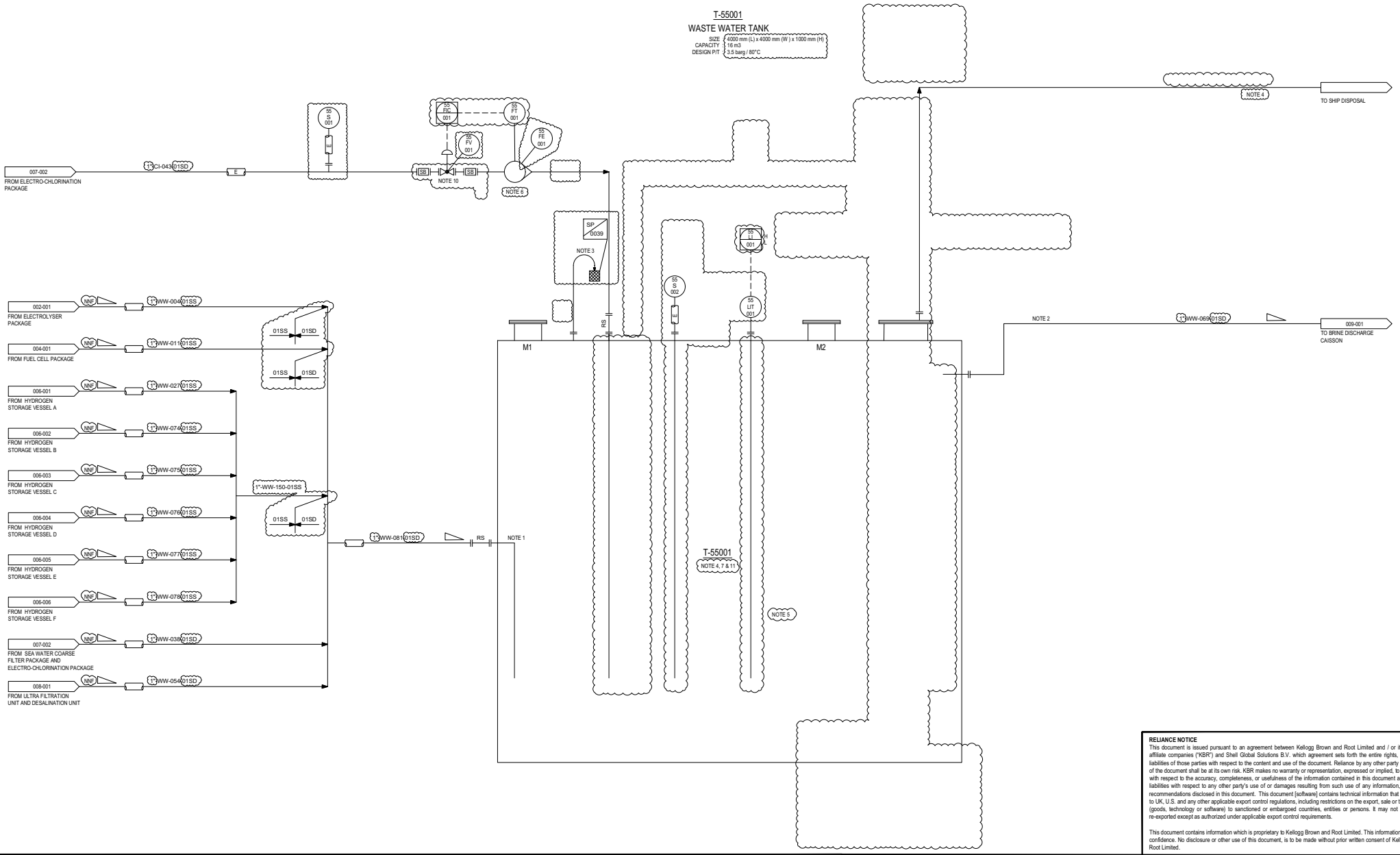
TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
WATER DISPOSAL SHEET 2

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80026		SHEET 001	REV. 02

DRAWING_NO.

REV.

File Name : FILE_NAME



NOTES:

1. DELETED.
2. OVERFLOW TO RISE ABOVE DECK TO MAXIMISE TANK WORKING CAPACITY.
3. LOCATE VENT DISCHARGE AWAY FROM WALKWAYS ETC.
4. IN DECK TANK WITH EXAMPLE EXPORT LINE SHOWN FOR CLARITY.
5. PERFORATED STILLING TUBE.
6. VARIABLE AREA FLOW METER TO BE INSTALLED VERTICALLY WITH DIRECTION OF FLOW UPWARDS.
7. METHODOLOGY FOR EMPTYING THE WASTE WATER TANK TO BE DEVELOPED IN THE NEXT PHASE, WHEN DETAILED REQUIREMENTS ARE KNOWN.
8. HEAT TRACING AND INSULATION REQUIREMENT TO BE DETERMINED IN THE NEXT PHASE, ONCE WINTERISATION REQUIREMENTS ARE DEFINED.
9. HAZOP ACTIONS TO BE INCORPORATED IN THE NEXT PHASE.
10. FOR PERIODIC DOSING OF THE WASTE WATER TANK.
11. ALL STILLING TUBES AND DIP PIPES SHALL BE SUPER DUPLEX.

HOLDS:

1. DELETED.
2. DELETED.
3. DELETED.
4. DELETED.
5. DELETED.
6. DELETED.

REFERENCE DRAWINGS

REV	DATE	DESCRIPTIONS	ORG'D	CHK'D	APPR'D
2	24/03/2023	ISSUE FOR INFORMATION	TS	HVP	JS
1	24/01/2023	ISSUE FOR HAZOP	TS	AD	HVP
0	11/01/2023	ISSUE FOR CLIENT REVIEW	AD	TS	HVP

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SHELL BLPH FEED
PIPING AND INSTRUMENTATION DIAGRAM
WATER DISPOSAL

SCALE	1:100	DWG NO.:	SHEET	REV
FORMAT	A1	K559-2254-PR-PID-009	002	2

BLPH SHEAMS SIGNATURE FORM

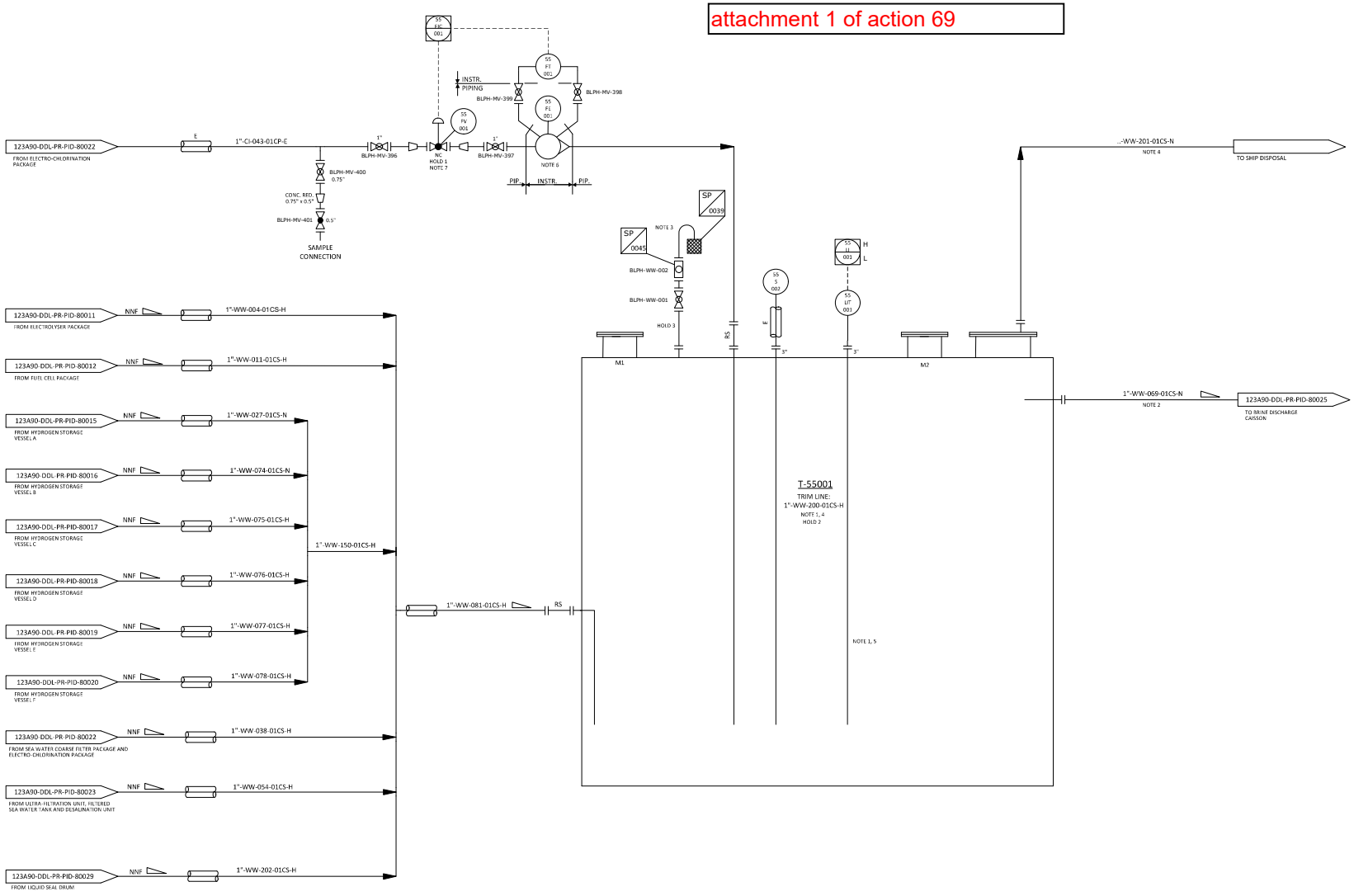
Action Title: **Ref. Doc.**	**HAZOP Study Actions** K559-2254-SE-REP-015
Item No.	69
Cause:	Loss of liquid level within T-55001. (Likely cause would be control loop failure of level control T-55001)
Consequence:	Pump P-55002 dry running, leading to pump damage
Safeguards:	Low level alarm (Not valid, part of IE) 'Low Low 'liquid level alarm (trip enunciation).
Actions:	Based on LOPA assessment, there is currently no requirement for 'LL' trip on waste water tank , T- 55001 to protect P55002, hence this can be redesigned as a DCS based switch independent from the level controller.
Assigned Respondent (By)	ROSETTI Process Engineer
RESPONSE	Both Pump P55002 and LL level trip (inside the T-55001) have been deleted on the last revision of the FEED PID. This is also confirmed by the EPC P&iD. Therefore, the recommendation is superseded (see EPC PID “123A90-DDL-PR-PID-80026”, attachment 1)
Attachments:	
Issue Date (19-01-24)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
Ciro Impradice (Process)	
EPC HSE Lead	**Sign**
Carolina Caracciolo	CC
EPC Project Engineering Manager	**Sign**
Davide Lo Sterzo	
Client	**Sign**
	Digitaal ondertekend door Petra van Nostum Datum: 2024.08.21 08:16:25 +02'00'

DRAWING NO. DRAWING_NO.

REV. REV

attachment 1 of action 69



NOTES

1. ALL STILLING TUBES AND DIP PIPES SHALL BE SUPER DUPLEX.
2. OVERFLOW TO RISE ABOVE DECK TO MAXIMISE TANK WORKING CAPACITY.
3. LOCATE VENT DISCHARGE AWAY FROM WALKWAYS ETC.
4. IN DECK TANK WITH EXAMPLE EXPORT LINE SHOWN FOR CLARITY.
5. PERFORATED STILLING TUBE.
6. VARIABLE AREA FLOW METER TO BE INSTALLED VERTICALLY WITH DIRECTION OF FLOW UPWARDS.
7. FOR PERIODIC DOSING OF THE WASTE WATER TANK.

HOLDS

1. CONTROL VALVE SIZE (BY VENDOR)
2. METHODOLOGY FOR EMPTIYNG THE WASTE WATER TANK.
3. VENT LINE DIAMETER.

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
WATER DISPOSAL SHEET 2

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK	SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE
A1	DRAWING NO. 123A90-DDL-PR-PID-80026	SHEET 001	REV. 00

File Name : FILE_NAME

CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #3 123A90-DDL-SAF-RE-30006
Item No.	#3
Causes	1.2.3. 25PIC005 failure opening 25PV006 2.2.3. 25PIC005 failure opening 25PV005 3.2.1. 25PIC005 failure opening 25PV005
Consequences	1.2.3.1. H2 sent to H2 vent header and vented to atmosphere, loss of product. Potential for fire/explosion of continuously vented H2 at top of H2 vent. A single H2 storage vessel can be depressurised while maintaining pressure in the other vessels. Consequence 2.2.3.1, 3.2.1.1
Recommendation	3. Review if it is credible to implement an interlock on 25PIC005 to prevent 25PV005 being opened outside of a purge cycle operation.
Actions	The TAG number of the valve 25PV005 and of the 25PIC005 (HAZOPED P&ID Revision 01, 24/11/2023) has been changed to 25PV035 and 25PIC035, respectively (ISSUED P&ID Revision 01, 15-02-2024).A software interlock on 25PIC035 to prevent 25PV035 being opened outside of a purge cycle operation has been provided, as per note 12 on the attached P&ID 123A90-DDL-PR-PID-80015_01, attachment 1 and as per "Process Control,Operation, Start-up and Shutdown Philosophy", doc. n. "123A90-DDL-PR-RE- 80031_01", attachment 2
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	

Approvals / Endorsements

EPC Discipline Lead	Cino Impradice	**Sign**
C. Impradice		
EPC HSE LEAD		**Sign**
C.Caracciolo	**03/05/2024**	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**

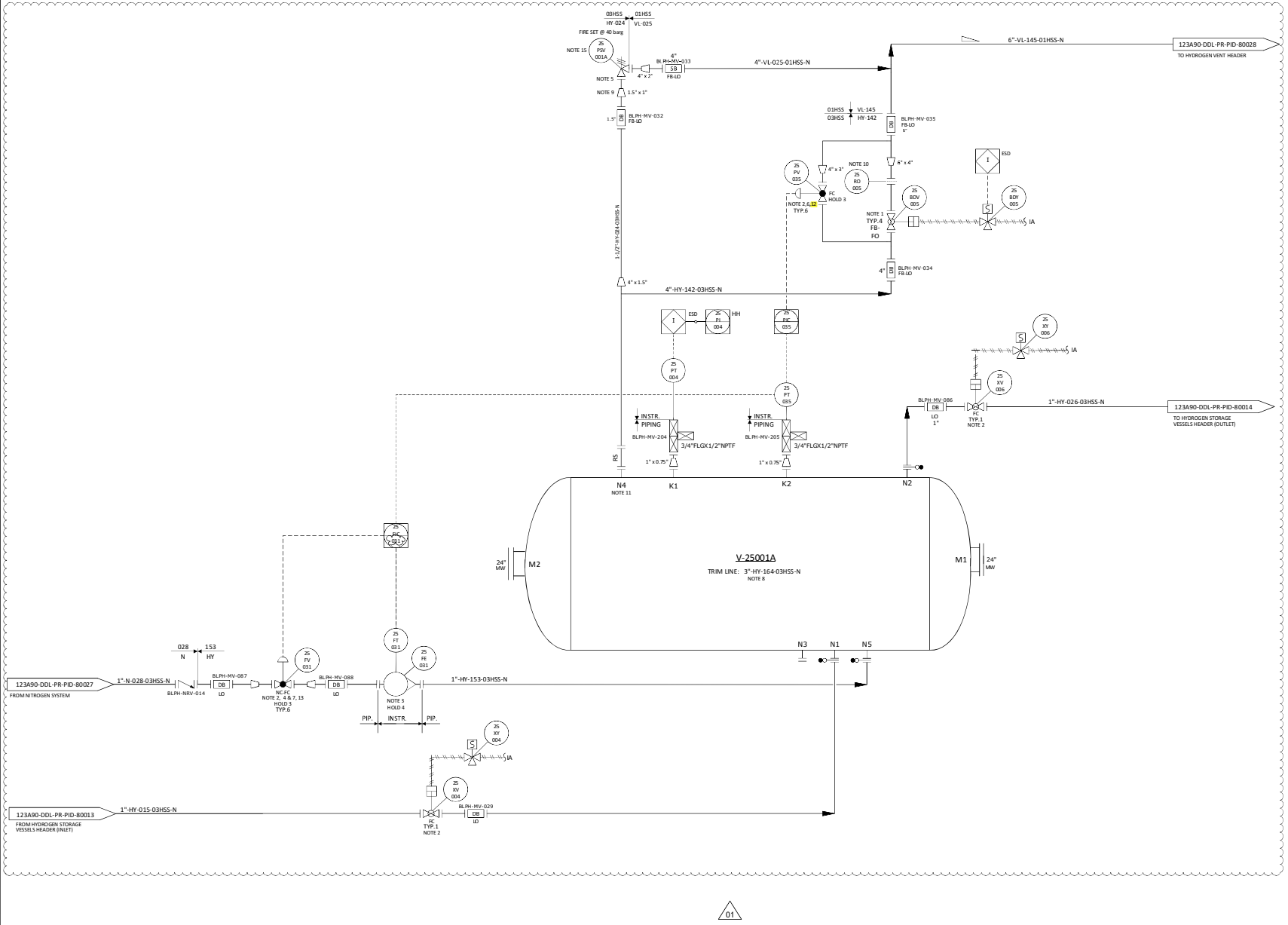
DRAWING NO. DRAWING_NO.

REV. REV.

V-25001_A

HYDROGEN STORAGE VESSEL

SIZE : 2800 mm (ID) X 15500 mm (L T/T)
DESIGN P/T : 40 barg / -10 / 80 °C
MATERIAL : CARBON STEEL
OPERATING P/T : 30 barg /AMB



NOTES

1. NECESSARY CONTROL SYSTEM SOFTWARE SHALL BE INCLUDED TO SUPPORT ADVACED VALVE CONTROL, PARTIAL STROKE TESTING AND DIAGNOSTICS FOR ANY SAFETY CRITICAL ON/OFF VALVES. THESE APPLICATION SHALL BE IDENTIFIED BY HAZOP AND LOPA EVALUATION IF PARTIAL STROKE TESTING WILL BE REQUIRED:
   THE "TYP. 3" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 2" FOR SDV
   THE "TYP. 5" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 4" FOR BDV
2. TIGHT SHUT OFF VALVE.
3. VARIABLE AREA FLOWMETER TO BE INSTALLED VERTICALLY WITH DIRECTION OF FLOW UPWARDS.
4. NITROGEN CONTROL VALVE (25-FV-001), CAN NOT OPEN UNTIL THE PRESSURE WITHIN THE VESSEL IS BELOW THE NITROGEN SUPPLY PRESSURE.
5. ONE COMMON UNINSTALLED SPARE PSV FOR ALL VESSELS.
6. FOR PULSE PRESSURE PURGING OF VESSEL WITH HYDROGEN.
7. FOR FLOW PURGING OF VESSEL WITH NITROGEN. 01
8. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 STORAGE, DOC. N. "123A90-DDL-MAC-DS-50027".
9. REDUCERS TO BE INSTALLED AS CLOSE TO PSV AS POSSIBLE.
10. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
11. NOZZLE N4 TO BE INSTALLED AT MINIMUM DISTANCE FROM TANGENT LINE OF THE VESSEL (ON THE OPPOSITE SIDE OF N5 NOZZLE).
12. SOFTWARE INTERLOCK TO PREVENT 25PV035 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION. CONTROL VALVE 25PV035 IS USED ONLY IN CASE OF VESSEL PURGING.
13. SOFTWARE INTERLOCK TO PREVENT 25FV031 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION.
14. A TIMER ALARM ON THE H2 PRESSURIZATION SECTION OF THE PURGE CYCLE IN THE CONTROL LOGIC IS PROVIDED TO DETERMINE IF THE PURGE VALVE 25PV035 HAS FAILED TO CLOSE.
15. 25PSV001A SIZED FOR FIRE.

HOLDS

1. DELETED.
2. DELETED.

01

3. CONTROL VALVE SIZE (BY VENDOR).
4. MULTIVARIABLE FLOWMETERS REQUIRE 7 DIAMETERS STRAIGHT LENGHT UPSTREAM AND 5 DIAMETERS STRAIGHT LENGHT DOWNSTREAM (TO BE CONFIRMED BY VENDOR).

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSEL A

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80015		SHEET 001	REV. 01

File Name : FILE_NAME

Base Load Power Hub (BLPH)

Process Control, Operation, Start-up and Shutdown philosophy

Document Number: 123A90-DDL-PR-RE-80031

Document Class: 1

01	23/04/2024	Issue for Approval (IFA)	CIM	RZI	DLO
00	13/12/2023	Issue for Approval (IFA)	CIM	RZI	DLO
Rev.	Date	Description	Prepared	Reviewed	Approved

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Should be the operating pressure (PV) fall under the PID regulator SP, the controller drives the control valve to decrease opening (Cv); vice versa, should the operating pressure (PV) rise above the PID regulator SP, the controller drives the control valve to increase its opening (Cv).

At the beginning of the purging operation a timer alarm, in the control logic, will be implemented to determine if 25-PIC-035 failure opening the valve 25-PV-035. It is expected that, according to flow rate of N2 entering to the vessel under purging operation, it will reach the desired pressure at which purging shall be performed within almost 40 minutes. Therefore, after 40 minutes, should the 25-PT-035 indicate a pressure less than the above indicate value of 2 barg, a time alarm will alert the operator that the vessel has not reach the pressure within the desired time. Once the pressure has been reached, then the time alarm shall be deactivated.

The control valve 25-PV-035 is used only in case of vessel purging. Therefore, a software interlock is provided to prevent 25-PV-035 being opened outside of a purge cycle operation. The same software interlock prevents the opening of the control valve 25-FV-031 outside of a purge cycle operation.

Moreover, once the desired pressure of 2 barg has been reached, should the pressure inside the vessel under purging operation fall below the set point of 2 barg, a low pressure alarm on the pressure transmitter 25-PT-035 is provided, to alert the operator. This low pressure alarm will be deactivated at beginning of the purging operation (during the pressurization phase), when the desired pressure is not yet reached. Once 2 barg has been reached, then the alarm will be activated. This is to prevent the low pressure alarm is triggered unnecessarily.

The above-described control loop is relevant to H2 Storage Vessel V-25001A under purging operation. The same applies to the others five H2 Storage Vessel V-25001B/C/D/E/F.

The same control loops 25-FIC-031 and 25-PIC-035 (for the vessel A) above described is used when, after maintenance activities, displacement of air is required, before to reinsert H2 inside the vessel. The purpose of displacing the air from the vessel is to create an inert atmosphere inside the vessel before starting the hydrogen loading phase.

Moreover, at inlet manifold of the vessels, there is a pressure transmitter (25-PT-001) that indicates the pressure value to the DCS with a high alarm threshold. This signal is replicated via software/serial link to the electrolyser package A-20000 in order to communicate the pressure level established inside the whole buffer volume.

Finally, an XV valve located at inlet hydrogen manifold allows for nitrogen purging during maintenance campaign.

3.4.1.3 Start-up and Shut-Down philosophy

No particular start-up or shutdown requirements are provided or needed for these vessels. Except that a dedicated pressure transmitter (25-PT-004/006/008/009/011/012) that handles the plant ESD in case of system overpressure. The emergency high-high level pressure signal is replicated to DCS. Moreover no

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HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #4 123A90-DDL-SAF-RE-30006
Item No.	#4
Causes	1.2.4. 25XV006 Driven open/inadvertently opened by operator
Consequences	1.2.4.1. Pressurise downstream system to 25PV025A/B up to 30barg. Potential to exceed design pressure (3 times design pressure) downstream of 25PV025A/B, LOPC of H2 and explosion on ignition.
Recommendation	4. Ensure that 80PSV001 is sized for failure of downstream isolation on H2 vessel during filling operation (i.e. 25XV006) with 25PV025A or B fully open.
Actions	80PSV001 has been verified also for the case "*failure of downstream isolation on H2 vessel during filling operation (i.e. 25XV006) with 25PV025A or B fully open* ". Moreover, as per "Relief, Vent and Blowdown Report" doc n. "123A90-DDL-PR-RE-80030_01", the above case is also the sizing case. For reference see attachment 1
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	

Approvals / Endorsements

EPC Discipline Lead	Ciro Impradice	**Sign**
Ciro Impradice	**08-04-2024**	
EPC HSE LEAD		**Sign**
C.Caracciolo	**08-04-2024**	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**

Digitaal ondertekend door Paul van Rossum
Datum: 2024.08.21 08:43:19 +02'00'

Base Load Power Hub (BLPH)

Relief, Vent and Blowdown Report

Document Number: 123A90-DDL-PR-RE-80030

Document Class: 1

01	05/02/2024	Accepted for Construction (AFC)	CIM	RZI	DLO
00	04/12/2023	Issue for Acceptance (IFA)	CIM	RZI	DLO
Rev.	Date	Description	Prepared	Reviewed	Approved

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3.3 PSV CALCULATION SUMMARY

The following table summarizes applicable scenarios and sizing results of each PSV, the detailed calculation are shown through the Appendix 01 Section.6.1:

PSV TAG	PID n°	Type	Set P (barg)	Case	Calc. load (kg/h)	Rated Flow (kg/h)	PSV size
25-PSV-001A to F (*)	123A90-DDL-PR-PID-80015 to PID-80020	Conventional	40	Fire	627	1067	1E2 300lbX150lb
80-PSV-001	123A90-DDL-PR-PID-80012	Conventional	10	Bloc.disch	106	185	1D2 150lbX150lb
				CV fail	2679	3095	3K4 150lbX150lb
64-PSV-001	123A90-DDL-PR-PID-80027	Conventional	10	Bloc.disch	61.4	690.4	1D2 150lbX150lb
				Reverse flow (H2 from vessel)	23.8	185	1D2 150lbX150lb

Table 4 – PSV calculation summary

(*) The PSV set pressure is reached only after 4.4 minutes and after that time the PSV valve starts to discharge at a pressure slightly above the set pressure value (~44 bara) as shown along the below APPENDIX 01 – PSV CALCULATION SHEETS.

See APPENDIX 01 – PSV CALCULATION SHEETS

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HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action No:	**EPC HAZOP Study Actions** #5
Ref Doc	123A90-DDL-SAF-RE-30006
Item No.	#5
Causes	2.2.5. Spectacle Blind on Waste Water Line left open following maintenance
Consequences	2.2.5.1. Potential overpressure of waste water tank T55001 due to N2 pressurisation resulting in overpressure and rupture of waste water tank T55001. Potential impact on personal.
Recommendation	5. Review whether a permanent connection to the waste water tank T55001 is required from the hydrogen storage vessels. If so then review the potential for open waste water drain on storage vessel V25001A-F to result in overpressurisation of waste water tank during an N2 pressure test of the vessel following maintenance activity. Also consider the required vent sizing of waste water tank T55001 (to be calculated).
Actions	Based on the Electrolyser Vendor information (see TQ number "123A90-PML-PM-TQ-00023", Attachment 1), the on-spec hydrogen, that is sent to the six Hydrogen Storage Vessel (V-25001A/F) is 99.999% pure (i.e. Dry hydrogen). Therefore, the liquid drain lines from each of the six vessels, leading to the Waste Water Tank (T-55001) have been deleted, see Attachment 2 (P&iD "123A90-DDL-PR-PID-80015_02"). In the two-year life cycle of the BLPH facility, no maintenance activity inside the storage vessel is expected. However, if after maintenance activity drainage of liquid (used for cleaning purpose) is required then the liquid from the vessels will be removed via a temporary vacuum pump and the liquid disposed of in the same manner as the liquids from the Waste Water Tank. The precise procedure will be part of the maintenance / operating manual (yet to be developed).
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	

Approvals / Endorsements

EPC Discipline Lead		**Sign**
C.Impradice		Ciro Impradice
EPC HSE LEAD		**Sign**
C.Caracciolo	**19/06/2024**	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**
		Digitaal ondertekend door Paul van Bossum Datum: 2024.08.21 08:35:43 +02'00'

CROSSWIND

ROSETTI MARINO

TECHNICAL QUERY
Hollandse Kust Noord

No. TQ :	123A90-PML-PM-TQ-00023	Rev:	00

Originating Party	Rosetti Marino					
Subject	Electrolyser Process Information					
Author	C. Impradice	TQ Aconex unique number:				
Interface TQ - from		TQ interface source Aconex unique number:				
Type	Query x			Interface x		
	Deviation			Derogation (SHALL[PS])		
	Note: No deviations nor derogations which have an adverse effect on HSSE will be granted					
Workpackage						
Area(s) of application	Design & Eng.	x	Procurement		Construction	
	Commissioning		Operations		Other	
Issue date	22/09/2023		Urgent reply 5 days	x	Routine reply 10 days	
Close-out date						
Closed-out by			TQ status:		Closed-out	

1. Description

Reference documents / Aconex unique numbers:
K559-2254-PR-PID-002-001 - BLPH PIPING AND INSTRUMENTATION DIAGRAM ELECTROLYSER PACKAGE rev2

Reference is made to FEED document "K559-2254-PR-PID-002-001 - BLPH PIPING AND INSTRUMENTATION DIAGRAM ELECTROLYSER PACKAGE rev2", attached to this TQ. In accordance to note 4 of the attached PID ("PACKAGE VENDOR TO DEFINE INTERFACE WITH CONTRACTOR AND CCS CONNECTION REQUIREMENTS"), Vendor is requested:

1) to inform RM about process fluids type (H2, N2, Instrument Air and water or whatever), which are necessary for the proper working of the package;
2) to provide all process information (IN and OUT) of all fluids (operating and design conditions);
3) to inform RM if a vent line outgoing from the package is present (if yes, then Vendor to inform RM about all process conditions on this stream).

For sake of clarity Vendor is requested also to markup the attached PID, indicating all missing interface points with the external RM system.

2. Response

Reference documents / Aconex unique numbers

INTERFACES TABLE

This communication is issued for the recipient's information and to facilitate the obligations of the Parties under the Contract. This communication has no authority to amend or vary the Contract nor relieve either Party of any duties, obligations or responsibilities.

Type	In/Out	Description	Diameter & Fitting	Material	Flow (m3/h)	Pressure (Barg)	Design Pressure (Barg)	Temperature (°C)	Design Temperature (°C)
Water supply	In	Softened water	1" FLANGE ASME B16.5	SS316	0,805	4-6	6	10-35	40
H2 Production	Out	Hydrogen 99,999%	1" FLANGE ASME B16.5	SS316	500 Nm3/h	30	40	5-65	80
H2 Vent	Out	Hydrogen	2" FLANGE ASME B16.5	SS316	500 Nm3/h	ATM	40	5-65	80
Nitrogen supply	In	Nitrogen 97%	1" FLANGE ASME B16.5	SS316	The maximum/peak value of Nitrogen flowrate, related to the flushing time (almost 2 minutes), is 36 m3/hr at 7 barg.	7	10	AMB	45
Operating Drain No.1: drain from water treatment package	Out	Waste water	2" FLANGE ASME B16.5	SS316	Normal: 0,402 Maximum: 1,8 (during quality rinse of RO system)	ATM	6	5-35	80
Operating Drain No.2: drain from collector of H2 vent's drain and hydrogen purification unit's vent	Out	Pure water + Hydrogen+ Catalyst + Zeolite	2" FLANGE ASME B16.5	SS316	0,50	ATM	6	5-35	80
Maintenance Drain No. 1	Out	Pure water +Hydrogen	Drain valves, Refer to PID	SS316	Volume: 2 m3	ATM	6	5-35	80
Maintenance Drain No. 2	Out	Pure water +Oxygen	Drain valves, Refer to PID	SS316	Volume: 6 m3	ATM	6	5-35	80
Instrument air	In	Compressed air	1" FLANGE ASME B16.5	SS316	18Nm3/h peak	7,00	10	AMB	45

In PID sent with this TQ, compressed air supply is missing as nan interface.

INTERFACES TABLE

Type	In/Out	Description	Diameter & Fitting	Material	Flow (m3/h)	Pressure (Barg)	Design Pressure (Barg)	Temperature (°C)	Design Temperature (°C)
Water supply	In	Softened water	1" FLANGE ASME B16.5	SS316	0,805	4-6	6	10-35	40

This communication is issued for the recipient's information and to facilitate the obligations of the Parties under the Contract. This communication has no authority to amend or vary the Contract nor relieve either Party of any duties, obligations or responsibilities.

H2 Production	Out	Hydrogen 99,999%	1" FLANGE ASME B16.5	SS316	500 Nm3/h	30	40	5-65	80
H2 Vent	Out	Hydrogen	2" FLANGE ASME B16.5	SS316	500 Nm3/h	ATM	40	5-65	80
Nitrogen supply	In	Nitrogen 97%	1" FLANGE ASME B16.5	SS316	The maximum/peak value of Nitrogen flowrate, related to the flushing time (almost 2 minutes), is 36 m3/hr at 7 barg.	7	10	AMB	45
Operating Drain No.1: drain from water treatment package	Out	Waste water	2" FLANGE ASME B16.5	SS316	Normal: 0,402 Maximum: 1,8 (during quality rinse of RO system)	ATM	6	5-35	80
Operating Drain No.2: drain from collector of H2 vent's drain and hydrogen purification unit's vent	Out	Pure water + Hydrogen+ Catalyst + Zeolite	2" FLANGE ASME B16.5	SS316	0,50	ATM	6	5-35	80
Maintenance Drain No. 1	Out	Pure water +Hydrogen	Drain valves, Refer to PID	SS316	Volume: 2 m3	ATM	6	5-35	80
Maintenance Drain No. 2	Out	Pure water +Oxygen	Drain valves, Refer to PID	SS316	Volume: 6 m3	ATM	6	5-35	80
Instrument air	In	Compressed air	1" FLANGE ASME B16.5	SS316	18Nm3/h peak	7,00	10	AMB	45

In PID sent with this TQ, compressed air supply is missing is on interface.

This communication is issued for the recipient's information and to facilitate the obligations of the Parties under the Contract. This communication has no authority to amend or vary the Contract nor relieve either Party of any duties, obligations or responsibilities.

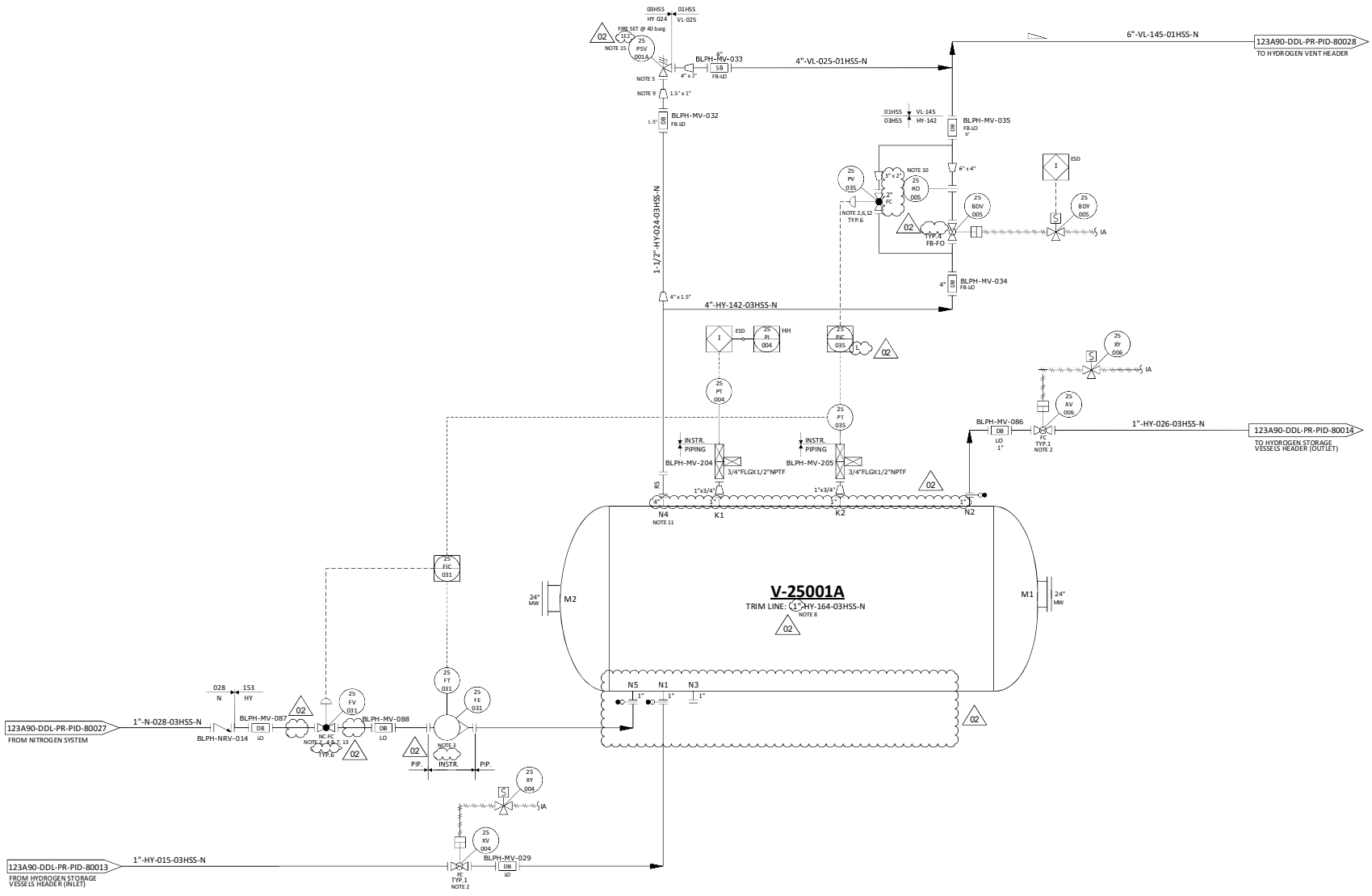
DRAWING NO. DRAWING_NO.

REV. REV.

V-25001_A

HYDROGEN STORAGE VESSEL

SIZE : 2800 mm (ID) X 15500 mm (L T/T)
DESIGN P/T : 40 barg / -10 / 80 °C
MATERIAL : CARBON STEEL
OPERATING P/T : 30 barg /AMB



NOTES

1. DELETED. 02
2. TIGHT SHUT OFF VALVE.
3. VARIABLE AREA FLOWMETER TO BE INSTALLED VERTICALLY WITH DIRECTION OF FLOW UPWARDS.
4. NITROGEN CONTROL VALVE (25-FV-001), CAN NOT OPEN UNTIL THE PRESSURE WITHIN THE VESSEL IS BELOW THE NITROGEN SUPPLY PRESSURE.
5. ONE COMMON UNINSTALLED SPARE PSV FOR ALL VESSELS.
6. FOR PULSE PRESSURE PURGING OF VESSEL WITH HYDROGEN.
7. FOR FLOW PURGING OF VESSEL WITH NITROGEN.
8. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 STORAGE, DOC. N. "123A90-DDL-MAC-DS-50027".
9. REDUCERS TO BE INSTALLED AS CLOSE TO PSV AS POSSIBLE.
10. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
11. NOZZLE N4 TO BE INSTALLED AT MINIMUM DISTANCE FROM TANGENT LINE OF THE VESSEL (ON THE OPPOSITE SIDE OF N5 NOZZLE).
12. SOFTWARE INTERLOCK TO PREVENT 25PV035 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION. CONTROL VALVE 25PV035 IS USED ONLY IN CASE OF VESSEL PURGING.
13. SOFTWARE INTERLOCK TO PREVENT 25FV031 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION.
14. A TIMER ALARM ON THE H2 PRESSURIZATION SECTION OF THE PURGE CYCLE IN THE CONTROL LOGIC IS PROVIDED TO DETERMINE IF THE PURGE VALVE 25PV035 HAS FAILED TO CLOSE.
15. 25PSV001A SIZED FOR FIRE.

HOLDS

1. DELETED.
2. DELETED.
3. DELETED.
4. DELETED.

02

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	12/06/2024	CIM	RZI	DLO	ACCEPTED FOR CONSTRUCTION (AFC)
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSEL A

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80015		SHEET 001	REV. 02

File Name : FILE_NAME

CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #6 123A90-DDL-SAF-RE-30006
Item No.	#6
Causes	1.2.5. 25FIC001 failure opening 25FV001 N2 valve 3.2.2. 25FIC001 failure opening 25FV001 N2 valve
Consequences	1.2.5.1. Potential for N2 (7barg) into H2 storage vessel V25001A during filling operation resulting in off spec H2 sent to the Fuel Cell leading to operational issue no hazardous consequences as per Fuel Cell HAZOP (Cause 1.13.1). Consequence: 1.13.2.1, 3.2.2.1
Recommendation	6. Review if it is credible to implement an interlock to prevent 25FV001 being opened outside of a purge cycle operation.
Actions	The TAG number of the valve 25FV001 (HAZOPED P&ID Revision 01, 24/11/2023) has been changed to 25FV031 (ISSUED P&ID Revision 02, 12-06-2024). A software interlock to prevent 25FV031 being opened outside of a purge cycle operation has been provided, as per note 13 on the attached P&ID 123A90-DDL-PR-PID-80015_02 (attachment1). Software interlock applies to all storage vessels N2 supply flow valve
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	

Approvals / Endorsements

EPC Process Lead		**Sign**
C.Impradice		
EPC HSE LEAD		**Sign**
C.Caracciolo	**20-06-2024**	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**

Ciro Impradice

Autore firma digitale: Impradice
Motivo: Sono l'autore di questo documento
Impradice email = ciro.impradice@rosetti.it C = IT O = Rosetti Marino OU = Process
Data: 2024.06.20 13:49:15 +02'00'

Digitaal ondertekend door Paul van Rossum
Datum: 2024.06.21 08:37:54 +02'00'

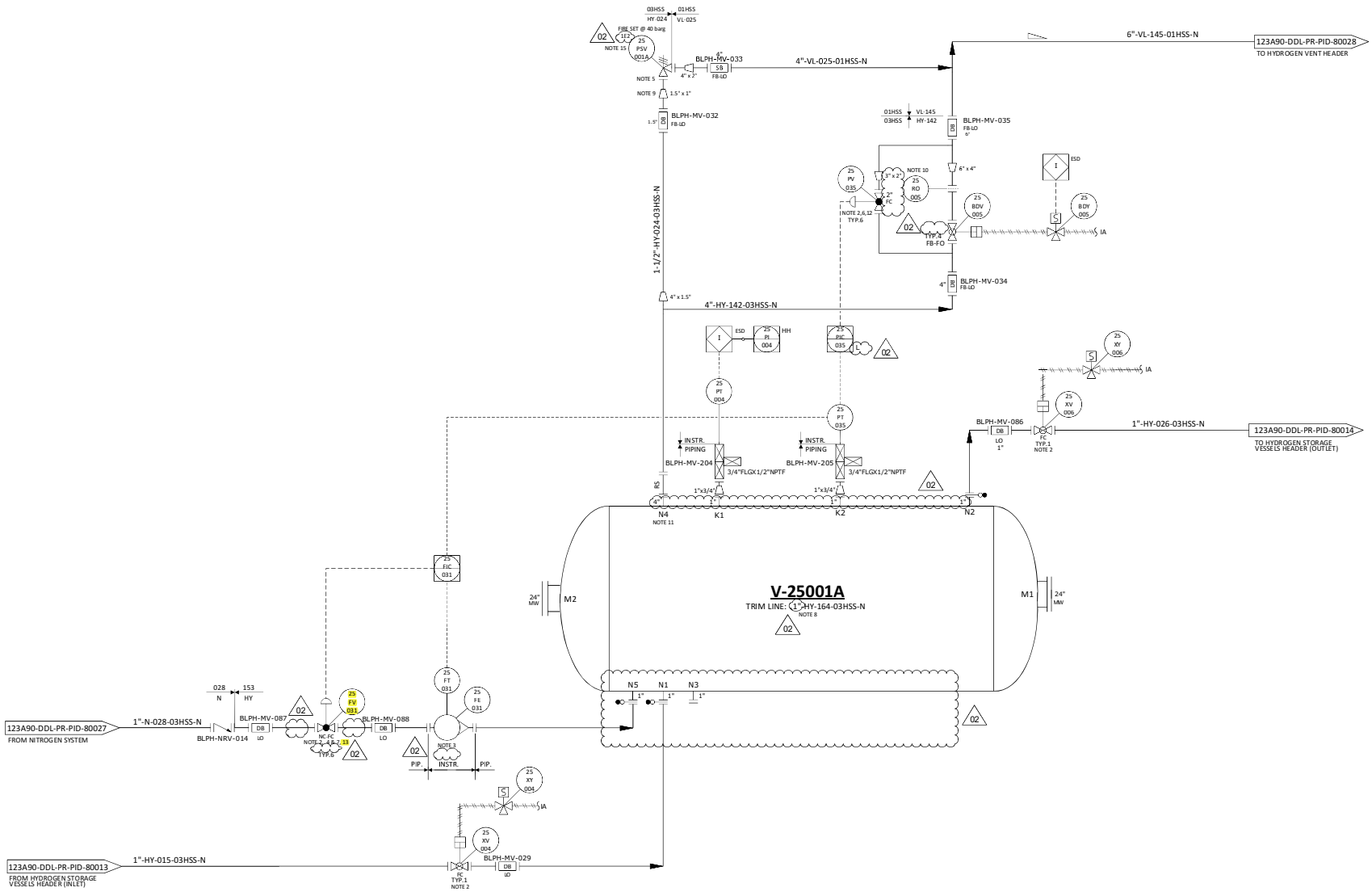
DRAWING NO. DRAWING_NO.

REV. REV.

V-25001_A

HYDROGEN STORAGE VESSEL

SIZE : 2800 mm (ID) X 15500 mm (L T/T)
DESIGN P/T : 40 barg / -10 / 80 °C
MATERIAL : CARBON STEEL
OPERATING P/T : 30 barg /AMB



NOTES

1. DELETED. 02
2. TIGHT SHUT OFF VALVE.
3. VARIABLE AREA FLOWMETER TO BE INSTALLED VERTICALLY WITH DIRECTION OF FLOW UPWARDS.
4. NITROGEN CONTROL VALVE (25-FV-001), CAN NOT OPEN UNTIL THE PRESSURE WITHIN THE VESSEL IS BELOW THE NITROGEN SUPPLY PRESSURE.
5. ONE COMMON UNINSTALLED SPARE PSV FOR ALL VESSELS.
6. FOR PULSE PRESSURE PURGING OF VESSEL WITH HYDROGEN.
7. FOR FLOW PURGING OF VESSEL WITH NITROGEN.
8. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 STORAGE, DOC. N. "123A90-DDL-MAC-DS-50027".
9. REDUCERS TO BE INSTALLED AS CLOSE TO PSV AS POSSIBLE.
10. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
11. NOZZLE N4 TO BE INSTALLED AT MINIMUM DISTANCE FROM TANGENT LINE OF THE VESSEL (ON THE OPPOSITE SIDE OF N5 NOZZLE).
12. SOFTWARE INTERLOCK TO PREVENT 25PV035 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION. CONTROL VALVE 25PV035 IS USED ONLY IN CASE OF VESSEL PURGING.
13. SOFTWARE INTERLOCK TO PREVENT 25FV031 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION.
14. A TIMER ALARM ON THE H2 PRESSURIZATION SECTION OF THE PURGE CYCLE IN THE CONTROL LOGIC IS PROVIDED TO DETERMINE IF THE PURGE VALVE 25PV035 HAS FAILED TO CLOSE.
15. 25PSV001A SIZED FOR FIRE.

HOLDS

1. DELETED.
2. DELETED.
3. DELETED.
4. DELETED.

02

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	12/06/2024	CIM	RZI	DLO	ACCEPTED FOR CONSTRUCTION (AFC)
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSEL A

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK			SCALE	NTS
DRAWN	CHECKED	APPROVED		DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80015			SHEET 001	REV. 02

File Name : FILE_NAME

CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #9 123A90-DDL-SAF-RE-30006
Item No.	#9
Causes	1.7.1. External Fire Consequence: 3.7.1.1
Consequences	1.7.1.1. Potential overpressure of H2 storage vessel V25001A resulting in LOPC of H2 and explosion on ignition.
Recommendation	9. Review the ESD logic for activation of ESD 1D on activation of 25PI004 HH and F&G detection system. Consider under which circumstances a single vessel should be depressurised and when all vessels should be depressurised.
Actions	
Assigned Respondent (By)	Tech Safety
Issue Date(01-12-2023)	
Action Response	The only identified cause for having high pressure on single H2 storage vessel is the external fire. As per F&G C&E matrix, doc. n. 123A90-DDL-IN-CE-40002, the ESD-1D is activated for both gas and fire in open area.

Approvals / Endorsements

EPC Discipline Lead		**Sign**
C.Caracciolo	05-04-24	
EPC HSE LEAD		**Sign**
C.Caracciolo	05-04-24	
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**
		Digitaal ondertekend door Paul van Rossum Datum: 2024.05.10 12:21:49 +02'00'

FIRE ZONE 01/02/03/05
HYDROGEN OPEN AREA

FZ-01= FUEL CELL AREA
FZ-02= H2 STORAGE VESSELS AREA
FZ-03= ELECTROLYZER AREA
FZ-04= B-200/B-300/B-400 CONTAINERS AREA
FZ-05= BESS AREA
FZ-06= B-100 CONTAINER AREA
FZ-07= MASTER POINT AREA
FZ-08= TRANSITION PIECE AREA

NOTES:

EFFECT

No.	SYS	TAG No.	DESCRIPTION	NOTES
1	AUDIO / VISUAL ALERT		OPERATOR WORKSTATION DISPLAY - EVENT/ALARM	
2	AUDIO / VISUAL ALERT			
3	AUDIO / VISUAL ALERT		F&G ALARM ON CAP ONSHORE	
4	AUDIO / VISUAL ALERT			
5	AUDIO / VISUAL ALERT		GAS BEACON ACTIVATION - AMBER	TO SHEET 17
6	AUDIO / VISUAL ALERT			
7	AUDIO / VISUAL ALERT		FIRE BEACON ACTIVATION - RED	TO SHEET 17
8	AUDIO / VISUAL ALERT			
9	AUDIO / VISUAL ALERT		SOUNDER ACTIVATION	TO SHEET 17
10	AUDIO / VISUAL ALERT			
11	AUDIO / VISUAL ALERT	72-XS-001	WAVE-OFF LIGHT ACTIVATION TO NAVAIDS	
12	AUDIO / VISUAL ALERT			
13	AUDIO / VISUAL ALERT			
14	AUDIO / VISUAL ALERT			
15	AUDIO / VISUAL ALERT			
16	AUDIO / VISUAL ALERT			
17	SIS SYSTEM	70-XS-005	H2 IN OPEN AREA TO SIS SYST. (TRIP EQ. NOT FOR ZONE 1 IN OPEN AREA)	
18	SIS SYSTEM			
19	SIS SYSTEM			
20	SIS SYSTEM			
21	SIS SYSTEM			
22	SIS SYSTEM			
23	SIS SYSTEM			
24	SIS SYSTEM			
25	SIS SYSTEM			
26	SIS SYSTEM			
27	ELECTRIC ISOLATION			
28	ELECTRIC ISOLATION			
29	ELECTRIC ISOLATION			
30	ELECTRIC ISOLATION			
31	ELECTRIC ISOLATION			
32	ELECTRIC ISOLATION			
33	OTHER			
34	OTHER			
35	OTHER			
36	OTHER			
37	OTHER			
38	OTHER			
39	OTHER			
40	OTHER			
41	OTHER			
42	OTHER			
43	OTHER			
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45	OTHER			
46	OTHER			
47	OTHER			
48	OTHER			
49	OTHER			
50	OTHER			
51	OTHER			
52	OTHER			
53	OTHER			

CAUSE

Row	TAG Nos	DESCRIPTION	VOTING	INHIBITION	REMARK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
1	950-GDZ-02101 950-GDZ-02102 950-GDZ-02103 950-GDZ-02104 950-GDZ-02105 950-GDZ-02106 950-GDZ-02107 950-GDZ-02108 950-GDZ-02109 950-GDZ-02110 950-GDZ-02111 950-GDZ-02112 950-GDZ-02113 950-GDZ-02114 950-GDZ-02115 950-GDZ-02116 950-GDZ-02117 (ULTRAS.) 950-GDZ-02118 (ULTRAS.) 950-GDZ-02119 (ULTRAS.) 950-GDZ-02120 (ULTRAS.)	FZ-02 - H2 GAS LOW (ELECT./ ULTRAS. POINT 5% LFL)	1oo20	X		X		F																																																		
2		FZ-02 - H2 GAS HIGH (ELECT./ ULTRAS. POINT 10% LFL)	1oo20	X		X		F																																																		
3		FZ-02 - H2 GAS HIGH CONFIRMED (ELECT./ ULTRAS. POINT 10% L	2oo20			X		F		X				X		X						X																																		
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13	950-GDZ-01101 (ULTRAS.) 950-GDZ-01102 (ULTRAS.) 950-GDZ-01103 (ULTRAS.)	FZ-01 - H2 GAS LOW (ULTRAS. POINT 5% LFL)	1oo3	X		X		F																																																			
14		FZ-01 - H2 GAS HIGH (ULTRAS. POINT 10% LFL)	1oo3	X		X		F																																																		
15		FZ-01 - H2 GAS HIGH CONFIRMED (ULTRAS. POINT 10% LFL)	2oo3			X		F		X				X		X						X																																		
16																																																								
17	950-GDZ-03101 (ULTRAS.) 950-GDZ-03102 (ULTRAS.) 950-GDZ-03103 (ULTRAS.) 950-GDZ-03104 (ULTRAS.) 950-GDZ-03105 (ULTRAS.)	FZ-03 - H2 GAS LOW (ULTRAS. POINT 5% LFL)	1oo5	X		X		F																																																			
18		FZ-03 - H2 GAS HIGH (ULTRAS POINT 10% LFL)	1oo5	X		X		F																																																		
20		FZ-03 - H2 GAS HIGH CONFIRMED (ULTRAS POINT 10% LFL)	2oo5			X		F		X				X		X						X																																		
21																																																								
22	950-GDZ-05101 950-GDZ-05102 950-GDZ-05103	FZ-05 - H2 GAS LOW (ELECTROCHEM. POINT 5% LFL)	1oo3	X		X		F																																																			
23		FZ-05 - H2 GAS HIGH (ELECTROCHEM. POINT 10% LFL)	1oo3	X		X		F																																																			
24		FZ-05 - H2 GAS HIGH CONFIRMED (ELECTROCHEM. POINT 10% LFL)	2oo3			X		F		X				X		X						X																																		
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LEGEND

TITLE	NUMBER

REFERENCE DOCUMENTS

TITLE	NUMBER
Process Safety Cause and Effect Matrix	123A90-DDL-IN-CE-40000
Process Safety Cause and Effect Block Diagram	123A90-DDL-PR-DG-80000
F&G detectors Layout - Lower deck and Upper deck	123A90-DDL-SAF-DL-30027
F&G detectors Layout - Below Lower deck	123A90-DDL-SAF-DL-30028

Rev.	Date	Status	Description	DRN	CHKD	APPD
00	08/03/2024	IFA	Issue for Acceptance (IFA)	LCA	MGA	DLO

CROSSWIND | ROSETTI MARINO

Fire & Gas Cause & Effect Matrix: HYDROGEN OPEN AREA

HOLLANDSE KUST NOORD WIND PARK Project
Contract No. CW-I-WP4-2023-05

DATE 08/03/2024

CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #10 123A90-DDL-SAF-RE-30006
Item No.	#10
Causes	1.18.2. Loss of Instrument Air 3.18.2. Loss of Instrument Air
Consequences	1.18.2.1. Section of line between 25SDV001 and 25XV004 will be blocked in during ESD scenario. Consequence 3.18.2.1
Recommendation	10. Review the requirement for a BDV (FO) with a bypass around (25XV003 and 25RO003) and (80XV001 and 80RO001) to allow emergency depressurisation on the manifold inlet line. See also recommendation 12.
Actions	Pressurized fluid and quantity trapped between (volume less than 0.05 m3 and quantity less than 0.11 kg): 1) 25SDV001 and 25XV004 (inlet manifold); 2) 25SDV0023 and FC Package (outlet manifold), is so limited that in case of random rupture possible fire scenario will last few seconds and in any case less than 10 minutes (that is the minimum time for escalation as per assumption register 123A90-DDL-SAF-LIS-30014, see attachment 1). Also dangerous radaiation levels for injuring operators are limited to less than 10 meters. As reference please refer attached simulation performed with phast software (attachment 2).
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	

Approvals / Endorsements		
EPC Discipline Lead / Construction		**Sign**
Ciro Impradice		
EPC HSE LEAD		**Sign**
C.Caracciolo	**19/04/2024**	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**

Ciro Impradice

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Datum: 2024.05.10 11:10:41 +02'00'

Base Load Power Hub (BLPH)

Assumption Register

Document Number: 123A90-DDL-SAF-LIS-30014

Document Class: 1

02	12/03/2024	Issue for Acceptance (IFA)	G. Giani	C. Caracciolo	D. Lo Sterzo
01	25/01/2024	Issue for Acceptance (IFA)	G. Giani	C. Caracciolo	D. Lo Sterzo
00	14/12/2023	Issue for Review (IFR)	G. Giani	C. Caracciolo	D. Lo Sterzo
Rev.	Date	Description	Prepared	Reviewed	Approved
ICARO					

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Time for detection

The rapidity of detection of a leak of a flammable substance is related to the extent of the release itself but also to the capacity of the detection systems available in the unit.

Time for isolation

Once the leak is identified the isolatable section can be isolated by closing the on-off valves by the intervention of F&G system. The time for the intervention is limited to the required time to close the valves, which show diameter less than 3 inches. Considering that a typical valve closure velocity is 2 second for inch, the isolation time is in the order of some seconds.

Time for emptying the circuit

Emptying of the isolatable section is function of dimension of the release hole and the hold up of the isolatable section.

In conclusion, in case of effective intervention of ESD system, the total release time for each hole diameter in the table below is summarized.

Type of release	Detection/Isolation (minutes)	Emptying
Small release	10	Depending on hold up of the section and release rate from the hole (calculated via Phast software, considering the dynamic flow rate)
Medium hole	5	
Full bore	1	

In case of ineffective intervention of ESD system, the scenarios will be not-isolated for each release hole, and the duration is assumed higher that 10 minutes (which is the threshold for escalation effects, see assumption 7).

Table 10 – Assumption #6

Study:	QRA, FERA		
Subject:	Scenario consequences calculation and reference threshold for QRA / FERA		
Assumption #	7	Rev.	1
Reference:	5, 6,7, 13, 17, 24, 29,30		

Scenario consequence modelling

The scenario consequences will be modelled with the package Phast released by DNV (8.9 latest revision available), in order to assess the spatial distribution of physical effects of scenarios. Operating pressure and temperature and composition of the hazardous fluid will be selected from H&M Balance project documentation. For gas releases the pressure in the system, and hence the release rate, could slowly decrease following isolation, resulting in a time dependent release. As a conservative approach, the calculated initial release rate is assumed constant over the release duration for such scenarios; the scenarios consequences will be evaluated at time = 0, where the release flow rate shows the maximum value. The orientation of the release is an important factor because it will define the orientation of jet fires and their impact. The orientation of release will be modelled as follows:

- horizontal non-impinged for jet fire, in order to maximize damage distances scenarios.
- horizontal (50 % of probability) and down impingement (50 % of probability) for flammable gas dispersion (FF and explosion), in order to maximize damage distances scenarios.

Reference thresholds for QRA

This paragraph provides information on the vulnerability of humans.

Jet fire exposure:

The values for humans' fatality are reported below:

- 37.5 kW/m^2: Probability of human lethality: 100%
- 12.5 kW/m^2: Probability of human lethality: 30%
- 4.73 kW/m^2: Probability of human lethality: 3%

Flash fire exposure:

The values for humans' fatality are reported below:

- LFL: Probability of human lethality: 100%
- LFL/2: Probability of human lethality: 50%

Overpressure exposure:

The values for humans' fatality are reported below:

- 0.5 bar: Probability of human lethality: 100%
- 0.3 bar: Probability of human lethality: 50%

Reference threshold for FERA

This paragraph provides information on the effects of fire and explosion on asset and structure.

Jet fire exposure:

The 37.5 kW/m^2 represent the threshold which unprotected steel will reach thermal stress temperatures that can cause failure. Anyway, for determination of escalation effect it is required to calculate the time which the target is involved in such critical thermal radiation. According to generally adopted exclusion criteria related to the duration of fire scenarios, a possible escalation effect can be expected in case of exposure to jet fire from more than 10 minutes.

For the determination of probability of escalation, a dedicated iso-damage contours will be calculated as the sum of all jet fire scenarios which duration equal or higher than 10 minutes.

Overpressure exposure:

The values for vulnerability to explosion for asset and structure are reported in the tables below.

Overpressure (bar)	Effect on asset/structure
0.35	Collapse of steel girder framed buildings
0.27	Frameless, self-framing steel panel building demolished
0.15	Partial collapse of roofs and walls of buildings.
0.07	Large and small windows usually shattered; occasional damage to windows frame.

Table 11 – Assumption #7

Outlet manifold

Audit Number	746
Crosswind Distance	0 m
Equipment	Pressure vessel
Height of interest	0 m
Material	HYDROGEN
Program	Phast 8,9
Scenario	Time varying short pipe release
Weather	Multiple Weather
Workspace	H2 vent



Consequence Summary Report

Workspace: H2 vent

Study: Study

Summary Basis

These tables will only report global values set in the parameters. Values that are modified in the study tree will not be reported.
The report is context sensitive, and filters up to the study level. You will need to generate multiple summary reports if you have multiple studies in your workspace.
The results in this report are from the non-CFD calculations only.

Discharge Results (after atmospheric expansion)

Path	Scenario	Weather	Peak Flowrate [kg/s]	Temperature [degC]	Liquid mass fraction in material [fraction]	Droplet diameter [um]	Velocity [m/s]	End time of release [s]
Study\Pressure vessel	Time varying short pipe release	Category 2/F	0,111268	-75,4366	0	0	396,359	3,74239
		Category 5/D	0,111268	-75,4366	0	0	396,359	3,74239

CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #11 123A90-DDL-SAF-RE-30006
Item No.	#11
Causes	1.18.2. Loss of Instrument Air 3.18.2. Loss of Instrument Air
Consequences	1.18.2.1. Section of line between 25SDV001 and 25XV004 will be blocked in during ESD scenario. Consequence 3.18.2.2.
Recommendation	11. Ensure that the trapped volume between 25SVD023 and 25PV025A/B is minimised such that it does not require blowdown.
Actions	
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	As per note 6 on PID 123A90-DDL-PR-PID-80014_01, SDV VALVE 25-SDV-023 will BE INSTALLED AS CLOSE AS POSSIBLE TO THE CONTROL VALVES 25-PV-055A/B. This is to ensure that pressurized fluid and quantity trapped (volume less than 0.05 m3 and quantity less than 0.11 kg) in the system is so limited that in case of random rupture possible fire scenario will last few seconds and in any case less than 10 minutes (that is the minimum time for escalation as per assumption register 123A90-DDL-SAF-LIS-314, attachment 1). Also dangerous radiation levels for injuring operators are limited to less than 10 meters. As reference please refer attached simulation performed with phast software (see attachment 2)

Approvals / Endorsements

EPC Discipline Lead	Ciro Impradice	**Sign**
Ciro Impradice		
EPC HSE LEAD		**Sign**
C.Caracciolo	**19/04/2024**	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**

Base Load Power Hub (BLPH)

Assumption Register

Document Number: 123A90-DDL-SAF-LIS-30014

Document Class: 1

02	12/03/2024	Issue for Acceptance (IFA)	G. Giani	C. Caracciolo	D. Lo Sterzo
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00	14/12/2023	Issue for Review (IFR)	G. Giani	C. Caracciolo	D. Lo Sterzo
Rev.	Date	Description	Prepared	Reviewed	Approved
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Time for detection

The rapidity of detection of a leak of a flammable substance is related to the extent of the release itself but also to the capacity of the detection systems available in the unit.

Time for isolation

Once the leak is identified the isolatable section can be isolated by closing the on-off valves by the intervention of F&G system. The time for the intervention is limited to the required time to close the valves, which show diameter less than 3 inches. Considering that a typical valve closure velocity is 2 second for inch, the isolation time is in the order of some seconds.

Time for emptying the circuit

Emptying of the isolatable section is function of dimension of the release hole and the hold up of the isolatable section.

In conclusion, in case of effective intervention of ESD system, the total release time for each hole diameter in the table below is summarized.

Type of release	Detection/Isolation (minutes)	Emptying
Small release	10	Depending on hold up of the section and release rate from the hole (calculated via Phast software, considering the dynamic flow rate)
Medium hole	5	
Full bore	1	

In case of ineffective intervention of ESD system, the scenarios will be not-isolated for each release hole, and the duration is assumed higher that 10 minutes (which is the threshold for escalation effects, see assumption 7).

Table 10 – Assumption #6

Study:	QRA, FERA		
Subject:	Scenario consequences calculation and reference threshold for QRA / FERA		
Assumption #	7	Rev.	1
Reference:	5, 6,7, 13, 17, 24, 29,30		

Scenario consequence modelling

The scenario consequences will be modelled with the package Phast released by DNV (8.9 latest revision available), in order to assess the spatial distribution of physical effects of scenarios. Operating pressure and temperature and composition of the hazardous fluid will be selected from H&M Balance project documentation. For gas releases the pressure in the system, and hence the release rate, could slowly decrease following isolation, resulting in a time dependent release. As a conservative approach, the calculated initial release rate is assumed constant over the release duration for such scenarios; the scenarios consequences will be evaluated at time = 0, where the release flow rate shows the maximum value. The orientation of the release is an important factor because it will define the orientation of jet fires and their impact. The orientation of release will be modelled as follows:

- horizontal non-impinged for jet fire, in order to maximize damage distances scenarios.
- horizontal (50 % of probability) and down impingement (50 % of probability) for flammable gas dispersion (FF and explosion), in order to maximize damage distances scenarios.

Reference thresholds for QRA

This paragraph provides information on the vulnerability of humans.

Jet fire exposure:

The values for humans' fatality are reported below:

- 37.5 kW/m^2: Probability of human lethality: 100%
- 12.5 kW/m^2: Probability of human lethality: 30%
- 4.73 kW/m^2: Probability of human lethality: 3%

Flash fire exposure:

The values for humans' fatality are reported below:

- LFL: Probability of human lethality: 100%
- LFL/2: Probability of human lethality: 50%

Overpressure exposure:

The values for humans' fatality are reported below:

- 0.5 bar: Probability of human lethality: 100%
- 0.3 bar: Probability of human lethality: 50%

Reference threshold for FERA

This paragraph provides information on the effects of fire and explosion on asset and structure.

Jet fire exposure:

The 37.5 kW/m^2 represent the threshold which unprotected steel will reach thermal stress temperatures that can cause failure. Anyway, for determination of escalation effect it is required to calculate the time which the target is involved in such critical thermal radiation. According to generally adopted exclusion criteria related to the duration of fire scenarios, a possible escalation effect can be expected in case of exposure to jet fire from more than 10 minutes.

For the determination of probability of escalation, a dedicated iso-damage contours will be calculated as the sum of all jet fire scenarios which duration equal or higher than 10 minutes.

Overpressure exposure:

The values for vulnerability to explosion for asset and structure are reported in the tables below.

Overpressure (bar)	Effect on asset/structure
0.35	Collapse of steel girder framed buildings
0.27	Frameless, self-framing steel panel building demolished
0.15	Partial collapse of roofs and walls of buildings.
0.07	Large and small windows usually shattered; occasional damage to windows frame.

Table 11 – Assumption #7

Outlet manifold

Audit Number	746
Crosswind Distance	0 m
Equipment	Pressure vessel
Height of interest	0 m
Material	HYDROGEN
Program	Phast 8,9
Scenario	Time varying short pipe release
Weather	Multiple Weather
Workspace	H2 vent



Consequence Summary Report

Workspace: H2 vent

Study: Study

Summary Basis

These tables will only report global values set in the parameters. Values that are modified in the study tree will not be reported.
The report is context sensitive, and filters up to the study level. You will need to generate multiple summary reports if you have multiple studies in your workspace.
The results in this report are from the non-CFD calculations only.

Discharge Results (after atmospheric expansion)

Path	Scenario	Weather	Peak Flowrate [kg/s]	Temperature [degC]	Liquid mass fraction in material [fraction]	Droplet diameter [um]	Velocity [m/s]	End time of release [s]
Study\Pressure vessel	Time varying short pipe release	Category 2/F	0,111268	-75,4366	0	0	396,359	3,74239
		Category 5/D	0,111268	-75,4366	0	0	396,359	3,74239

CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #12 123A90-DDL-SAF-RE-30006
Item No.	#12
Causes	1.18.2. Loss of Instrument Air Consequence: 2.18.2.3
Consequences	1.18.2.1. Section of line between 25SDV001 and 25XV004 will be blocked in during ESD scenario.
Recommendation	12.Review the trapped volume between Fuel Cell Package and 25PV025A/B is minimised such that it does not require blowdown or consider providing a blowdown route. See also recommendation 10.
Actions	
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	Pressurized fluid and quantity trapped in the system (volume less than 0.05 m3 and quantity less than 0.11 kg) is so limited that in case of random rupture possible fire scenario will last few seconds and in any case less than 10 minutes (that is the minimum time for escalation as per assumption register 123A90-DDL-SAF-LIS-314, see attachment 1). Also dangerous radiation levels for injuring operators are limited to less than 10 meters. As reference please refer attached simulation performed with phast software (attachment 2).

Approvals / Endorsements

EPC Discipline Lead / Construction	Ciro Impradice	**Sign**
Ciro Impradice		
EPC HSE LEAD		**Sign**
C.Caracciolo	**19/04/2024**	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**

Autore firma digitale: Ciro Impradice
Nome e cognome: CN = Ciro Impradice email = ciro.impradice@rosetti.it C = IT O = Rosetti Marino OU = Pavona
Data: 2024.04.19 15:01:55 02'00'

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Datum: 2024.06.21 14:15:43 +02'00'

Base Load Power Hub (BLPH)

Assumption Register

Document Number: 123A90-DDL-SAF-LIS-30014

Document Class: 1

02	12/03/2024	Issue for Acceptance (IFA)	G. Giani	C. Caracciolo	D. Lo Sterzo
01	25/01/2024	Issue for Acceptance (IFA)	G. Giani	C. Caracciolo	D. Lo Sterzo
00	14/12/2023	Issue for Review (IFR)	G. Giani	C. Caracciolo	D. Lo Sterzo
Rev.	Date	Description	Prepared	Reviewed	Approved
ICARO					

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Time for detection

The rapidity of detection of a leak of a flammable substance is related to the extent of the release itself but also to the capacity of the detection systems available in the unit.

Time for isolation

Once the leak is identified the isolatable section can be isolated by closing the on-off valves by the intervention of F&G system. The time for the intervention is limited to the required time to close the valves, which show diameter less than 3 inches. Considering that a typical valve closure velocity is 2 second for inch, the isolation time is in the order of some seconds.

Time for emptying the circuit

Emptying of the isolatable section is function of dimension of the release hole and the hold up of the isolatable section.

In conclusion, in case of effective intervention of ESD system, the total release time for each hole diameter in the table below is summarized.

Type of release	Detection/Isolation (minutes)	Emptying
Small release	10	Depending on hold up of the section and release rate from the hole (calculated via Phast software, considering the dynamic flow rate)
Medium hole	5	
Full bore	1	

In case of ineffective intervention of ESD system, the scenarios will be not-isolated for each release hole, and the duration is assumed higher that 10 minutes (which is the threshold for escalation effects, see assumption 7).

Table 10 – Assumption #6

Study:	QRA, FERA		
Subject:	Scenario consequences calculation and reference threshold for QRA / FERA		
Assumption #	7	Rev.	1
Reference:	5, 6,7, 13, 17, 24, 29,30		

Scenario consequence modelling

The scenario consequences will be modelled with the package Phast released by DNV (8.9 latest revision available), in order to assess the spatial distribution of physical effects of scenarios. Operating pressure and temperature and composition of the hazardous fluid will be selected from H&M Balance project documentation. For gas releases the pressure in the system, and hence the release rate, could slowly decrease following isolation, resulting in a time dependent release. As a conservative approach, the calculated initial release rate is assumed constant over the release duration for such scenarios; the scenarios consequences will be evaluated at time = 0, where the release flow rate shows the maximum value. The orientation of the release is an important factor because it will define the orientation of jet fires and their impact. The orientation of release will be modelled as follows:

- horizontal non-impinged for jet fire, in order to maximize damage distances scenarios.
- horizontal (50 % of probability) and down impingement (50 % of probability) for flammable gas dispersion (FF and explosion), in order to maximize damage distances scenarios.

Reference thresholds for QRA

This paragraph provides information on the vulnerability of humans.

Jet fire exposure:

The values for humans' fatality are reported below:

- 37.5 kW/m^2: Probability of human lethality: 100%
- 12.5 kW/m^2: Probability of human lethality: 30%
- 4.73 kW/m^2: Probability of human lethality: 3%

Flash fire exposure:

The values for humans' fatality are reported below:

- LFL: Probability of human lethality: 100%
- LFL/2: Probability of human lethality: 50%

Overpressure exposure:

The values for humans' fatality are reported below:

- 0.5 bar: Probability of human lethality: 100%
- 0.3 bar: Probability of human lethality: 50%

Reference threshold for FERA

This paragraph provides information on the effects of fire and explosion on asset and structure.

Jet fire exposure:

The 37.5 kW/m^2 represent the threshold which unprotected steel will reach thermal stress temperatures that can cause failure. Anyway, for determination of escalation effect it is required to calculate the time which the target is involved in such critical thermal radiation. According to generally adopted exclusion criteria related to the duration of fire scenarios, a possible escalation effect can be expected in case of exposure to jet fire from more than 10 minutes.

For the determination of probability of escalation, a dedicated iso-damage contours will be calculated as the sum of all jet fire scenarios which duration equal or higher than 10 minutes.

Overpressure exposure:

The values for vulnerability to explosion for asset and structure are reported in the tables below.

Overpressure (bar)	Effect on asset/structure
0.35	Collapse of steel girder framed buildings
0.27	Frameless, self-framing steel panel building demolished
0.15	Partial collapse of roofs and walls of buildings.
0.07	Large and small windows usually shattered; occasional damage to windows frame.

Table 11 – Assumption #7

Outlet manifold

Audit Number	746
Crosswind Distance	0 m
Equipment	Pressure vessel
Height of interest	0 m
Material	HYDROGEN
Program	Phast 8,9
Scenario	Time varying short pipe release
Weather	Multiple Weather
Workspace	H2 vent



Consequence Summary Report

Workspace: H2 vent

Study: Study

Summary Basis

These tables will only report global values set in the parameters. Values that are modified in the study tree will not be reported.
The report is context sensitive, and filters up to the study level. You will need to generate multiple summary reports if you have multiple studies in your workspace.
The results in this report are from the non-CFD calculations only.

Discharge Results (after atmospheric expansion)

Path	Scenario	Weather	Peak Flowrate [kg/s]	Temperature [degC]	Liquid mass fraction in material [fraction]	Droplet diameter [um]	Velocity [m/s]	End time of release [s]
Study\Pressure vessel	Time varying short pipe release	Category 2/F	0,111268	-75,4366	0	0	396,359	3,74239
		Category 5/D	0,111268	-75,4366	0	0	396,359	3,74239

CROSSWIND

ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #13 123A90-DDL-SAF-RE-30006
Item No.	#1
Cause	1.20.1. DC systems
Consequences	1.20.1.1. Potential for electrically induced corrosion.
Recommendation	13. Ensure that the potential for electrically induced corrosion and requisite earthing is considered in the SAFOP.
Actions	To prevent induced corrosion, all metallic items not welded to the structure, will be earthed/bounded to the structure. See Earthing layout: 123A90-DDL-EL-DL-20132÷20134, 123A90-DDL-EL-DL-20136÷20138 and 123A90-DDL-IN-DL-40013 only for ITER container.
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	

Approvals / Endorsements		
EPC Discipline Lead / Construction	**Date**	**Sign**
A. Madaschi	22/07/24	
EPC HSE LEAD		**Sign**
C.Caracciolo	22/07/24	
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**
		Digitaal ondertekend door Paul van Rossum Datum: 2024.08.21 08:36:58 +02'00'

CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action Title:	**EPC HAZOP Study Actions**
Action No:	#16
Ref Doc	123A90-DDL-SAF-RE-30006
Item No.	#16
Causes	2.2.6. 25FIC001 failure opening 25FV001 N2 valve 2.3.2. 25XV008/11/14/17/20 open when not required and V25001B-F contains N2 at low pressure
Consequences	2.2.6.1. Potential for N2 (7barg) into H2 storage vessel V25001A during purge operation resulting in off spec H2 sent to the Fuel Cell leading to operational issue no hazardous consequences as per Fuel Cell HAZOP (Cause 1.13.1). 2.3.2.1. Potential for N2 into H2 storage vessel V25001A under purge operation resulting in off spec H2 sent to the Fuel Cell leading to operational issue no hazardous consequences as per Fuel Cell HAZOP (Cause 1.13.1).
Recommendation	16.Implement 25FV001 as a Type 6 as it is critical to the operation of the fuel cell that N2 is excluded from the storage system.
Actions	
Assigned Respondent (By)	Instrumentation
Issue Date(01-12-2023)	
Action Response	As per P&IDs "Hydrogen Storage Vessel A/B/C/D/E/F" n° 123A90-DDL-PR-PID-80015/16/17/18/19/20 rev.01, all the Nitrogen flow control valves inlet to Storage Vessels are Type 6 as critical control valves.

Approvals / Endorsements

EPC Discipline Lead / Construction		**Sign**
L. Calabrese	02/04/2024	
EPC HSE LEAD		**Sign**
C.Caracciolo	16/04/24	
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**
		Digitaal ondertekend door Paul van Rossum Datum: 2024.05.10 12:38:00 +02'00'

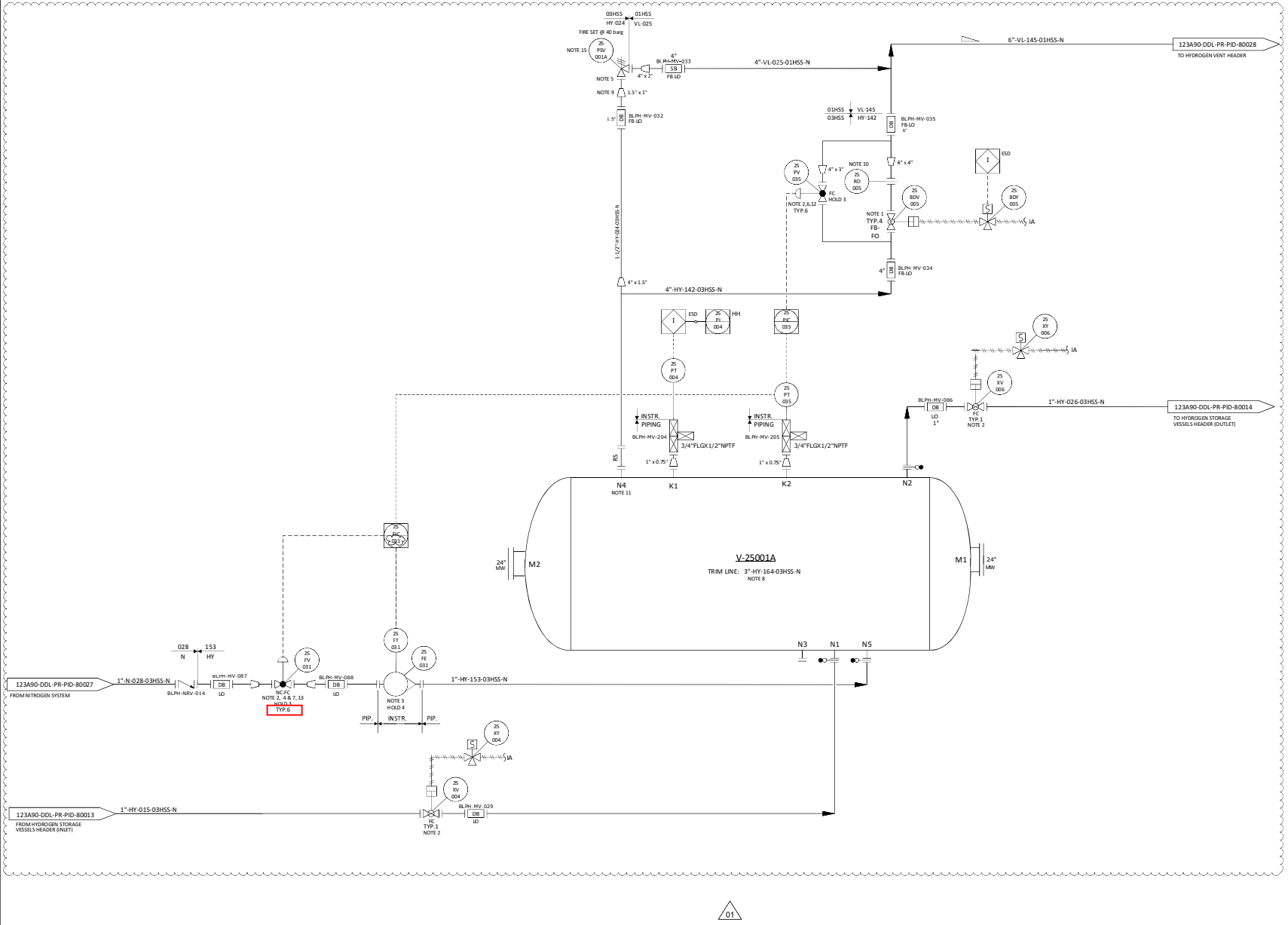
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REV. REV.

V-25001_A

HYDROGEN STORAGE VESSEL

SIZE : 2800 mm (ID) X 15500 mm (L T/T)
DESIGN P/T : 40 barg / -10 / 80 °C
MATERIAL : CARBON STEEL
OPERATING P/T : 30 barg /AMB



NOTES

1. NECESSARY CONTROL SYSTEM SOFTWARE SHALL BE INCLUDED TO SUPPORT ADVACED VALVE CONTROL, PARTIAL STROKE TESTING AND DIAGNOSTICS FOR ANY SAFETY CRITICAL ON/OFF VALVES. THESE APPLICATION SHALL BE IDENTIFIED BY HAZOP AND LOPA EVALUATION IF PARTIAL STROKE TESTING WILL BE REQUIRED:
   THE "TYP. 3" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 2" FOR SDV
   THE "TYP. 5" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 4" FOR BDV
2. TIGHT SHUT OFF VALVE.
3. VARIABLE AREA FLOWMETER TO BE INSTALLED VERTICALLY WITH DIRECTION OF FLOW UPWARDS.
4. NITROGEN CONTROL VALVE (25-FV-001), CAN NOT OPEN UNTIL THE PRESSURE WITHIN THE VESSEL IS BELOW THE NITROGEN SUPPLY PRESSURE.
5. ONE COMMON UNINSTALLED SPARE PSV FOR ALL VESSELS.
6. FOR PULSE PRESSURE PURGING OF VESSEL WITH HYDROGEN.
7. FOR FLOW PURGING OF VESSEL WITH NITROGEN. 01
8. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 STORAGE, DOC. N. "123A90-DDL-MAC-DS-50027".
9. REDUCERS TO BE INSTALLED AS CLOSE TO PSV AS POSSIBLE.
10. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
11. NOZZLE N4 TO BE INSTALLED AT MINIMUM DISTANCE FROM TANGENT LINE OF THE VESSEL (ON THE OPPOSITE SIDE OF N5 NOZZLE).
12. SOFTWARE INTERLOCK TO PREVENT 25PV035 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION. CONTROL VALVE 25PV035 IS USED ONLY IN CASE OF VESSEL PURGING.
13. SOFTWARE INTERLOCK TO PREVENT 25FV031 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION.
14. A TIMER ALARM ON THE H2 PRESSURIZATION SECTION OF THE PURGE CYCLE IN THE CONTROL LOGIC IS PROVIDED TO DETERMINE IF THE PURGE VALVE 25PV035 HAS FAILED TO CLOSE.
15. 25PSV001A SIZED FOR FIRE.

HOLDS

1. DELETED.
2. DELETED.

01

3. CONTROL VALVE SIZE (BY VENDOR).
4. MULTIVARIABLE FLOWMETERS REQUIRE 7 DIAMETERS STRAIGHT LENGHT UPSTREAM AND 5 DIAMETERS STRAIGHT LENGHT DOWNSTREAM (TO BE CONFIRMED BY VENDOR).

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSEL A

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK			SCALE	NTS
DRAWN	CHECKED	APPROVED		DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80015			SHEET 001	REV. 01

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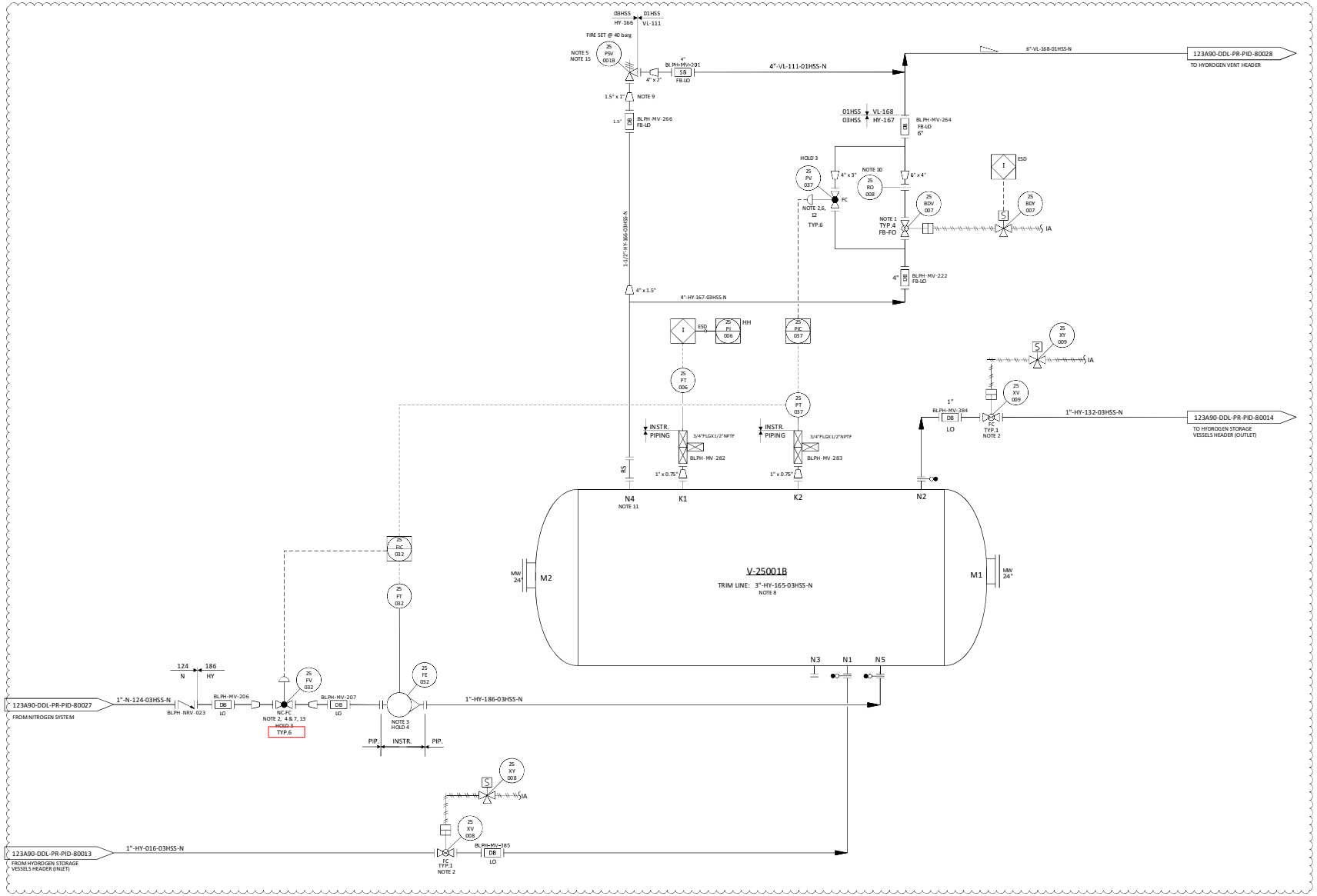
DRAWING NO. DRAWING_NO.

REV. REV.

V-25001_B

HYDROGEN STORAGE VESSEL

SIZE : 2800 mm (ID) X 15500 mm (L T/T)
DESIGN P/T : 40 barg / -10 / 80 °C
MATERIAL : CARBON STEEL
OPERATING P/T : 30 barg / AMB



01

NOTES

1. NECESSARY CONTROL SYSTEM SOFTWARE SHALL BE INCLUDED TO SUPPORT ADVACED VALVE CONTROL, PARTIAL STROKE TESTING AND DIAGNOSTICS FOR ANY SAFETY CRITICAL ON/OFF VALVES. THESE APPLICATION SHALL BE IDENTIFIED BY HAZOP AND LOPA EVALUATION IF PARTIAL STROKE TESTING WILL BE REQUIRED:
   THE "TYP. 3" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 2" FOR SDV
   THE "TYP. 5" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 4" FOR BDV
2. TIGHT SHUT OFF VALVE.
3. VARIABLE AREA FLOWMETER TO BE INSTALLED VERTICALLY WITH DIRECTION OF FLOW UPWARDS.
4. NITROGEN CONTROL VALVE (25-FV-001), CAN NOT OPEN UNTIL THE PRESSURE WITHIN THE VESSEL IS BELOW THE NITROGEN SUPPLY PRESSURE.
5. ONE COMMON UNINSTALLED SPARE PSV FOR ALL VESSELS.
6. FOR PULSE PRESSURE PURGING OF VESSEL WITH HYDROGEN.
7. FOR FLOW PURGING OF VESSEL WITH NITROGEN. 01
8. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 STORAGE, DOC. N. "123A90-DDL-MAC-DS-50027".
9. REDUCERS TO BE INSTALLED AS CLOSE TO PSV AS POSSIBLE.
10. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
11. NOZZLE N4 TO BE INSTALLED AT MINIMUM DISTANCE FROM TANGENT LINE OF THE VESSEL (ON THE OPPOSITE SIDE OF N5 NOZZLE).
12. SOFTWARE INTERLOCK TO PREVENT 25PV037 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION. CONTROL VALVE 25PV037 IS USED ONLY IN CASE OF VESSEL PURGING.
13. SOFTWARE INTERLOCK TO PREVENT 25FV032 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION.
14. A TIMER ALARM ON THE H2 PRESSURIZATION SECTION OF THE PURGE CYCLE IN THE CONTROL LOGIC IS PROVIDED TO DETERMINE IF THE PURGE VALVE 25PV037 HAS FAILED TO CLOSE.
15. 25PSV001B SIZED FOR FIRE.

HOLDS

1. DELETED. 01
2. DELETED.
3. CONTROL VALVE SIZE (BY VENDOR).
4. MULTIVARIABLE FLOWMETERS REQUIRE 7 DIAMETERS STRAIGHT LENGHT UPSTREAM AND 5 DIAMETERS STRAIGHT LENGHT DOWNSTREAM (TO BE CONFIRMED BY VENDOR).

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSEL B

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80016		SHEET 001	REV. 00

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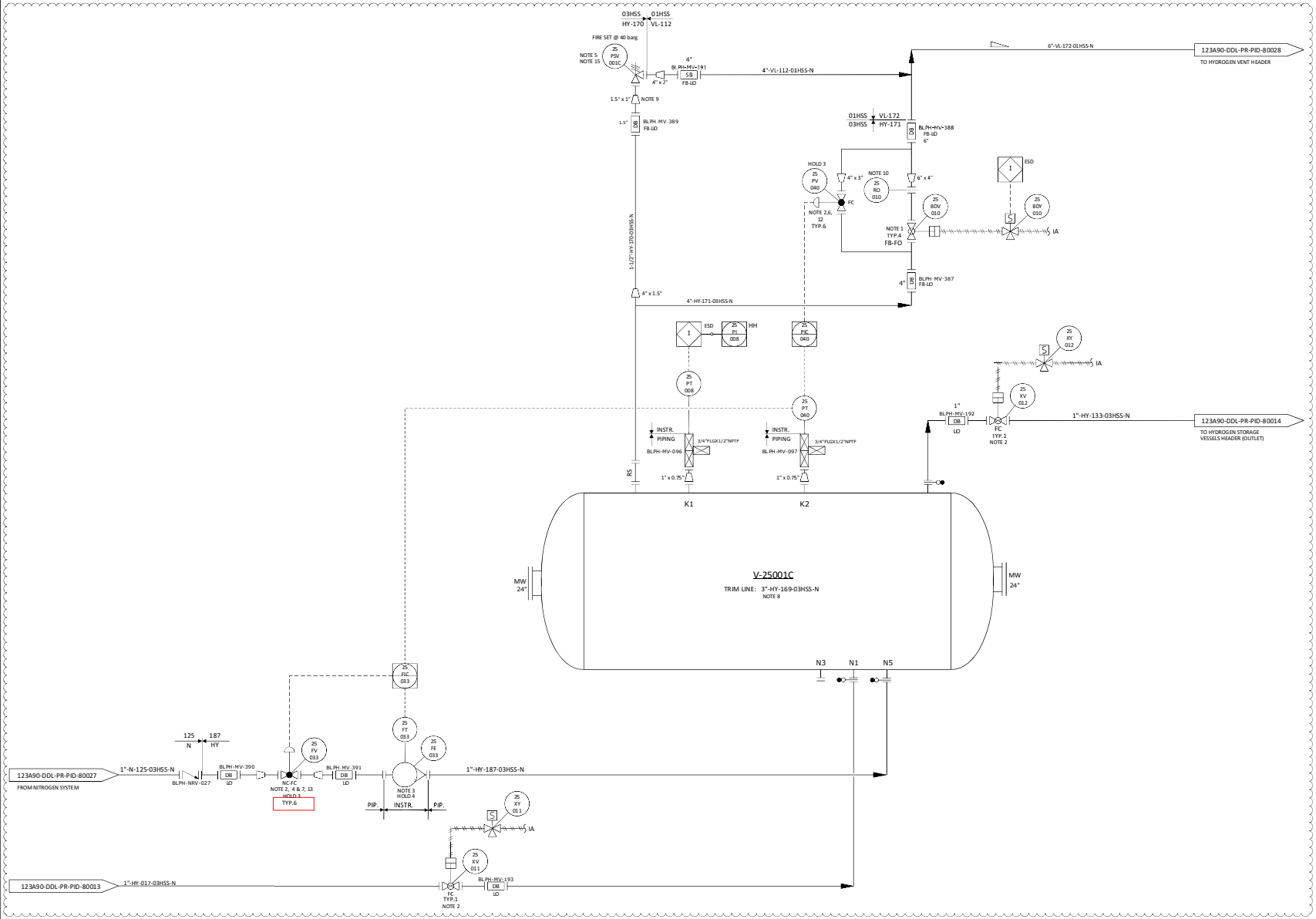
DRAWING NO. DRAWING_NO.

REV. REV.

V-25001_C

HYDROGEN STORAGE VESSEL

SIZE : 2800 mm (ID) X 15500 mm (L T/T)
DESIGN P/T : 40 barg / -10 / 80 °C
MATERIAL : CARBON STEEL
OPERATING P/T : 30 barg / AMB



01

NOTES

1. NECESSARY CONTROL SYSTEM SOFTWARE SHALL BE INCLUDED TO SUPPORT ADVACED VALVE CONTROL, PARTIAL STROKE TESTING AND DIAGNOSTICS FOR ANY SAFETY CRITICAL ON/OFF VALVES. THESE APPLICATION SHALL BE IDENTIFIED BY HAZOP AND LOPA EVALUATION IF PARTIAL STROKE TESTING WILL BE REQUIRED:
   THE "TYP. 3" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 2" FOR SDV
   THE "TYP. 5" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 4" FOR BDV
2. TIGHT SHUT OFF VALVE.
3. VARIABLE AREA FLOWMETER TO BE INSTALLED VERTICALLY WITH DIRECTION OF FLOW UPWARDS.
4. NITROGEN CONTROL VALVE (25-FV-001), CAN NOT OPEN UNTIL THE PRESSURE WITHIN THE VESSEL IS BELOW THE NITROGEN SUPPLY PRESSURE.
5. ONE COMMON UNINSTALLED SPARE PSV FOR ALL VESSELS.
6. FOR PULSE PRESSURE PURGING OF VESSEL WITH HYDROGEN.
7. FOR FLOW PURGING OF VESSEL WITH NITROGEN.

01

8. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 STORAGE, DOC. N. "123A90-DDL-MAC-DS-50027".
9. REDUCERS TO BE INSTALLED AS CLOSE TO PSV AS POSSIBLE.
10. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
11. NOZZLE N4 TO BE INSTALLED AT MINIMUM DISTANCE FROM TANGENT LINE OF THE VESSEL (ON THE OPPOSITE SIDE OF N5 NOZZLE).
12. SOFTWARE INTERLOCK TO PREVENT 25PV040 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION. CONTROL VALVE 25PV040 IS USED ONLY IN CASE OF VESSEL PURGING.
13. SOFTWARE INTERLOCK TO PREVENT 25FV033 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION
14. A TIMER ALARM ON THE H2 PRESSURIZATION SECTION OF THE PURGE CYCLE IN THE CONTROL LOGIC IS PROVIDED TO DETERMINE IF THE PURGE VALVE 25PV040 HAS FAILED TO CLOSE.
15. 25PSV001C SIZED FOR FIRE.

HOLDS

1. DELETED.
2. DELETED.

01

3. CONTROL VALVE SIZE (BY VENDOR).
4. MULTIVARIABLE FLOWMETERS REQUIRE 7 DIAMETERS STRAIGHT LENGHT UPSTREAM AND 5 DIAMETERS STRAIGHT LENGHT DOWNSTREAM (TO BE CONFIRMED BY VENDOR).

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSEL C

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE NTS
DRAWN	CHECKED	APPROVED	DATE
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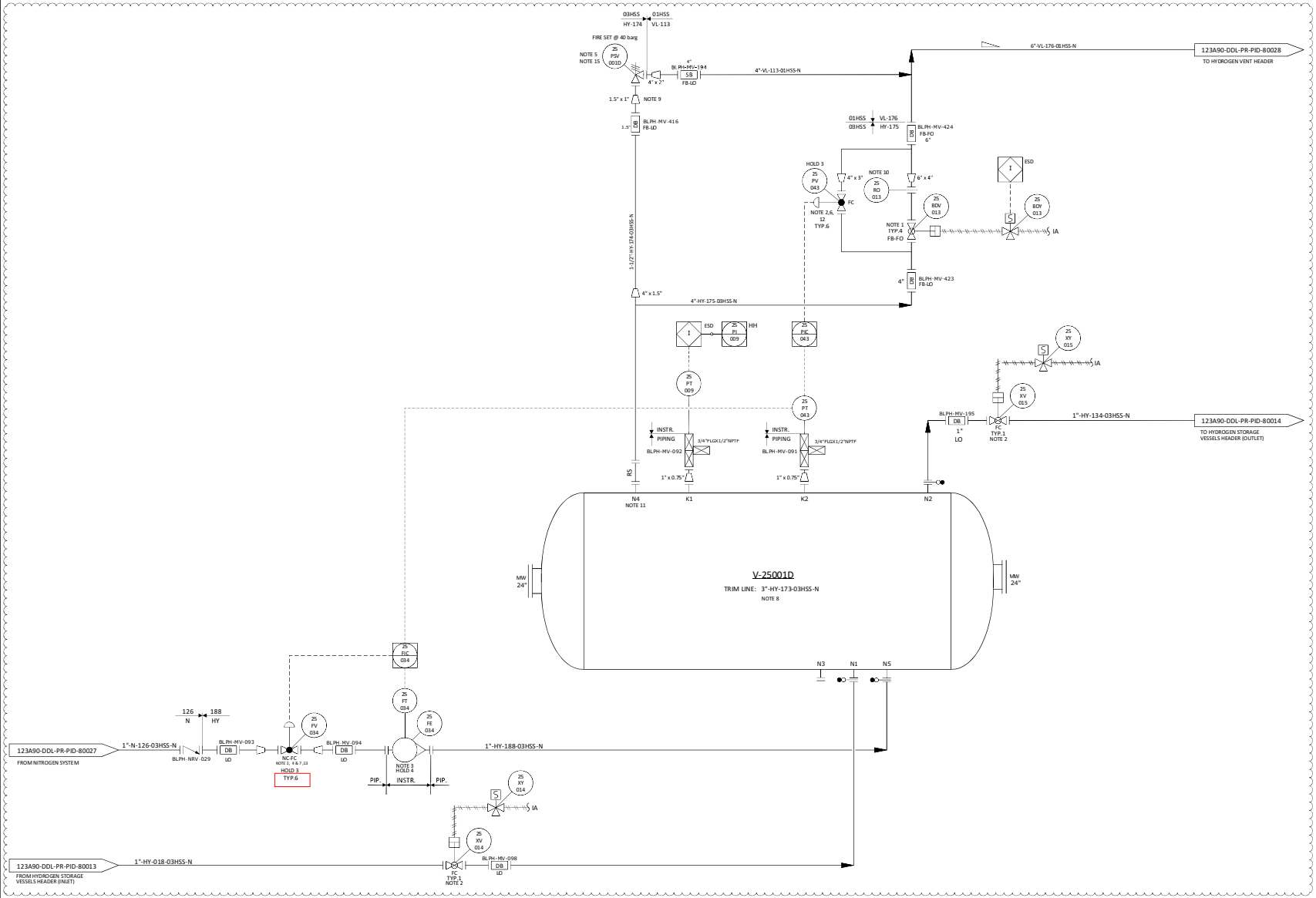
DRAWING NO. DRAWING_NO.

REV. REV.

V-25001_D

HYDROGEN STORAGE VESSEL

SIZE : 2800 mm (ID) X 15500 mm (L T/T)
DESIGN P/T : 40 barg / -10 / 80 °C
MATERIAL : CARBON STEEL
OPERATING P/T : 30 barg / AMB



NOTES

1. NECESSARY CONTROL SYSTEM SOFTWARE SHALL BE INCLUDED TO SUPPORT ADVACED VALVE CONTROL, PARTIAL STROKE TESTING AND DIAGNOSTICS FOR ENY SAFETY CRITICAL ON/OFF VALVES. THESE APPLICATION SHALL BE IDENTIFIED BY HAZOP AND LAPA EVALUATION IF PARTIAL STROKE TESTING WILL BE REQUIRED:
   THE "TYP. 3" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 2" FOR SDV
   THE "TYP. 5" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 4" FOR BDV
2. TIGHT SHUT OFF VALVE.
3. VARIABLE AREA FLOWMETER TO BE INSTALLED VERTICALLY WITH DIRECTION OF FLOW UPWARDS.
4. NITROGEN CONTROL VALVE (25-FV-001), CAN NOT OPEN UNTIL THE PRESSURE WITHIN THE VESSEL IS BELOW THE NITROGEN SUPPLY PRESSURE.
5. ONE COMMON UNINSTALLED SPARE PSV FOR ALL VESSELS.
6. FOR PULSE PRESSURE PURGING OF VESSEL WITH HYDROGEN.
7. FOR FLOW PURGING OF VESSEL WITH NITROGEN. 01
8. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 STORAGE, DOC. N. "123A90-DDL-MAC-DS-50027".
9. REDUCERS TO BE INSTALLED AS CLOSE TO PSV AS POSSIBLE.
10. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
11. NOZZLE N4 TO BE INSTALLED AT MINIMUM DISTANCE FROM TANGENT LINE OF THE VESSEL (ON THE OPPOSITE SIDE OF N5 NOZZLE).
12. SOFTWARE INTERLOCK TO PREVENT 25PV043 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION. CONTROL VALVE 25PV043 IS USED ONLY IN CASE OF VESSEL PURGING
13. SOFTWARE INTERLOCK TO PREVENT 25FV034 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION
14. A TIMER ALARM ON THE H2 PRESSURIZATION SECTION OF THE PURGE CYCLE IN THE CONTROL LOGIC IS PROVIDED TO DETERMINE IF THE PURGE VALVE 25PV043 HAS FAILED TO CLOSE.
15. 25PSV001D SIZED FOR FIRE.

HOLDS

1. DELETED.
2. DELETED. 01
3. CONTROL VALVE SIZE (BY VENDOR).
4. MULTIVARIABLE FLOWMETERS REQUIRE 7 DIAMETERS STRAIGHT LENGHT UPSTREAM AND 5 DIAMETERS STRAIGHT LENGHT DOWNSTREAM (TO BE CONFIRMED BY VENDOR).

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSEL D

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
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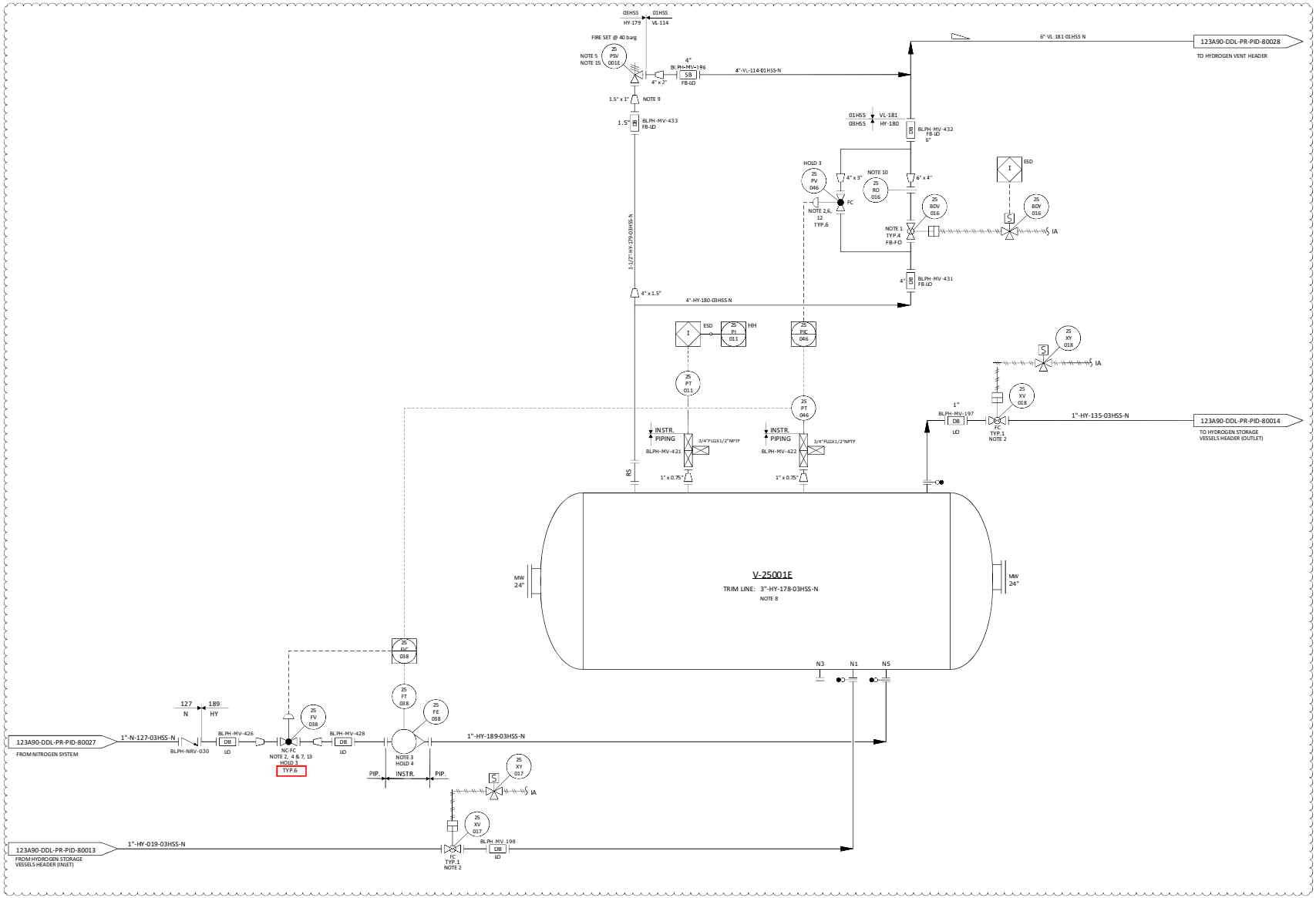
DRAWING NO. DRAWING_NO.

REV. REV.

V-25001_E

HYDROGEN STORAGE VESSEL

SIZE : 2800 mm (ID) X 15500 mm (L T/T)
DESIGN P/T : 40 barg / -10 / 80 °C
MATERIAL : CARBON STEEL
OPERATING P/T : 30 barg / AMB



NOTES

1. NECESSARY CONTROL SYSTEM SOFTWARE SHALL BE INCLUDED TO SUPPORT ADVACED VALVE CONTROL, PARTIAL STROKE TESTING AND DIAGNOSTICS FOR ENY SAFETY CRITICAL ON/OFF VALVES. THESE APPLICATION SHALL BE IDENTIFIED BY HAZOP AND LAPA EVALUATION IF PARTIAL STROKE TESTING WILL BE REQUIRED:
   THE "TYP. 3" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 2" FOR SDV
   THE "TYP. 5" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 4" FOR BDV
2. TIGHT SHUT OFF VALVE.
3. VARIABLE AREA FLOWMETER TO BE INSTALLED VERTICALLY WITH DIRECTION OF FLOW UPWARDS.
4. NITROGEN CONTROL VALVE (25-FV-001), CAN NOT OPEN UNTIL THE PRESSURE WITHIN THE VESSEL IS BELOW THE NITROGEN SUPPLY PRESSURE.
5. ONE COMMON UNINSTALLED SPARE PSV FOR ALL VESSELS.
6. FOR PULSE PRESSURE PURGING OF VESSEL WITH HYDROGEN.
7. FOR FLOW PURGING OF VESSEL WITH NITROGEN. 01
8. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 STORAGE, DOC. N. "123A90-DDL-MAC-DS-50027".
9. REDUCERS TO BE INSTALLED AS CLOSE TO PSV AS POSSIBLE.
10. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
11. NOZZLE N4 TO BE INSTALLED AT MINIMUM DISTANCE FROM TANGENT LINE OF THE VESSEL (ON THE OPPOSITE SIDE OF N5 NOZZLE).
12. SOFTWARE INTERLOCK TO PREVENT 25PV046 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION. CONTROL VALVE 25PV046 IS USED ONLY IN CASE OF VESSEL PURGING
13. SOFTWARE INTERLOCK TO PREVENT 25FV038 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION
14. A TIMER ALARM ON THE H2 PRESSURIZATION SECTION OF THE PURGE CYCLE IN THE CONTROL LOGIC IS PROVIDED TO DETERMINE IF THE PURGE VALVE 25PV046 HAS FAILED TO CLOSE.
15. 25PSV001E SIZED FOR FIRE.

HOLDS

1. DELETED. 01
2. DELETED.
3. CONTROL VALVE SIZE (BY VENDOR).
4. MULTIVARIABLE FLOWMETERS REQUIRE 7 DIAMETERS STRAIGHT LENGHT UPSTREAM AND 5 DIAMETERS STRAIGHT LENGHT DOWNSTREAM (TO BE CONFIRMED BY VENDOR).

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSEL E

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80019		SHEET 001	REV. 01

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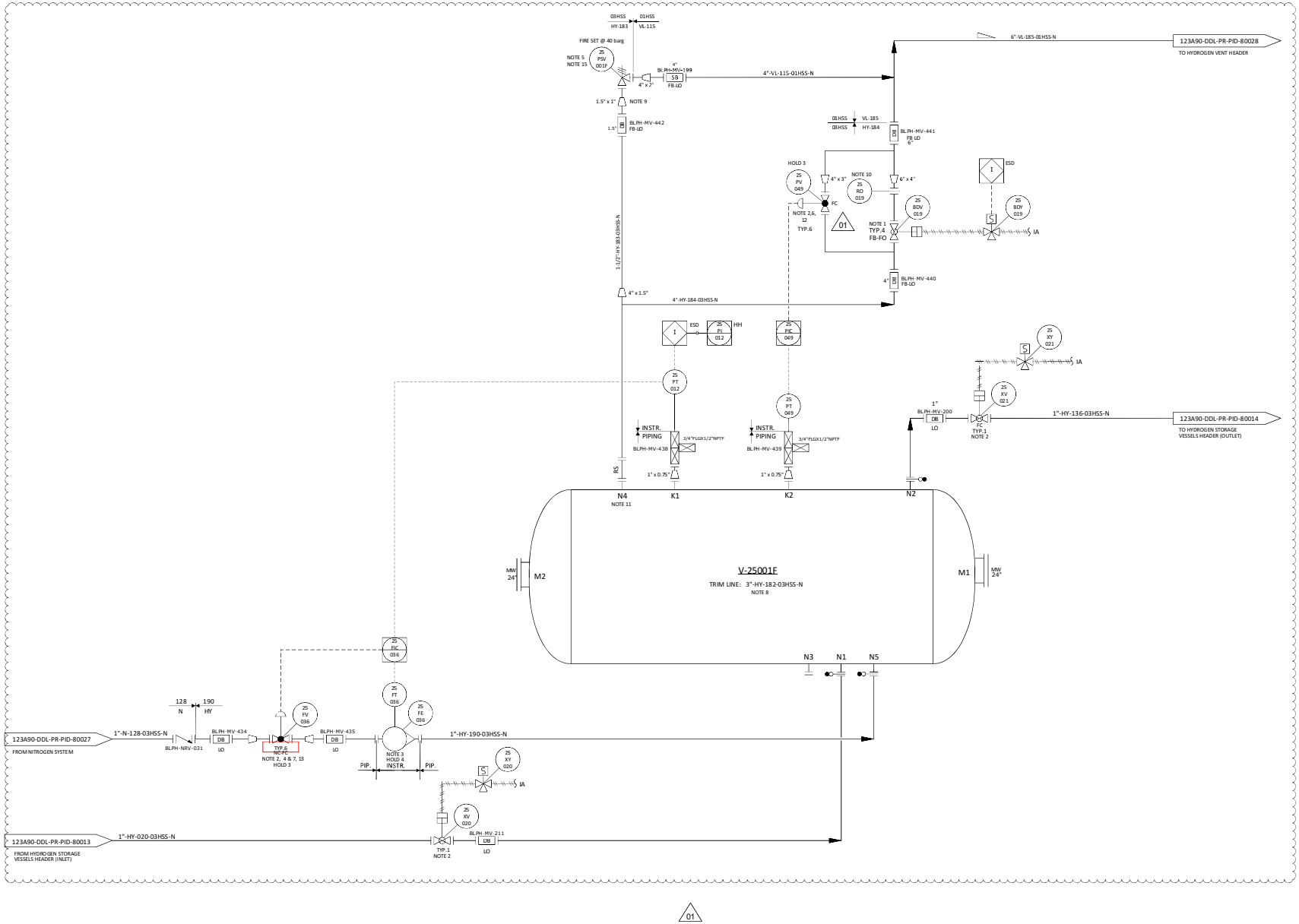
DRAWING NO. DRAWING_NO.

REV. REV.

V-25001_F

HYDROGEN STORAGE VESSEL

SIZE : 2800 mm (ID) X 15500 mm (L T/T)
DESIGN P/T : 40 barg / -10 / 80 °C
MATERIAL : CARBON STEEL
OPERATING P/T : 30 barg / AMB



NOTES

1. NECESSARY CONTROL SYSTEM SOFTWARE SHALL BE INCLUDED TO SUPPORT ADVACED VALVE CONTROL, PARTIAL STROKE TESTING AND DIAGNOSTICS FOR ENY SAFETY CRITICAL ON/OFF VALVES. THESE APPLICATION SHALL BE IDENTIFIED BY HAZOP AND LAPA EVALUATION IF PARTIAL STROKE TESTING WILL BE REQUIRED:
   THE "TYP. 3" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 2" FOR SDV
   THE "TYP. 5" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 4" FOR BDV
2. TIGHT SHUT OFF VALVE.
3. VARIABLE AREA FLOWMETER TO BE INSTALLED VERTICALLY WITH DIRECTION OF FLOW UPWARDS.
4. NITROGEN CONTROL VALVE (25-FV-001), CAN NOT OPEN UNTIL THE PRESSURE WITHIN THE VESSEL IS BELOW THE NITROGEN SUPPLY PRESSURE.
5. ONE COMMON UNINSTALLED SPARE PSV FOR ALL VESSELS.
6. FOR PULSE PRESSURE PURGING OF VESSEL WITH HYDROGEN.
7. FOR FLOW PURGING OF VESSEL WITH NITROGEN. 01
8. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 STORAGE, DOC. N. "123A90-DDL-MAC-DS-50027.
9. REDUCERS TO BE INSTALLED AS CLOSE TO PSV AS POSSIBLE.
10. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
11. NOZZLE N4 TO BE INSTALLED AT MINIMUM DISTANCE FROM TANGENT LINE OF THE VESSEL (ON THE OPPOSITE SIDE OF N5 NOZZLE).
12. SOFTWARE INTERLOCK TO PREVENT 25PV049 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION. CONTROL VALVE 25PV049 IS USED ONLY IN CASE OF VESSEL PURGING.
13. SOFTWARE INTERLOCK TO PREVENT 25FV036 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION
14. A TIMER ALARM ON THE H2 PRESSURIZATION SECTION OF THE PURGE CYCLE IN THE CONTROL LOGIC IS PROVIDED TO DETERMINE IF THE PURGE VALVE 25PV049 HAS FAILED TO CLOSE.
15. 25PSV001F SIZED FOR FIRE.

HOLDS

1. DELETED. 01
2. DELETED.
3. CONTROL VALVE SIZE (BY VENDOR).
4. MULTIVARIABLE FLOWMETERS REQUIRE 7 DIAMETERS STRAIGHT LENGHT UPSTREAM AND 5 DIAMETERS STRAIGHT LENGHT DOWNSTREAM (TO BE CONFIRMED BY VENDOR).

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR HAZOP (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSEL F

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80020		SHEET 001	REV. 00

File Name : FILE_NAME

CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #20 123A90-DDL-SAF-RE-30006
Item No.	#20
Causes	3.1.17. BLPH-MV-492 SB Left in closed position on Downstream line 3.1.18. Blockage in line within Fuel Cell Package, considered to be failure to reopen main isolation valve following maintenance.
Consequences	3.1.17.1. Upstream: Potential overpressure of pipework downstream of 25PV025A/B. LOPC of H2 and potential explosion on ignition. Not included in recommendation 21/22 for LOPA as the likelihood of this cause will not be significant. 3.1.18.1. Upstream: Potential overpressure of pipework downstream of 25PV025A/B. LOPC of H2 and potential explosion on ignition.
Recommendation	20.Ensure that 80PSV001 is verified for blocked discharge downstream of 25PV025A/B during fuel cell operation. No consideration is made of advantageous control from 25PCV025A/B as per Shell rule set.
Actions	
Issue Date (01-12-2023)	
Action Response	As per "Relief, Vent and Blowdown Report" doc. n. "123A90-DDL-PR-RE-80030" revision 01, it is confirmed that the 80PSV001 has been verified for blocked discharge downstream of 25PV025A/B during fuel cell operation. See Section 3.3 of the above mentioned document, attached to this Action.

Approvals / Endorsements

EPC Discipline Lead	Ciro Impradice	**Sign**
C.Impradice	13/03/2024	
EPC HSE LEAD		**Sign**
C.Caracciolo	13/03/2024	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**

Base Load Power Hub (BLPH)

Relief, Vent and Blowdown Report

Document Number: 123A90-DDL-PR-RE-80030

Document Class: 1

01	05/02/2024	Accepted for Construction (AFC)	CIM	RZI	DLO
00	04/12/2023	Issue for Acceptance (IFA)	CIM	RZI	DLO
Rev.	Date	Description	Prepared	Reviewed	Approved

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Revision / Change Log

Rev.	Description
00	Issue for Acceptance (IFA)
01	Accepted for Construction (AFC)

HOLDS LIST

No.	Description
HOLD1	"Deleted"
HOLD2	"Deleted"
HOLD3	"Deleted"
HOLD4	"Deleted"

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3.3 PSV CALCULATION SUMMARY

The following table summarizes applicable scenarios and sizing results of each PSV, the detailed calculation are shown through the Appendix 01 Section.6.1:

PSV TAG	PID n°	Type	Set P (barg)	Case	Calc. load (kg/h)	Rated Flow (kg/h)	PSV size
25-PSV-001A to F (*)	123A90-DDL-PR-PID-80015 to PID-80020	Conventional	40	Fire	627	1067	1E2 300lbX150lb
80-PSV-001	123A90-DDL-PR-PID-80012	Conventional	10	Bloc.disch	106	185	1D2 150lbX150lb
				CV fail	2679	3095	3K4 150lbX150lb
64-PSV-001	123A90-DDL-PR-PID-80027	Conventional	10	Bloc.disch	61.4	690.4	1D2 150lbX150lb
				Reverse flow (H2 from vessel)	23.8	185	1D2 150lbX150lb

Table 4 – PSV calculation summary

(*) The PSV set pressure is reached only after 4.4 minutes and after that time the PSV valve starts to discharge at a pressure slightly above the set pressure value (~44 bara) as shown along the below APPENDIX 01 – PSV CALCULATION SHEETS.

See APPENDIX 01 – PSV CALCULATION SHEETS

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CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #22 123A90-DDL-SAF-RE-30006
Item No.	#22
Causes	3.2.5. 25PIC025A/B control failure opening 25PV025A/B 3.1.18. Blockage in line within Fuel Cell Package, considered to be failure to reopen main isolation valve following maintenance 1.2.4. 25XV006 Driven open/inadvertently opened by operator
Consequences	3.2.5.1. Potential overpressure of pipework downstream of 25PV025A/B. LOPC of H2 and potential explosion on ignition. 1.2.4.1. Pressurise downstream system to 25PV025A/B up to 30barg. Potential to exceed design pressure (3 times design pressure) downstream of 25PV025A/B, LOPC of H2 and explosion on ignition. 25PV025A/B are downstream pressure controlled and are potentially opened when fuel cell is not online."
Recommendation	22. Review the required response time (PST) of 80PSV001 to ensure that it is able to react and depressurise the system quickly enough to prevent overpressure of the pipework and Fuel Cell if 25PCV025A/B are fully opened. Consider the opening times of storage vessels outlet XVs, e.g. 25XV006 and 25PV025A/B. .If PSV reaction time criteria cannot be met LOPA for 25PI002 must be reviewed.
Actions	Pressurization calculation of the inventory downstream the control valves 25PV055A/B have been performed to calculate the time for the system to reaches the transient pressure acceptable to Fuel Cell in the event of the 80PSV001 lifting. As it can be seen from the "ATTACHMENT 1 - CALCULATION SHEET", the time to reach such transient pressure is higher then the time for the 80PSV001 to fully open (100%). The calculation is based on information presented in Attachment 2, 3, 4 & 5. Therefore: 1) With the two conservative assumptions made on the attachment 1 and; 2) Considering that the time (102 msec) to reach 13.5 barg (Fuel Cell design pressure) is higher then the 80PSV001 valve opening time (≤ 100 msec), the 80PSV001 is able to react and depressurise the system quickly enough to prevent overpressure of the Fuel Cell Package A-80000.
Assigned Respondent (By)	Rosetti/Crosswind (Interface)
Issue Date(01-12-2023)	
Action Response	

Approvals / Endorsements

EPC Discipline Lead / Crosswind		**Sign**
C.Impradice (Rosetti) / Hamant Patel (Crosswind)		
EPC HSE LEAD		**Sign**
C.Caracciolo		**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**
		Digitaal ondertekend door Paul van Rossum Datum: 2024.08.21 08:39:17 +02'00'

CALCULATION SHEET - ATTACHMENT 1

		Lines			
		2"-HY-023-01HSS-N	4"-HY-152-01HSS-N	1"-HY-163-01HSS-N	UoM
3	ID pipe	0.055	0.108	0.027	m
4	Pipe length	21.2	11.7	25.2	m
5	Pipe volume	0.05	0.11	0.01	m3
6	Volume beetwen 25PV055A/B and FC inlet (TP010)	0.172			m3
7					
8	Temperature	25.0			°C
9	80PSV001 set pressure	10.0			barg
10	H2 density @PSV set	0.895			kg/m3
11	H2 mass @PSV set (t1 = 0 sec)	0.153			kg
12	FC design pressure (Note3)	13.5			barg
13	H2 density @ FC design P	1.179			kg/m3
14	H2 mass @ FC design P	0.202			kg
15	Delta mass between PSV set point and FC design P	0.049			kg
16	Number of control valves considered fully open (Note4)	1			-
17	Max H2 flow rate through one control valves (Note1)	1725.0			kg/hr
18	Max H2 flow rate through fully open control valve(s)	1725.0			kg/hr
19	Time, t2	**102**			msec
20					
21					

NOTES:

Note1: max H2 flow rate through one control valve calculated considering 100% valve open and corresponding CV of 13 (**Ref.[1]**)

Note2: as per 80PSV001 Vendor information, valve opening time ≤ 100 msec (t1), (**Ref.[4]**).

Note3: as per TQ doc. n. "CWHKN-INN-BPH-TQ-00053" (**Ref.[2]**), the transient pressure acceptable to Fuel Cell in the event of PSV lifting, is <=13.5 barg

Note4: According to note 7 of PID 123A90-DDL-PR-PID-80014_01, only one control valve is considered fully open. Note7 says (see **Ref.[3]**):
"*HS INCLUDES SOFTWARE INTERLOCK TO PREVENT BOTH VALVES TO BE ONLINE SIMULTANEOUSLY.*
SOFTWARE INTERLOCK PREVENTS VALVE 25PV055B TO OPEN IF VALVE 25PV055A IS NOT CLOSED "
This reduces the possibility of having both control valves fully opened at the same time.

CONSERVATIVE ASSUMPTIONS:

a) Gas flow through the 80PSV001 is considered to be zero, but i reality at the time of reaching PSV set pressure there will be gas outgoing from the pressurized system. This means that after t2 msec the pressure inside the system is still below the "FC design pressure" of 13.5 barg.

b) Available piping volume within the FC system is considered to be zero, this is conservative from time calculation point of view since the higher volume is the higher is the time to pressurize the system

REFERENCE DOCUMENTS

Attachment 2 - Ref.[1]: 1724000740-IN-DS-00003, SIZING CALCULATION SHEET (INCLUDING NOISE LEVEL DATA SHEETS, CONTROL VALVE CURVES)

Attachment 3 - Ref.[2]: CWHKN-INN-BPH-TQ-00053, Design of Hydrogen Supply Pressure Control Valves 25-PV-055 A B

Attachment 4 - Ref.[3]: 123A90-DDL-PR-PID-80014, BLPH PIPING AND INSTRUMENTATION DIAGRAM HYDROGEN STORAGE VESSELS HEADER (OUTLET)

Attachment 5 - Ref.[4]: 1724000518-IN-DS-00004, INSTRUMENTS DATA SHEETS PSV (INCLUDING SIZING CALCULATION SHEETS)

Base Load Power Hub (BLPH)

SIZING CALCULATION SHEET (INCLUDING NOISE LEVEL DATA SHEETS, CONTROL VALVE CURVES)

Document Number: 1724000740-IN-DS-00003

Document Class: 2

00	27/05/2024	Issue for Review (IFR)	AT	AP	AP
Rev.	Date	Description	Prepared	Reviewed	Approved

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CALCULATION FORM FOR CONTROL VALVES

Customer	ROSETTI MARINO SPA	QUOTE	CV2400221
Order	1724000740 123A90A	Sheet	13
Plant		Created By	RC

PIPELINE DATA

	INLET	OUTLET
Nominal diameter	1 1/2"	1 1/2"
Schedule	40	40
External Diameter, mm	48,30	48,30
Internal Diameter, mm	40,9	40,9
Thickness, mm	3,7	3,7

VALVE DATA

Valve TAG	25-PV-055A
Serial AST	
AST Ref.	130
Upstream Fluid State	GAS

VALVE DATA: BODY

Valve Family	CV-8400
Valve Model	CV-8407
Valve Description	Globe - Straigth way - Contoured Plug
Unit	NPS
Body Size	1 1/2"
Fluid	HYDROGEN

VALVE DATA: TRIM

Trim Configuration	CP-E
Stroke, mm	20
Port Size, Inch	1"
Flow Characteristic	Equal%
Flow Action	FTO
Selected Flow Coefficient	13

PROCESS DATA

		Units	#1	#2	#3	#4	NOTES
Fluid	-	-	GAS	GAS			
Flow Rate	Q/W	kg/h	106,00	106,00			
Inlet Temperature	T1	°C	15,00	15,00			
Inlet Pressure	P1	bar (g)	30,000	4,500			
Outlet Pressure	P2		3,500	3,500			
Differential Pressure	ΔP	-	26,500	1,000			
Fluid density at P1 and T1	ρ1	kg/m³	2,563	0,456			
Dynamic Viscosity	μ	cP					
Molecular Weight	MW	kg/kmol	2,000	2,000			
Specific Heat Ratio (cp/cv)	γ	-	1,420	1,420			
Compressibility Factor	Z	-	1,010	1,010			
Critical Pressure	Pcrit	bar (A)					
Vapor pressure	Pvap	bar (A)					
Calculated Flow Coefficient	**C**	-	**0,7563**	**6,271**			
Selected Flow Coefficient	**Cv**	-	13	13			
Calculated / Selected	C/Cv	%	5,817	48,24			
Pressure Recovery Factor	F_L	-	0,9345	0,919			
Valve Style Modifier	F_d	-	0,07612	0,2445			
Pressure Differential Ratio Factor	X_T	-	0,7336	0,7097			
Stroke %		**%**	**32,7**	**82,4**			
Predicted Noise SPL	-	dB	84,95	76,25			
Valve Outlet Velocity	v2	m/s	59,96	59,96			
Valve Outlet Mach Number	M2	-	0,04597	0,04597			
Downstream Pipe Fluid Velocity	vP2	m/s	59,96	59,96			
Flow Regime	-	-	Choked	Normal			
Upstream Fluid State	-	-	Gaseous	Gaseous			
Downstream Fluid State	-	-	Gaseous	Gaseous			

NOTES

	Rev.	Date	Reason For Issue	EM / CK / APP
Rev Index.	0			RC / RC / RC

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CROSSWIND

TECHNICAL QUERY
Hollandse Kust Noord

No. TQ :	CW-ROS-TQ-0016	Rev:	1

Originating Party	CrossWind					
Subject	Design of Hydrogen Supply Pressure Control Valves : 25-PV-055 A/B					
Author	Paul Kyle	TQ Aconex unique number: CWHKN-INN-BPH-TQ-00053				
Interface TQ - from	Rosetti	TQ interface source Aconex unique number:				
Type	Query			Interface		X
	Deviation			Derogation (SHALL[PS])		
	Note: No deviations nor derogations which have an adverse effect on HSSE will be granted					
Work package						
Area(s) of application	Design & Eng.	X	Procurement		Construction	
	Commissioning		Operations	X	Other	
Issue date	20-05-2024		Urgent reply 5 days	X	Routine reply 10 days	
Close-out date						
Closed-out by			TQ status:		Open	

1. Description

Reference documents / Aconex unique numbers :

Ref.: Ballard, “Fuel Cell Package Hydrogen Usage and Fuel Cell Module Alarm Limits”, Rev.001, 24/04/2024

HydrogenFlowRates rev1.pdf

Contractor kindly asks RM to consider the below data to design the H2 control system upstream of the fuel cell interface:

- Normal Hydrogen Storage Vessel Pressure (i.e. upstream pressure): 30 barg to 5 barg.
  - Extreme pressure expected, upstream of the PVs, will be High High Pressure Alarm Point.
- Normal Hydrogen supply temperature (ambient temperatures): -8.4 ºC to 25 ºC.
- Hydrogen Supply flow range: 0.9 g/s (3.24 kg/hr) to 29.4 g/s (105.84 kg/hr).
- Hydrogen supply pressure to Fuel Cell: 4 barg to 6.5 barg.
- Normal supply pressure to be controlled at 6 barg.
- PSV (80-PSV-001) set point is 10 barg.
- Transient pressure acceptable to Fuel Cell in the event of PSV lifting, is <=13.5 barg.

Other Parameter that should be considered in determining the control response are the below Hydrogen Consumption scenarios (Ref.: Ballard, “Fuel Cell Package Hydrogen Usage and Fuel Cell Module Alarm Limits”, Rev.001, 24/04/2024):

This communication is issued for the recipient’s information and to facilitate the obligations of the Parties under the Contract. This communication has no authority to amend or vary the Contract nor relieve either Party of any duties, obligations or responsibilities.

Scenario	Fuel Cell Modules	Description	Hydrogen Usage Initial [g/s]	Hydrogen Flowrate After [g/s]	Duration of change [s]
Startup	1	A single fuel cell module start up	0	0.9	3
Startup	3	Half (3) of the fuel cell module start up	0	2.7	3
Startup	6	All (6) of the fuel cell module start up	0	5.4	3
Ramp-up	1	Single module ramps from idle to full power	0.9	3.6	18
Ramp-up	3	Half (3) module ramps from idle to full power	2.7	10.8	18
Ramp-up	6	All (6) module ramps from idle to full power	5.4	21.6	18
Stopdown	1	A single fuel cell module performs a controlled stop	4.9 (worst) 3.9 (expected)	0	15
Stopdown	3	Half (3) fuel cell module performs a controlled stop	14.9 (worst) 10.8 (expected)	0	15
Stopdown	6	All (6) fuel cell module performs a controlled stop	29.4 (worst) 23.4 (expected)	0	15
ESD	1	A single fuel cell module performs an emergency stop	4.9 (worst) 3.6 (expected)	0	0.02 (20 ms)
ESD	6	All fuel cell modules perform an emergency stop	29.4 (worst) 23.4 (expected)	0	0.02 (20 ms)

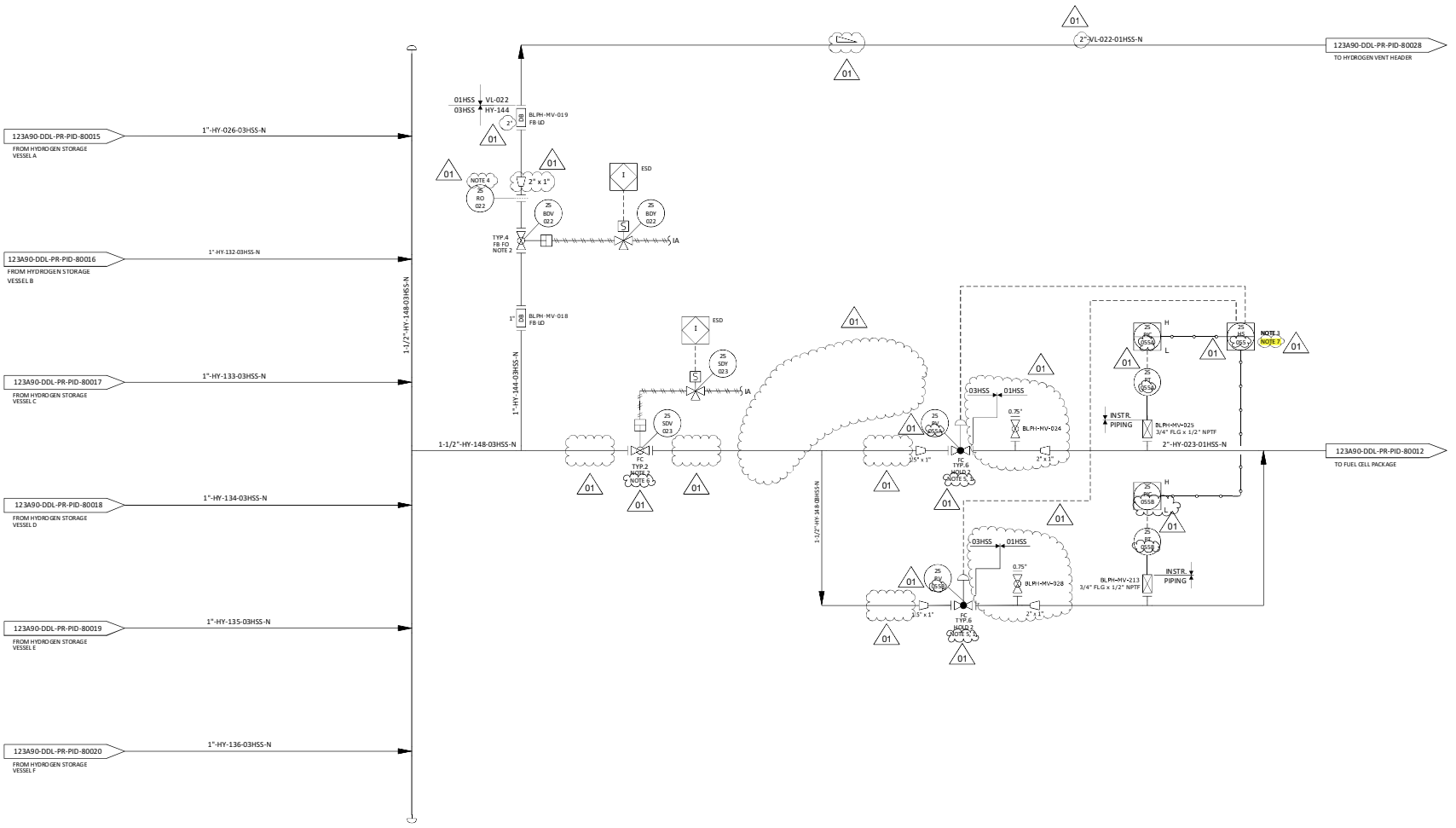
2. Response

Reference documents / Aconex unique numbers

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DRAWING NO. DRAWING_NO.

REV. REV.



NOTES

1. DELETED.
2. NECESSARY CONTROL SYSTEM SOFTWARE SHALL BE INCLUDED TO SUPPORT ADVACED VALVE CONTROL, PARTIAL STROKE TESTING AND DIAGNOSTICS FOR ANY SAFETY CRITICAL ON/OFF VALVES. THESE APPLICATION SHALL BE IDENTIFIED BY HAZOP AND LOPA EVALUATION IF PARTIAL STROKE TESTING WILL BE REQUIRED:
   THE "TYP. 3" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 2" FOR SDV
   THE "TYP. 5" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 4" FOR BDV
3. HAND SELECTOR TO ALLOW THE OPERATOR TO SELECT THE CONTROL LOOP (REMOTELY).
4. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
5. SOFTWARE INTERLOCK PREVENTS OPENING OF THE CONTROL VALVES 25-PV-055A/B IN CASE FUEL CELL PACKAGE (A-80000) IS NOT RUNNING.
6. SDV VALVE 25-SDV-023 TO BE INSTALLED AS CLOSE AS POSSIBLE TO THE CONTROL VALVES 25-PV-055A/B.
7. HS INCLUDES SOFTWARE INTERLOCK TO PREVENT BOTH VALVES TO BE ONLINE SIMULTANEOUSLY. SOFTWARE INTERLOCK PREVENTS VALVE 25PV055B TO OPEN IF VALVE 25PV055A IS NOT CLOSED.

01

HOLDS

1. DELETED.
2. CONTROL VALVE SIZE (BY VENDOR).

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSELS HEADER (OUTLET)

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80014		SHEET 001	REV. 01

File Name : FILE_NAME

Base Load Power Hub (BLPH)

INSTRUMENTS DATA SHEETS PSV (INCLUDING SIZING CALCULATION SHEETS)

Document Number: 1724000518-IN-DS-00004

Document Class: 2

02	29/05/2024	Issue for Review (IFR)	Di Virgilio L.	Delponte P.L.	Bianchi R.
01	11/04/2024	Issue for Review (IFR)	Di Virgilio L.	Delponte P.L.	Bianchi R.
00	22/03/2024	Issue for Review (IFR)	Di Virgilio L.	Delponte P.L.	Bianchi R.
Rev.	Date	Description	Prepared	Reviewed	Approved

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SAFETY VALVE
SIZING SHEET

GENERAL INFO

1	TECHNICAL Ref. / Item	23-3962 / 10	4	Project	HOLLANDSE KUST NOORD WIND PARK	ROSETTI MARINO SPA	
2	Valve Code	320-K10-5L	5	Quantity	2		
3	Tag Number	80-PSV-001 + 80-PSV-001_S					

DESIGN DATA

6	Operating Pressure	6,5	bar g	10	Operating Temperature	25	ºC		
7	Ambient Pressure	1,013	bar a	11	Sizing Code	API Std 520			
8	Basis	Upstream fail open		12	Fire Case	No			
9	Governing Case	Yes		13	Rupture Disc	No			

INSTALLATION DATA

14	Inlet	3" 150# RF		22	Outlet	4" 150# RF			
15	**Valve Model**	**30000**		23	Valve Type	CONVENTIONAL			
16	Superimposed Bkp			24	Seat Type	METAL-TO-METAL			
17	Constant	Pbcs	0 bar g	25	Set Pressure	Ps	10,000	bar g	
18	Variable	Pbvs	0 bar g	26	CDTP		10,000	bar g	
19	Total	Pbs	0 bar g	27	Overpressure	Overp	10	%	
20	Built-up Backpressure	Pbb	0,17 bar g	28	Relieving Temperature	T_0	25,0	ºC	
21	Total BackPressure	Pb	0,17 bar g	29	Required Flow Rate	W	2678,00	kg/h	

FLUID PROPERTIES

30	Phase	GAS		35	Density	ρ	-	kg/m3	
31	Medium	Hydrogen		36	Specific Volume	v	-	m3/kg	
32	Ratio of Specific Heats	k	1,405 -	37	Specific Gravity	G	-	-	
33	Molecular Weight	M	2,02 kg/kmol	38	Dynamic Viscosity	μ	0,008754	cP	
34	Compressibility Factor	Z	1,004 -	39	Dryness Steam Factor	x0	-	-	

SIZING — CRITICAL FLOW - GAS&VAPOURS - API 520

40	Critical / Subcritical Flow		CRITICAL	
41	Relieving Pressure	P_0	12,013	bar a
42	C Factor	C	2,7066	-
43	Discharge Coefficient	K_D	**0,940**	-
44	Backpressure Corr. Factor	K_{BP}	1	-
45	Subcritical Corr. Factor	Kb	-	-
46	Rupture Disk Corr. Factor	K_C	1	-
47	Steam Correction Factor EN	ks	-	-
48	Superheat Corr. Factor	ksh	-	-
49	Supercritical Corr. Factor	ksc	-	-
50	Napier Factor	kn	-	-
51	Viscosity Corr. Factor	K_V	-	-
52	Reynolds Number	Re	-	-
53	Calculated Area	A	11,8631	cm²
54	Orifice Designation	-	**K**	-
55	Selected Area	A_S	**12,940**	cm²
56	Area Gain	-	9	%
57	Maximum Flow Rate	W_T	2921,12	kg/h
58				

$$A = \frac{W}{0{,}9\ C\ P_0\ K_D K_{BP} K_C}\sqrt{\frac{Z T_0}{M}}$$

$$C = 3{,}948\sqrt{k\left(\frac{2}{k+1}\right)^{\frac{(k+1)}{(k-1)}}}$$

$$W_T = \frac{W\ \ As}{A}$$

Units of measure
A [mm^2]; W [kg/h]; P [kPa]; T [K]; M [kg/kg mole]

REACTION FORCE — API 520 PART II — OPEN DISCHARGE TO ATMOSPHERE

59	Reaction force (Flow)	FF	1081	N
60	Reaction force (Static Bkp)	FB	133	N
61	Total Reaction Force	FT	1215	N

$$F_F = \frac{129 W_{MAX}}{0{,}9 * 3600}\sqrt{\frac{k\ T_0}{(k+1)M}}\ ;\ F_B = \frac{A_2 P_b}{10}\ ;\ F_T = F_F + F_B$$

NOISE EVALUATION — API 521 — Not Applicable for Liquid

62	Noise Level @ 30m	L30	116,6	dB
63	Distance d	d	1	m
64	Outlet Tube Diameter	da	0,1	m
65	Noise Level @ distance d	Ld	146,2	dB

$$L_{30} = L + 10 log_{10}\left(\frac{W_{M-MAX}\ c^2}{3600 * 0{,}9 * 2}\right);\ c = 91{,}2\left(\frac{k\ T_0}{M}\right)^{0{,}5}$$

$$L_p = L_{30} - 20 log_{10}\left(\frac{d}{30}\right)$$

REMARKS: Process data are under customer responsibility.

Testing according to Doc. 1724000518-QC-ITP-00002

Valve opening time ≤ 100 msec

REV	DATE	DESCRIPTION	PREP.	CHECK.	APPROV.
2	29/05/2024	ADD. VALVE	TCH	L. DI VIRGILIO	P.L.DELPONTE
1	11/04/2024	MOD. PAINTING SYSTEM	TCH	L. DI VIRGILIO	P.L.DELPONTE
0	18/03/2024	FIRST ISSUE	TCH	C. PASQUALINI	P.L.DELPONTE

CROSSWIND

ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK

Project Base Load Power Hub (BLPH)

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #23 123A90-DDL-SAF-RE-30006
Item No.	#23
Causes	3.6.1. Low Pressure at inlet to Fuel Cell
Consequences	3.6.1.1. Potential damage of Fuel Cell and loss of Power generation. Operational issue, no hazardous consequences. Low pressure likely to occur during normal operation when storage tank is depleted.
Recommendation	23. Review the requirement for a low pressure alarm on 25PIC025A/B to indicate that the PCV no longer has control over the downstream pressure due to depletion (low pressure) of the H2 storage vessel and low low pressure trip on 80PI002 to shutdown the Fuel Cell Package.
Actions	Requirement for: 1) a low pressure alarm on 25PIC055A/B (ex 25PIC025A/B) downstream control valves 25PV055A/B, allerting the operator in case of low pressure at Fuel Cell inlet; 2) and low low pressure trip on 80PI002 to shutdown the Fuel Cell Package, have been verified and added on P&iDs (see attachment-1 PID "123A90-DDL-PR-PID-80014" and attachment-2 PID "123A90-DDL-PR-PID-80012", respectively)
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	

Approvals / Endorsements

EPC Discipline Lead		**Sign**
Ciro Impradice	**22/03/2024**	
EPC HSE LEAD		**Sign**
C.Caracciolo	**22/03/2024**	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**

CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #25 123A90-DDL-SAF-RE-30006
Item No.	#25
Causes	1.13.4. O2 contamination of H2 in the storage system
Consequences	1.13.4.1. O2 contamination of H2 in the storage system. Potential for explosion in H2 storage vessel. For flammable concentration to be formed within the H2 storage vessel O2 would have to accumulate within the vessel and not be flushed out.
Recommendation	25. Perform a calculation to determine how long/number of fill cycles it would require for a flammable concentration to be formed within the H2 storage vessel based on 500ppm O2 to determine if a flammable concentration is credible in the H2 storage vessel.
Actions	
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	Calculation to determine how long/number of fill cycles it would require for a flammable concentration to be formed within the H2 storage vessel based on 500ppm O2 has been performed, see attached calculation sheet (attachment 1). According to result, a flammable concentration is not credible in the H2 storage vessel.

Approvals / Endorsements		
EPC Discipline Lead	Ciro Impradice	**Sign**
Ciro Impradice		
EPC HSE LEAD		**Sign**
C.Caracciolo	**08-04-2024**	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**
		Digitaal ondertekend door Paul van Rossum Datum: 2024.05.10 11:52:52 +02'00'

		UoM
Pressure inside the vessel at end of filling operation	30.0	*barg*
Temperature inside the vessel at end of filling operation	30.0	*°C*
Fluid density at end of vessel filling operation	2.5	*kg/m3*
Vessel ID	2.8	*m*
Vessel length	15.5	*m*
One vessel volume	101.2	*m3*
H2 mass inside the vessel at end of filling operation	248.2	*kg*
Max O2 concentration in the inlet H2 stream	500.0	*ppm*
O2 mass inside the vessel at end of first filling operation, *mO2initial*	0.124	*kg*
Hydrogen pressure inside vessel (at end FC operation)	5.0	*barg*
Fluid density at end of FC operation	0.5	*kg/m3*
H2 mass inside the vessel at end of FC operation	48.1	*kg*
H2 mass fed to the vessel in one cycle, after the first filling	200.1	*kg*
O2 mass fed to the vessel in one cycle, after the first filling, *mO2cycle*	0.100	*kg*
Max permitted O2 concentration	4.0	*%*
Max permitted O2 mass inside vessel, *mO2max*	9.93	*kg*
Max number of fill cycles to reach max permitted O2 concentration, *n*	99.0	-

n = 1 + [(mO2max - mO2initial) / mO2cycle]

ASSUMPTION

- The total accumulated O2 mass over all filling cycle has been calculated taking into consideration that no oxygen will leave the vessel during Fuel Cell operation. This assumption is very conservative from max oxygen calculation point of view, since in the reality, due to the time required to allow settling of oxygen mass in the bottom side of the vessel, there could be always a small O2 quantity that will leave the vessel as the H2 is fed to the Fuel Cell package. Therefore, one could say that the number of filling cycles required to create a flammable concentration to be formed within the H2 storage vessel will be even higher than the calculated one.

CONCLUSION

- As per above calcolation, and considering the following:

90 Electrolyser starts/yr, as per ELOGEN information,

the number of filling cycles required to form a flammable concentration is higher than the number of time the electrolyse starts in one year, therefore flammable concentartion formation is not credible.

CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

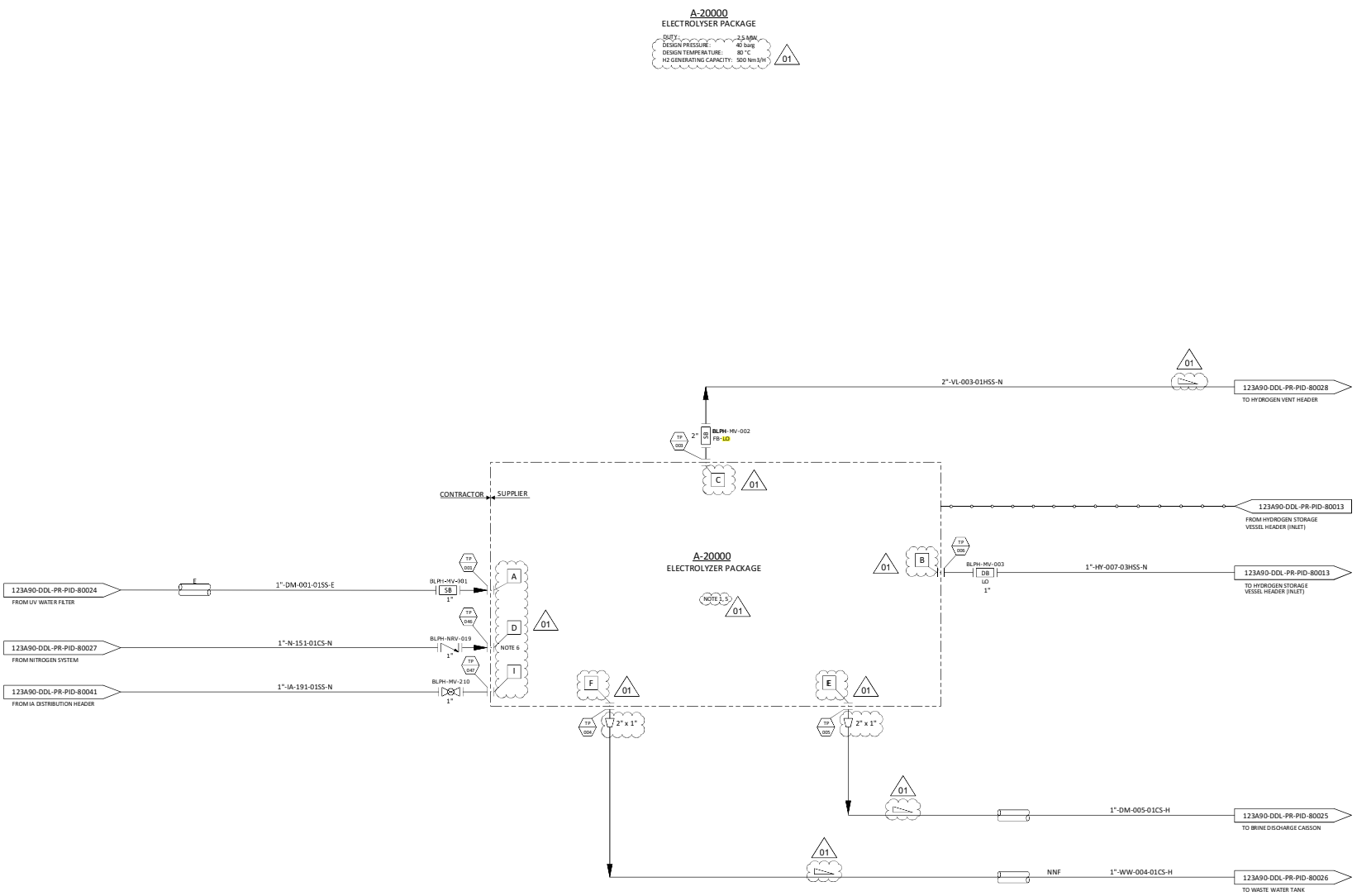
Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #30 ~~123A90-DDL-SAF-RE-30006~~
Item No.	#30
Causes	4.1.1. BLPH-MV-002 SB Left in closed position
Consequences	4.1.1.1. Upstream: No flow from Electrolyser Package into H2 vent. Blocked outlet on Electrolyser relief and vent systems. Review in Elogen HAZOP. [Parking Lot; What: Review in Elogen HAZOP.]
Recommendation	30. Review the requirement for BLPH-MV-002 in the H2 vent system as this is a potential isolation point within a relief route. Also review the piping specification around the tie in point and identify it on P&ID to ensure compatibility.
Actions	The requirement for BLPH-MV-002 in the H2 vent system is confirmed, since it will be used as an isolation valve when required. Moreover, the manual valve BLPH-MV-002 is specified to be locked open ("LO"), therefore the scenario of leaving the valve in closed position is not credible (for reference see attachment 1)
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	

Approvals / Endorsements

EPC Discipline Lead	Ciro Impradice Autore firma digitale: Ciro Impradice Nome distintivo: CN = Ciro Impradice email = ciro.impradice@rosetti.it C = IT O = Rosetti Marino OU = Process Data: 2024.06.06 11:28:42 +02'00'	**Sign**
Ciro Impradice		
EPC HSE LEAD		**Sign**
C.Caracciolo		**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**
	Digitaal ondertekend door Paul van Rossum Datum: 2024.06.21 14:49:29 +02'00'	

DRAWING NO. DRAWING_NO.

REV. REV.



NOTES

1. PACKAGE SUPPLIED WITH POWER FROM THE BLPH ELECTRICAL SYSTEM.
2. DELETED.
3. DELETED.
4. DELETED.
5. ELECTROLYSER PACKAGE INCLUDES AN OXYGEN VENT LINE WHICH IS IN THE SCOPE OF SUPPLY OF THE ELECTROLYSER PACKAGE UP TO THE ATMOSPHERE. NO PHYSICAL INTERFACE IS PRESENT BETWEEN ELECTROLYSER PACKAGE AND CONTRACTOR ON THIS LINE.
6. AN ISOLATION VALVE DOWNSTREAM THE CHECK VALVE NRV-019 IS PROVIDED WITHIN THE PACKAGE A-20000.

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM ELECTROLYSER PACKAGE

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK	SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE
A1	DRAWING NO. 123A90-DDL-PR-PID-80011	SHEET 001	REV. 01

File Name : FILE_NAME

CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** 31 123A90-DDL-SAF-RE-30006
Item No.	31
Causes	4.1.4. BLPH-MV-033 DBB Left in closed position 4.1.10. BLPH-MV-005 DBB Left in closed position
Consequences	4.1.4.1. upstream: Unable to relieve vessel V-25001A when required. Potential escalation of existing incident or unable to prepare installation for maintenance. Consequence 4.1.10.1
Recommendation	31 Review the location of the spec break downstream of: 1. 25PSV001A/BLPH-MV-033 2. 80PSV001/BLPH-MV-005 As pipework between PSV and manual valve will see upstream pressure if closed and a relief occurs.
Actions	
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	Location of the spec break downstream of: 1. 25PSV001A/BLPH-MV-033 2. 80PSV001/BLPH-MV-005 are confirmed as they are, since all manual valves installed downstream PSVs are locked open "LO" (see attachment 1 and 2). The situation of having a release scenario and at same time a manual valve wrongly closed (due to human error) represents a double jeopardy. The simultaneous occurrence of two or more unrelated causes of overpressure (also known as double or multiple jeopardy) is not a basis for design. To be noted that the closure of a manual valve located downstream a PSV is not a cause of having overpressure in the analyzed system, in the sense that all PSVs object of this HAZOP recommendation are required to be opened in case of: 1) upstream CV failure (80PSV001); 2) fire (25PSV001). Both scenarios above indicated are not caused by having closed the manual valve installed downstream the PSV. Therefore, the causes of overpressure are considered to be unrelated.

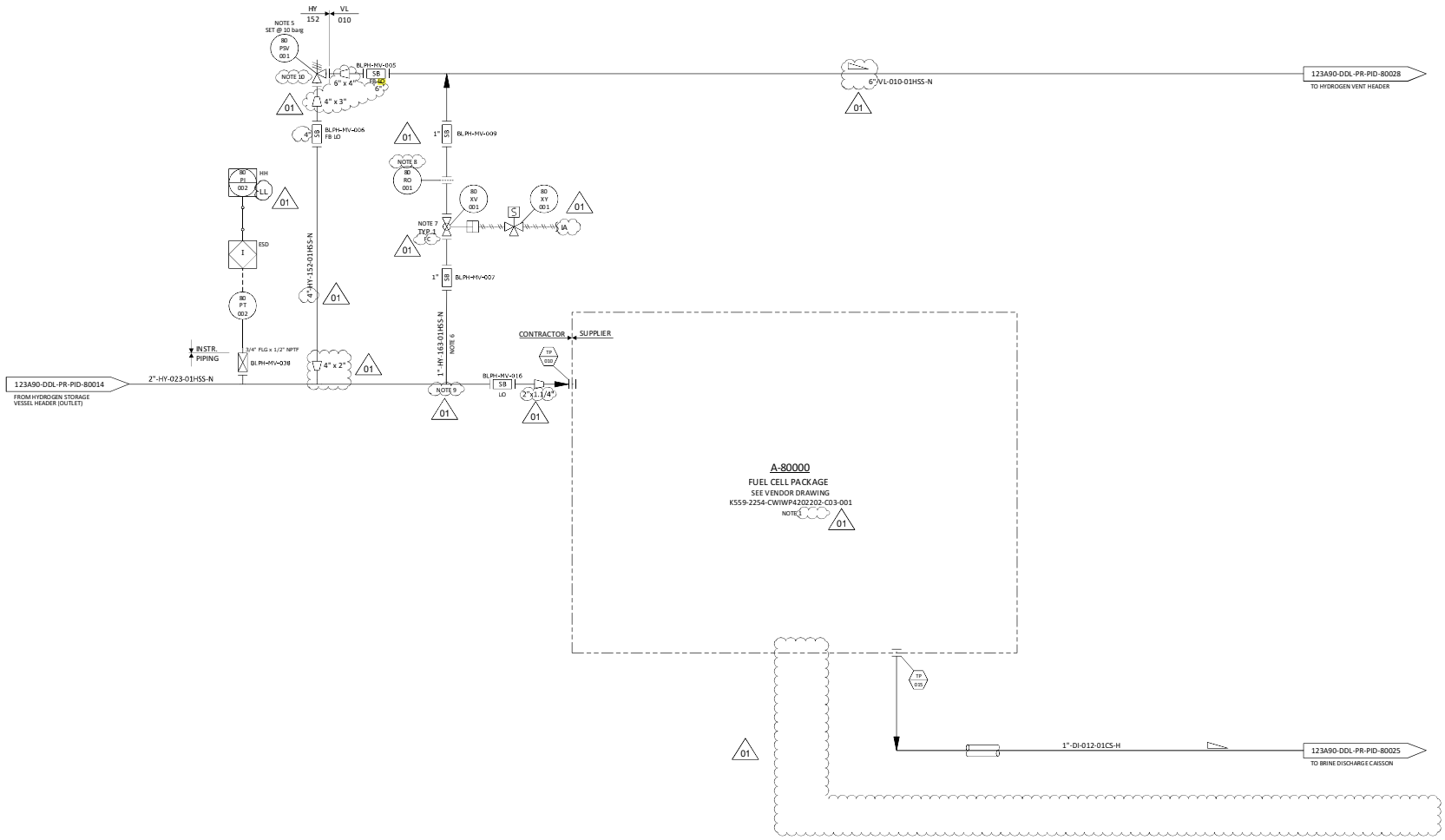
Approvals / Endorsements		
EPC Discipline Lead	Ciro Impradice	**Sign**
Ciro Impradice		
EPC HSE LEAD		**Sign**
C.Caracciolo	**10/06/2024**	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**

Autore firma digitale: Ciro Impradice
Nome distintivo: CN = Ciro Impradice email = ciro.impradice@rosetti.it C = IT O = Rosetti Marino OU = Process Data: 2024.08.19 10:54:14 +02'00'

Digitaal ondertekend door Paul van Rossum Datum: 2024.08.21 08:38:41 +02'00'

DRAWING_NO. DRAWING_NO.

REV. REV.



NOTES

1. THE VENDOR PACKAGE WILL CONTAIN AIR INTAKE AND EXHAUST, SUITABLY SAFEGUARDED AND SEPARATED.
2. DELETED.
3. DELETED.
4. DELETED

01

5. ONE UNINSTALLED SPARE PSV SHALL BE AVAILABLE.
6. LINE REQUIRED FOR PURGING OF PIPING WORK.
7. TIGHT SHUT-OFF VALVE.
8. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
9. LINE 1"-HY-163-01HSS-N WILL BE LOCATED AS CLOSE TO THE PACKAGE AS POSSIBLE TO ENSURE COMPLETE PURGING OF THE LINE.
10. 80PSV001 SIZED FOR CV FAILURE OF UPSTREAM CONTROL VAVE 25PV055A/B.

01

HOLDS

1. DELETED.
2. DELETED.

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM
FUEL CELL PACKAGE

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK	SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE
A1	DRAWING NO. 123A90-DDL-PR-PID-80012	SHEET 001	REV. 01

File Name : FILE_NAME

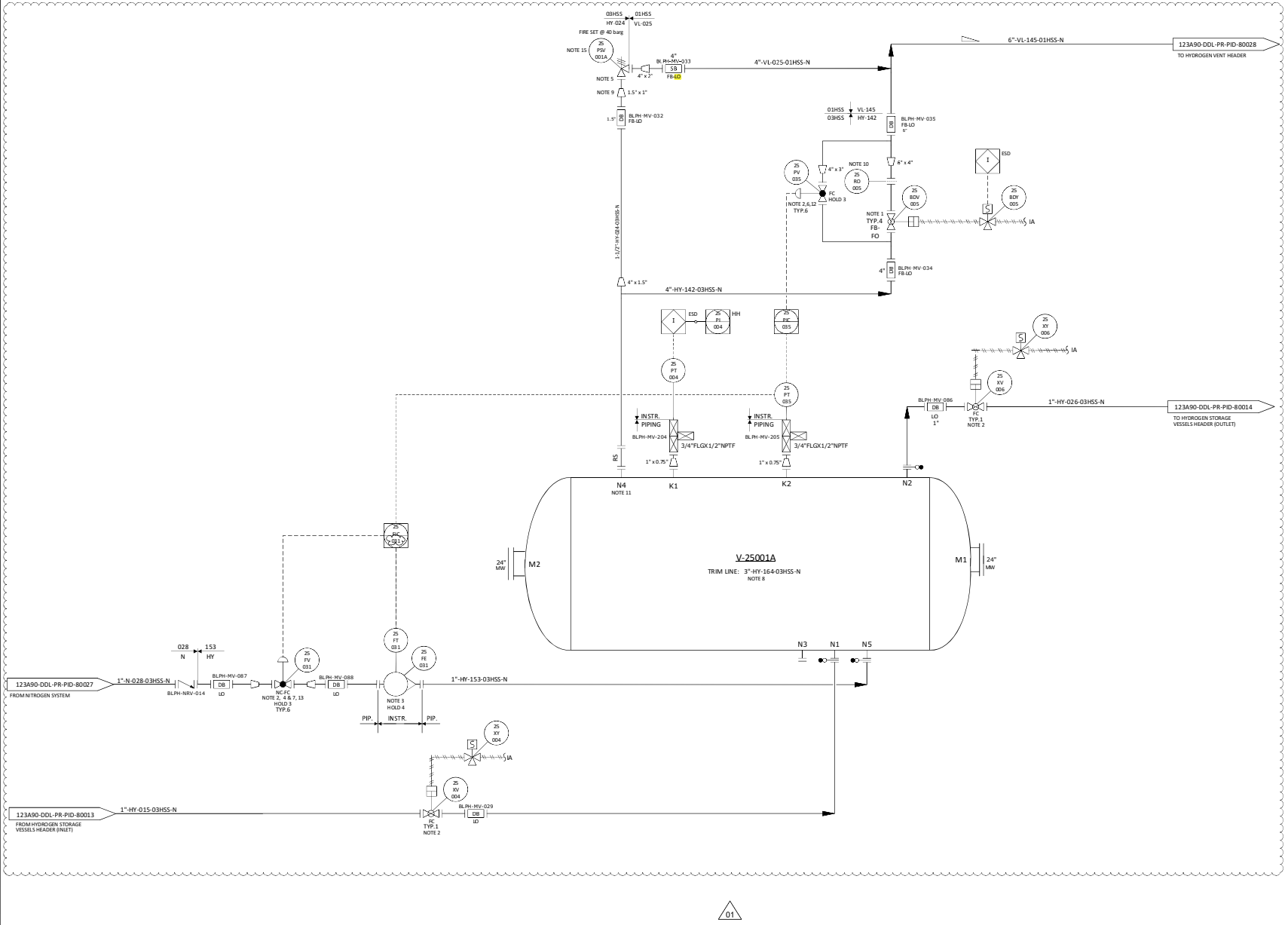
DRAWING NO. DRAWING_NO.

REV. REV.

V-25001_A

HYDROGEN STORAGE VESSEL

SIZE : 2800 mm (ID) X 15500 mm (L T/T)
DESIGN P/T : 40 barg / -10 / 80 °C
MATERIAL : CARBON STEEL
OPERATING P/T : 30 barg /AMB



NOTES

1. NECESSARY CONTROL SYSTEM SOFTWARE SHALL BE INCLUDED TO SUPPORT ADVACED VALVE CONTROL, PARTIAL STROKE TESTING AND DIAGNOSTICS FOR ANY SAFETY CRITICAL ON/OFF VALVES. THESE APPLICATION SHALL BE IDENTIFIED BY HAZOP AND LOPA EVALUATION IF PARTIAL STROKE TESTING WILL BE REQUIRED:
   THE "TYP. 3" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 2" FOR SDV
   THE "TYP. 5" SHALL BE CONSIDERED INSTEAD THE ACTUAL "TYP. 4" FOR BDV
2. TIGHT SHUT OFF VALVE.
3. VARIABLE AREA FLOWMETER TO BE INSTALLED VERTICALLY WITH DIRECTION OF FLOW UPWARDS.
4. NITROGEN CONTROL VALVE (25-FV-001), CAN NOT OPEN UNTIL THE PRESSURE WITHIN THE VESSEL IS BELOW THE NITROGEN SUPPLY PRESSURE.
5. ONE COMMON UNINSTALLED SPARE PSV FOR ALL VESSELS.
6. FOR PULSE PRESSURE PURGING OF VESSEL WITH HYDROGEN.
7. FOR FLOW PURGING OF VESSEL WITH NITROGEN. 01
8. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 STORAGE, DOC. N. "123A90-DDL-MAC-DS-50027".
9. REDUCERS TO BE INSTALLED AS CLOSE TO PSV AS POSSIBLE.
10. FOR ORIFICE DIAMETER REFERENCE SHALL BE MADE TO "RELIEF, VENT AND BLOWDOWN REPORT" DOC. N. "123A90-DDL-PR-RE-80030".
11. NOZZLE N4 TO BE INSTALLED AT MINIMUM DISTANCE FROM TANGENT LINE OF THE VESSEL (ON THE OPPOSITE SIDE OF N5 NOZZLE).
12. SOFTWARE INTERLOCK TO PREVENT 25PV035 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION. CONTROL VALVE 25PV035 IS USED ONLY IN CASE OF VESSEL PURGING.
13. SOFTWARE INTERLOCK TO PREVENT 25FV031 BEING OPENED OUTSIDE OF A PURGE CYCLE OPERATION.
14. A TIMER ALARM ON THE H2 PRESSURIZATION SECTION OF THE PURGE CYCLE IN THE CONTROL LOGIC IS PROVIDED TO DETERMINE IF THE PURGE VALVE 25PV035 HAS FAILED TO CLOSE.
15. 25PSV001A SIZED FOR FIRE.

HOLDS

1. DELETED.
2. DELETED. 01
3. CONTROL VALVE SIZE (BY VENDOR).
4. MULTIVARIABLE FLOWMETERS REQUIRE 7 DIAMETERS STRAIGHT LENGHT UPSTREAM AND 5 DIAMETERS STRAIGHT LENGHT DOWNSTREAM (TO BE CONFIRMED BY VENDOR).

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSEL A

CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE	NTS
DRAWN	CHECKED	APPROVED	DATE	
A1	DRAWING NO. 123A90-DDL-PR-PID-80015		SHEET 001	REV. 01

File Name : FILE_NAME

CROSSWIND

ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK

Project Base Load Power Hub (BLPH)

Action Title:	**EPC HAZOP Study Actions**
Action No:	35
Ref Doc	123A90-DDL-SAF-RE-30006
Item No.	35
Causes	4.2.6. BLPH-MV-171 open more than required on N2 system
Consequences	4.2.6.1. Potential for impact on other N2 users resulting in an inability to purge. Loss of safeguard.
Recommendation	35 Ensure sizing of the Needle Valve BLPH-MV-171 prevents excessive N2 use which may impact other users by selecting the CV of the valve and hence maximum flowrate.
Actions	According to PID 123A90-DDL-PR-PID-80028: 1) the manual valve MV-171 has been specified to be locked in place (LIC), see note2 on attachment 1; 2) flow meter 64FG001 has been specified to be readable from manual valve MV-171 (see note 1, on attachment 1). The operator will open the MV-171 such that the nitrogen flow rate readable from the flow meter will be 9.2 Nm3/hr, as per 123A90-DDL-PR-RE-80037 APPENDIX01 (see attachemt 2). This will then prevents excessive N2 use for continuous vent header purging purpose.
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	

Approvals / Endorsements

EPC Discipline Lead		**Sign**
Ciro Impradice	**22/03/2024**	
EPC HSE LEAD		**Sign**
C.Caracciolo	**22/03/2024**	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**

CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

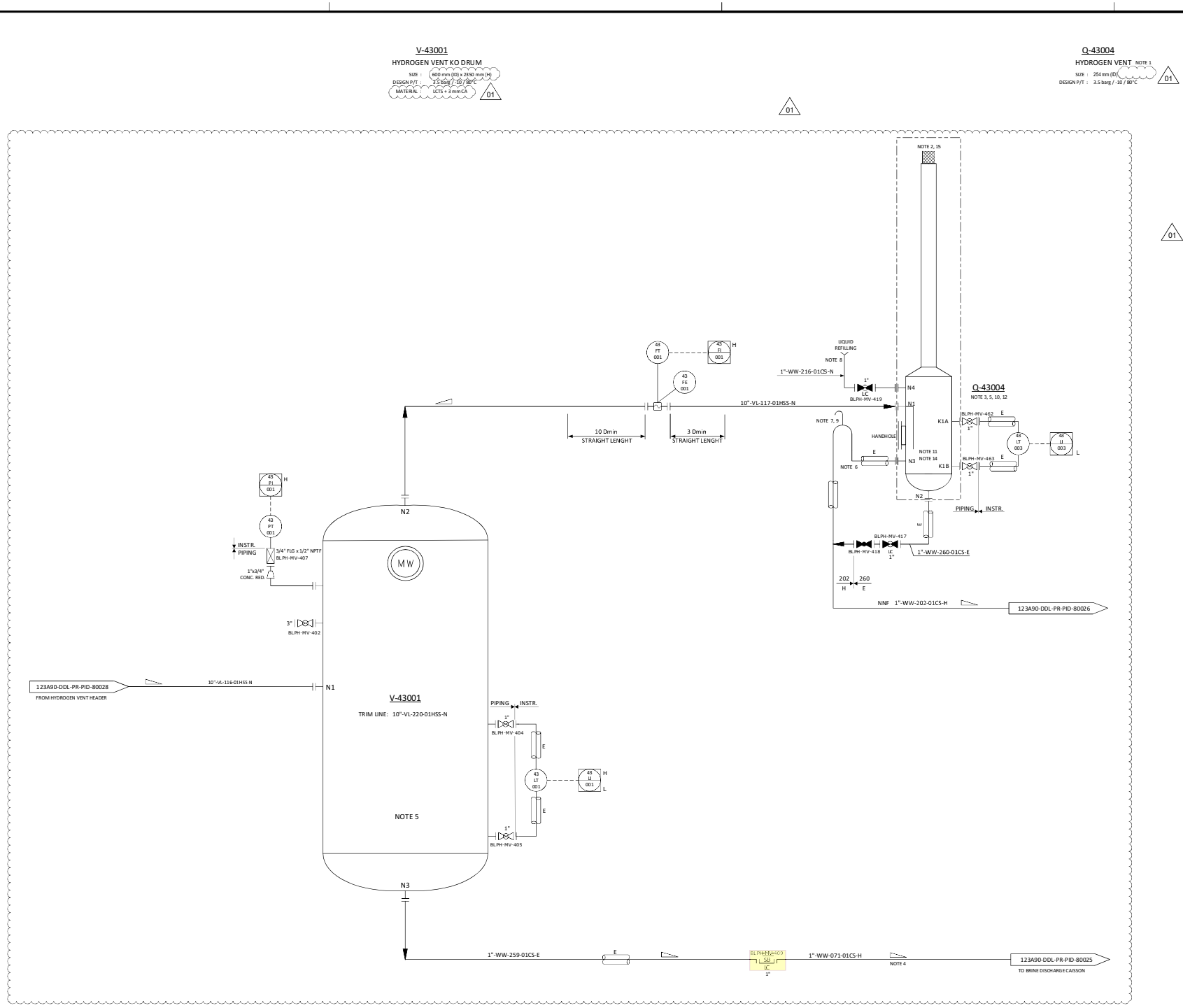
ROSETTI MARINO

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** 38 123A90-DDL-SAF-RE-30006
Item No.	38
Causes	4.10.1. Low level in Liquid boot of V43001
Consequences	4.10.1.1. Low liquid level in KO drum V43001 is expected to be normal, potentially dropping below low low level alarm point overtime due to evaporation within KO drum.
Recommendation	38 Review how the liquid drain line from the KO drum V43001 can be safely routed for disposal considering that it may be subject to gas blow-by due to loss of liquid seal by evaporation. Review against recommendation 39.
Actions	
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	As per P&iDs 123A90-DDL-PR-PID-80029_01, control valve on the liquid drain line of the H2 Vent KOD has been deleted. The manual valve installed on the drain line (valve BLPH-MV-409) has been specified to be "LC" (locked closed). See attached P&iD.

Approvals / Endorsements		
EPC Discipline Lead / Construction		**Sign**
C.Impradice (EPC Process LEAD)	13/03/2024	Ciro Impradice **Sign**
EPC HSE LEAD		**Sign**
C.Caracciolo	13/03/2024	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client	Digitaal ondertekend door Paul van Rossum Datum: 2024.03.19 15:13:52 +01'00'	**Sign**

DRAWING NO. DRAWING_NO.

REV. REV



NOTES

1. VENT TO SAFE LOCATION SEGREGATED FROM OTHER VENTS.
2. VENT TO BE EQUIPPED WITH FLAME ARRESTOR AND BIRD SCREEN.
3. LIQUID SEAL DRUM IS PART OF THE VENT SYSTEM.
4. LIQUID DRAINLINES TO BE ROUTED TO ENSURE GRAVITY DRAIN.
5. HYDROGEN VENT KO DRUM BOOT AND LIQUID SEAL DRUM TO BE HEAT TRACING.
6. SEAL LEG WILL BE DETERMINATED ON THE MAXIMUM BACK PRESSURE IN THE VENT.
7. SEAL VENT TO BE PLACED INTO A SAFE POSITION.
8. FILLING LINE TO BE PLACED IN AN ACCESSIBLE POSITION.
9. TRACED FROM NOZZLE N3 UP TO SWAN NECK.
10. LIQUID SEAL DRUM I.D. 590 mm, HEIGHT 2350 mm (T/T). TBC BY H2 VENT VENDOR.
11. INLET DIP LEG SUBMERSION HEIGHT OF 0.2 m (TBC BY VENDOR).
12. FLUID HEIGHT OF 1.5 m FROM BOTTOM T.L. (TBC BY VENDOR). 01
13. FOR DESCRIPTION AND SPECIFICATION OF VESSEL NOZZLE, REFERENCE SHALL BE MADE TO THE TECHNICAL DATA SHEET FOR H2 VENT KOD.
14. LIQUID INSIDE SEAL DRUM IS A WATER - GLYCOL MIXTURE WITH 40% VOLUME OF GLYCOLE.
15. TOP OF TIP OF H2 VENT SHALL BE AT AS MINIMUM 6.2 m FROM HIGHEST REACHABLE PLATFORM.

01

HOLDS

1. DELETED.
2. DELETED.
3. DELETED.

01

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	15/02/2024	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)
00	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN VENT DRUM

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK			SCALE NTS
DRAWN	CHECKED	APPROVED	DATE
A1	DRAWING NO. 123A90-DDL-PR-PID-80029	SHEET 001	REV. 01

File Name : FILE_NAME

CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action Title:	**EPC HAZOP Study Actions**
Action No:	42
Ref Doc	123A90-DDL-SAF-RE-30006
Item No.	42
Causes	4.18.3. Loss of Instrument Air
Consequences	4.18.3.1. 43LV001 moves to air fail position.
Recommendation	42 Make air fail position of 43LV001 fail closed and type 6 (critical).
Actions	
Assigned Respondent (By)	Process
Issue Date (01-12-2023)	
Action Response	As per HAZOP worksheet, see note on point 4.1.14.1, which states: QUOTE 90 Electrolyser starts/yr, 0.5 hr/start-up, 3.2kg/hr of water(worst credible scenario based on condensation of all water in stream), Platform visited for maintenance 2 times/yr where issue can be identified and rectified. 0.076 m3 of water within 2m3 KO drum overfill of vessel not considered credible. UNQUOTE the amount of water accumulated within the H2 Vent KOD V-43001 is very small and it can be stored over a period of 6 months. Therefore, 43LV001 has been deleted. In case water is accumulated within the vessel, then it will be drained off during maintenance, by opening a manual valve ("LC") installed on the liquid outlet line of the H2 Vent KOD.

Approvals / Endorsements		
EPC Discipline Lead / Construction	Ciro Impradice	**Sign**
C.Impradice (EPC Process LEAD)	13/03/2024	
EPC HSE LEAD		**Sign**
C.Caracciolo	13/03/2024	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client	Digitaal ondertekend door Paul van Bossum Datum: 2024.03.19 15:13:11 +01'00'	**Sign**

CROSSWIND

ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #46 123A90-DDL-SAF-RE-30006
Item No.	#46
Causes	1.2.4. 25XV006 Driven open/inadvertently opened by operator 3.16.1. Start up of Fuel Cell 135 times/year
Consequences	1.2.4.1. Pressurise downstream system to 25PV025A/B up to 30barg. Potential to exceed design pressure (3 times design pressure) downstream of 25PV025A/B, LOPC of H2 and explosion on ignition. 25PV025A/B are downstream pressure controlled and are potentially opened when fuel cell is not online. 3.16.1.1. Potential for overpressurisation of line and Fuel Cell downstream of 25PCV025A/B due to reaction speed of 25PIC025A/B. Insufficient time for control system to react to prevent downstream overpressure. Assumption is that as fuel cell runs down 25PIC025A/B opens 25PV025A/B such that when restart occurs 25PV025A/B are fully open.
Recommendation	46. As fuel cell runs down 25PIC025A/B opens 25PV025A/B. Ensure that when restart occurs 25PV025A/B are fully closed and review how the downstream pressure can be slowly increased to the point where 25PIC025A/B can be given automatic control.
Actions	
Assigned Respondent (By)	Instrumentation
Issue Date(01-12-2023)	
Action Response	As per doc. "Process Control, Operation, Start-up and Shutdown philosophy"° 123A90-DDL-PR-RE-80031 rev.01 par. 3.4.1.4, when the Fuel Cell is stopped, the control logic will force the operating control valve 25-PV-055A (or B) to fully close. As the Fuel Cell starts, the 25-PIC-055A/B controller will command the opening of the control valve 25-PV-055A (or B).

Approvals / Endorsements

EPC Discipline Lead		**Sign**
L.Calabrese	**14/05/2024**	
EPC HSE LEAD		**Sign**
C.Caracciolo	**10/05/2024**	**CC**
EPC Project Manager		**Sign**
D.Lo.Sterzo		
Client		**Sign**
		Digitaal goedgekeurd door Paul van Rossum Datum: 2024.06.21 15:41:40 +02'00'

Base Load Power Hub (BLPH)

Process Control, Operation, Start-up and Shutdown philosophy

Document Number: 123A90-DDL-PR-RE-80031

Document Class: 1

01	23/04/2024	Issue for Approval (IFA)	CIM	RZI	DLO
00	13/12/2023	Issue for Approval (IFA)	CIM	RZI	DLO
Rev.	Date	Description	Prepared	Reviewed	Approved

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- 80-PSV-001 to protect the downstream FC package from any failure of the upstream 25-PV-055A/B (or in case of blocked discharge)
- 80-XV-001 to allow for nitrogen purging prior to maintenance campaign

The Fuel Cell pressure control valve(s) control(s) the hydrogen supply to the Fuel Cell by means of the control loop identified with:

1) pressure controllers: 25-PIC-055A/B;
2) pressure transmitters: 25-PT-055A/B (Process Variable, PV);
3) final elements: 25-PV-055A/B;
4) SP value: 3.5 barg;
5) Sub-Controller(s) action: REVERSE (pressure increase, valve close);
6) Failure direction: FC

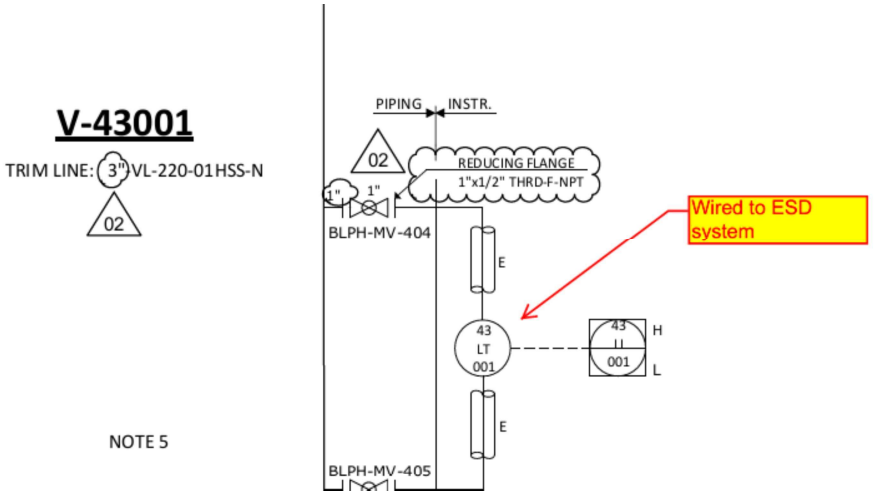
Should be the operating pressure (PV) fall under the PID regulator SP, the controller drives the relevant control valve to increase its opening (Cv); vice versa, should the operating pressure (PV) rise above the PID regulator SP, the controller drives the relevant control valve to decrease its opening (Cv).

During Fuel Cell operation, only one valve (25-PV-055 A or B) will be used, while the other one will be fully closed. The operator has the possibility to choose which control loop (and then which control valve) to use by means of the hand selector 25-HS-055. The hand selector includes software interlock to prevent both valves to be online simultaneously. Therefore, the software interlock prevents valve 25-PV-055B to open if control valve 25-PV-055A is not closed. Moreover, software interlock prevents opening of the control valves 25-PV-055A/B in case Fuel Cell package (A-80000) is not running.

As Fuel Cell stops, the control logic will force the operating control valve 25-PV-055A (or B) to fully close. As the Fuel Cell starts, the 25-PIC-055A/B controller will command the opening of the control valve 25-PV-055A (or B) such that the downstream pressure will slowly increase to the point where 25-PIC-055A (or B) can be given automatic control, by fixing a control valve opening lower than the required operating point for a period that allows the fuel cells to run at full load.

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CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Base Load Power Hub (BLPH)	ROSETTI MARINO

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** 45 123A90-DDL-SAF-RE-30006
Item No.	45
Causes	4.1.14. BLPH-MV-409 SB Left in closed position on V-43001 drain 4.1.15. 43LIC001 control loop failure closing 43LV001
Consequences	4.1.14.1. Upstream: Unable to drain liquid from KO Drum V-43001 leading to potential high level in KO Drum and liquid into H2 relief header resulting in high back pressure to relieving streams. Rupture of relief streams, LOPC of H2 and explosion on ignition. 90 Electrolyser starts/yr, 0.5 hr/start-up, 3.2kg/hr of water(worst credible scenario based on condensation of all water in stream), Platform visited for maintenance 2 times/yr where issue can be identified and rectified. 0.076 m3 of water within 2m3 KO drum overfill of vessel not considered credible. Consequence 4.1.15.1
Recommendation	45 Review the requirement for 43LI002 High High activating ESD 1 as no scenarios were identified within the HAZOP which would activate the trip. Verify before removal that there is no requirement from project applicable standards and good practice (DEP) for this trip.
Actions	For good practice of this project (DEP) the following has been performed: • Level transmitter 43-LT-001 will be kept and wired to ESD system instead of PCS system; • In case of HH trip, logic will trip Electrolyser package, water treatment package and sea water pumps; • P&IDs, wiring diagram and logic will be revised accordingly 

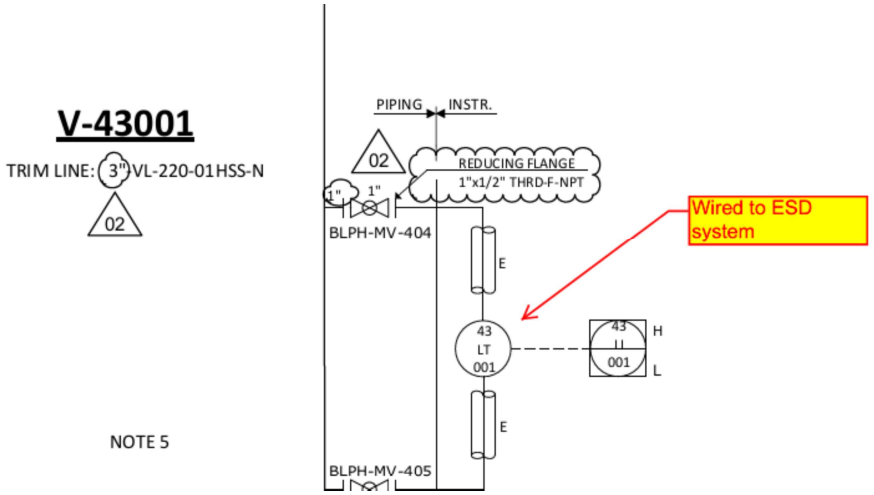
Assigned Respondent (By)	Process	
Issue Date		
Action Response		
Approvals / Endorsements		
EPC Process Lead		**Sign**
C.Impradice	**04/09/24**	
EPC HSE LEAD		**Sign**
C.Caracciolo	**04/09/24**	
EPC Project Manager		**Sign**
D.Lo.Sterzo	**04/09/24**	
Client		**Sign**

Digitaal ondertekend door Paul van Rossum
Datum: 2024.09.04 16:36:08 +02'00'

CROSSWIND

HOLLANDSE KUST NOORD WIND PARK
Project Base Load Power Hub (BLPH)

ROSETTI MARINO

Action Title: **Action No:** **Ref Doc**	**EPC HAZOP Study Actions** #47 123A90-DDL-SAF-RE-30006
Item No.	#47
Causes	4.1.14. BLPH-MV-409 SB Left in closed position on V-43001 drain 4.1.15. 43LIC001 control loop failure closing 43LV001
Consequences	4.1.14.1. Upstream: Unable to drain liquid from KO Drum V-43001 leading to potential high level in KO Drum and liquid into H2 relief header resulting in high back pressure to relieving streams. Rupture of relief streams, LOPC of H2 and explosion on ignition. 90 Electrolyser starts/yr, 0.5 hr/start-up, 3.2kg/hr of water(worst credible scenario based on condensation of all water in stream), Platform visited for maintenance 2 times/yr where issue can be identified and rectified. 0.076 m3 of water within 2m3 KO drum overfill of vessel not considered credible. Consequence 4.1.15.1
Recommendation	47. Review the requirement for 43LI002 High High activating ESD 1 as no scenarios were identified within the HAZOP which would activate the trip. Verify before removal that there is no requirement from project applicable standards and good practice (DEP) for this trip.
Actions	For good practice of this project (DEP) the following has been performed: • Level transmitter 43-LT-001 will be kept and wired to ESD system instead of PCS system; • In case of HH trip, logic will trip Electrolyser package, water treatment package and sea water pumps; • P&IDs, wiring diagram and logic will be revised accordingly 

Assigned Respondent (By)	Process	
Issue Date		
Action Response		
Approvals / Endorsements		
EPC Process Lead		**Sign**
C.Impradice	**04/09/24**	
EPC HSE LEAD		**Sign**
C.Caracciolo	**04/09/24**	
EPC Project Manager		**Sign**
D.Lo.Sterzo	**04/09/24**	
Client		**Sign**
		Digitaal ondertekend door Paul van Rossum Datum: 2024.09.04 16:36:08 +02'00'

4.4 EPC HFE RECOMMENDATIONS

CROSSWIND

ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action Title: Human Factor Workshop

Action n.: 1

Reference Document n: 123A90-DDL-SAF-RE-30049

Item n.: BLPH Interface level, BLPH Lower deck, BLPH Upper Deck (where applicable considering the presence of rungs)

Cause: requirements from NORSOK S-002, Annex B

Are rungs provided with a non-slip surface?

Consequence: Rungs have a square shape, that prevent slipping off the end of the rungs, but the surface is not classified non-slip surface.

Actions: Consider to provide non-slip surface to the rungs of vertical ladders

Assigned Respondent (By): Rosetti - Structural

Issue date: 27/02/2024

Action Response: As per doc. "Boat landing and ladder", n. 144671-VOOW-TF-ENG-REP-1401, non-slip surfaces will be provided at all ladders.

Approvals / Endorsement:

EPC Discipline Lead / Construction	Date	Sign
A. Balzarotti	02-09-24	Alessandro Balzarotti Digitally signed by Alessandro Balzarotti DN: cn=Alessandro Balzarotti, o, ou=Tecon srl, email=alessandro.balzarotti@teconsrl.it, c=IT Date: 2024.09.04 15:47:03 +02'00'
EPC HSE Lead	**Date**	**Sign**
C. Caracciolo	02-09-24	**CC**
EPC Project Engineering Manager	**Date**	**Sign**
D. Lo Sterzo	**06/09/2024**	
Client	**Date**	**Sign**
N LE BRUN	06/09/2024	LE BRUN Signer ID: 5VSEXLUBO

A check of the clearances between the vessel and the access ladder is included in this section.

According to IMCA (ref. [32], quoted text italic):

"Leave a safe zone between the vessel bow and the boat landing ladder to eliminate the risk of crushing between the vessel and the ladder. The safe zone should provide:

- *A minimum of 500mm clearance between the vessel fender and the ladder rungs*
- *A maximum stepping distance of 650mm between a suitable and safe non-slip surface on the vessel and the ladder on the boat landing.*

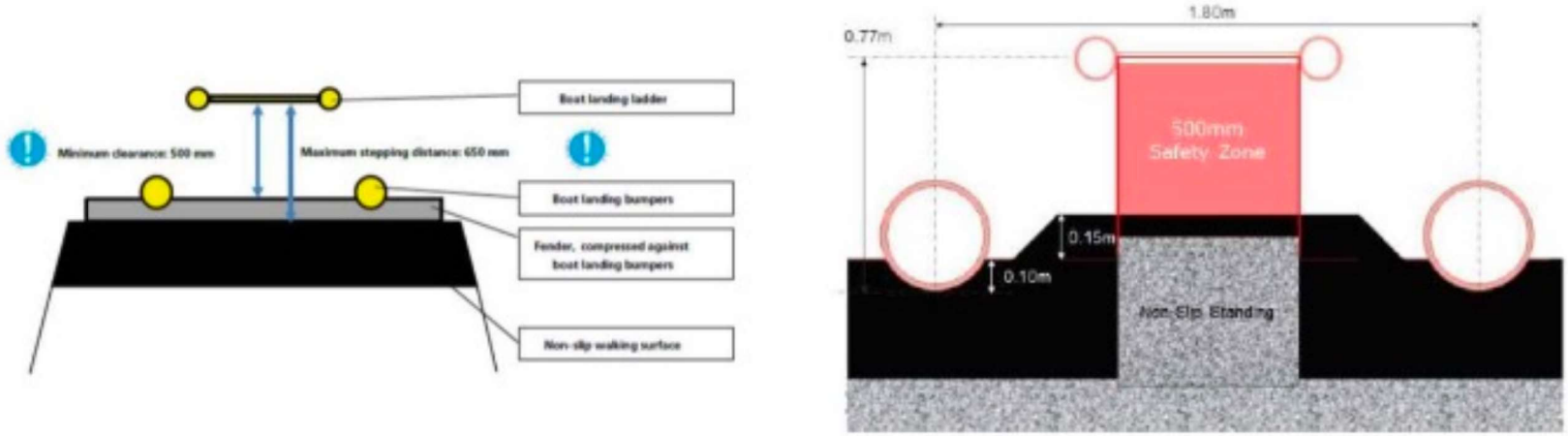


Figure 4-6, IMCA recommendations (ref. [32]).

There is still some room for interpretation in the new guidance and therefore a common interpretation is proposed below:

- *The 500mm clearance should be measured from the face of the fender to the closest point of the rung (not the centreline of the rung or the closest face of the stringer);*
- *The stepping distance of 650mm should be measured from the closest point of the non-slip surface to the centreline of the rung;*

CROSSWIND

ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action Title: Human Factor Workshop

Action n.: 2

Reference Document n: 123A90-DDL-SAF-RE-30049

Item n.: BLPH Interface level

Cause: requirements from DNVGL-OS-A101

Easily accessible muster areas shall be clearly defined on the offshore installation. All muster areas shall be located with direct and ready access to the escape mean or other life-saving appliances.

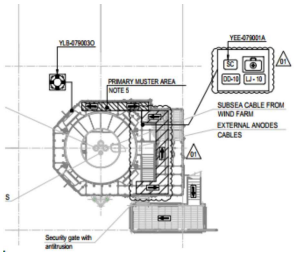
Consequence: Requirement partially satisfied (presence of safety cabinet and other life saving appliances, see 123A90-DDL-SAF-DL-30025)

Actions: Verify the type and position of stair for transition piece entrance in order to avoid possible interference with primary muster point.

Assigned Respondent (By): Rosetti - Structural & Safety

Issue date: 27/02/2024

Action Response: As shown on Escape Route layout, doc. n. 123A90-DDL-SAF-DL-30025 rev 01, no interference is present with the Primary Muster Area moved to the north side of the deck

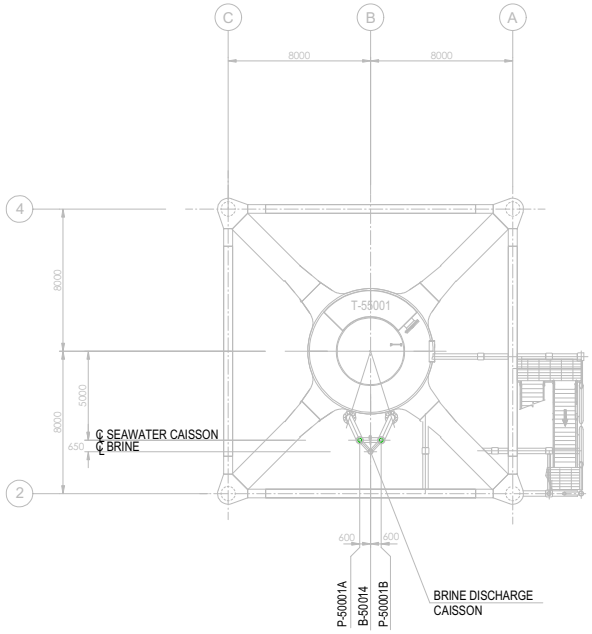


Approvals / Endorsement:

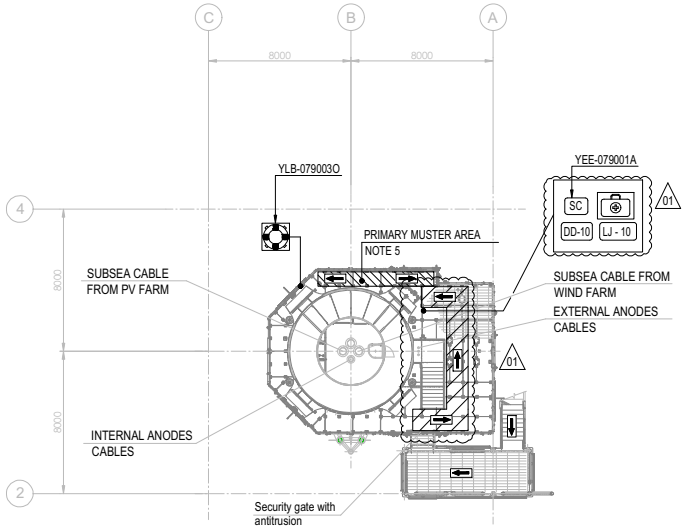
EPC Discipline Lead / Construction	Date	Sign
C.Caracciolo	02-09-24	CC
EPC HSE Lead	**Date**	**Sign**
C. Caracciolo	02.09.24	**CC**
EPC Project Engineering Manager	**Date**	**Sign**
D. Lo Sterzo	04/09/2024	
Client	**Date**	**Sign**
N LE BRUN	04/09/2024	LE BRUN Signer ID: 5VSEXLUIBO...

DRAWING NO. 123A90-DDL-SAF-DL-30025

REV. 01

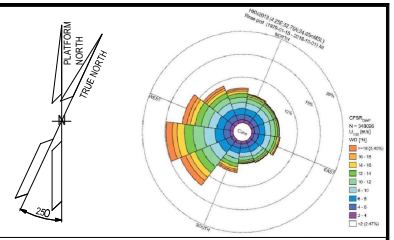


PLAN ON TRANSITION PIECE
EL+21.710 T.O.S.



PLAN ON EXISTING
PLATFORM AT
EL+16.860 T.O.S.

SYMBOL	DESCRIPTION
	LIFE BUOY(FITTED WITH LIGHT, SMOKE SIGNAL & LIFELINE)
	FIRST AID KIT
	01
LJ-XX	LIFE JACKET (INSIDE CABINET)
SC	SAFETY CABINET
DD	DESCENT DEVICE 01



NOTES

1. ALL DIMENSIONS IN mm U.N.O
2. ALL ELEVATIONS IN METERS.
3. PRIMARY ESCAPE ROUTES SHALL BE MINIMUM 1.2m WIDTH AND 2.3m HEIGHT.
4. SECONDARY ESCAPE ROUTES SHALL BE MINIMUM 0.8m WIDTH AND 2.3m HEIGHT.
5. PRIMARY MUSTER AREA SHALL BE SIZED IN ORDER TO PROVIDE SUFFICIENT SPACE FOR THE MAXIMUM POB OF 10 ON THE PLATFORM, CONSIDERING AS MINIMUM 0.8 m^2 PER PERSON.
6. THE EVACUATION PHILOSOPHY IS AS FOLLOW:
   - PRIMARY MEANS OF EVACUATION - VIA PRIMARY MUSTER AREA,LOCATED AT PLATFORM ON TRANSITION PIECE THEN TO CREW TRANSFER VESSEL.
   - SECONADRY MEANS OF EVACUATION - VIA SECONDARY MUSTER AREA, LOCATED AT THE NORTH-EAST CORNER OF THE LOWER DECK, THEN TO LIFERAFTS.
7. ESCAPE MASKS, ELECTRICAL SAFETY KIT, RESUSCITATION UNIT, IMMERSION SUITS, LIFE JACKET AND FIRST AID KID TO BE LOCATED IN WEATHERPROOF CABINETS, AT STRATEGIC POSITIONS.
8. EACH LIFERAFT TO BE SIZED FOR MAXIMUM POB OF 10 PERSONS.
9. 2 NOS. OF PORTABLE CO2 EXTINGUISHERS TO BE LOCATED IN EACH ROOM (ITER, HV & LV ROOMS AND UPS ROOM).
10. EYEWASH BOTTLES TO BE PORTABLE AND CARRIED BY OPERATORS ONLY DURING MAINTENACE PERIOD.
11. ALL PORTABLE EXTINGUISHERS LOCATED IN OPEN AREA WILL BE EQUIPPED WITH A WEATHERPROOF CABINET. (01)
12. LIFE RAFT ACCESS WILL BE GUARANTED BY MEANS OF DESCENT DEVICE.

LEGEND

PRIMARY ESCAPE ROUTE

SECONDARY ESCAPE ROUTE

HOLDS

REFERENCE DOCUMENTS

123A90-DDL-PP-DS-70071	PLOT PLAN - BELOW LOWER DECK

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	10/07/24	MMA	CCA	DLO	ACCEPTED FOR CONSTRUCTION (AFC)
0	31/01/24	MMA	CCA	DLO	ISSUE FOR REVIEW (IFR)

CROSSWIND

ROSETTI MARINO

TITLE :
ESCAPE ROUTES, FIRE FIGHTING, LIFE SAVING EQUIPMENT AND SAFETY EQUIPMENT LAYOUTS DRAWINGS

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK			SCALE 1:150
DRAWN M. MAGNI	CHECKED C. CARACCIOLO	APPROVED D. LO STERZO	DATE 10/07/24
A1	DRAWING NO. 123A90-DDL-SAF-DL-30025	SHEET 001	REV. 01

File Name : 123A90-DDL-SAF-DL-30025 Rev.01

CROSSWIND

ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action Title: Human Factor Workshop

Action n.: 3

Reference Document n: 123A90-DDL-SAF-RE-30049

Item n.: BLPH Lower deck workplaces and equipment inspection activities

Cause: requirements from NORSOK S-002, Annex B

Are horizontal workspaces for fixed equipment minimum 700 mm?

Consequence: Position of the pumps and related piping is not yet defined.

Actions: Ensure adequate space for maintenance activities of water pumps in the final position.

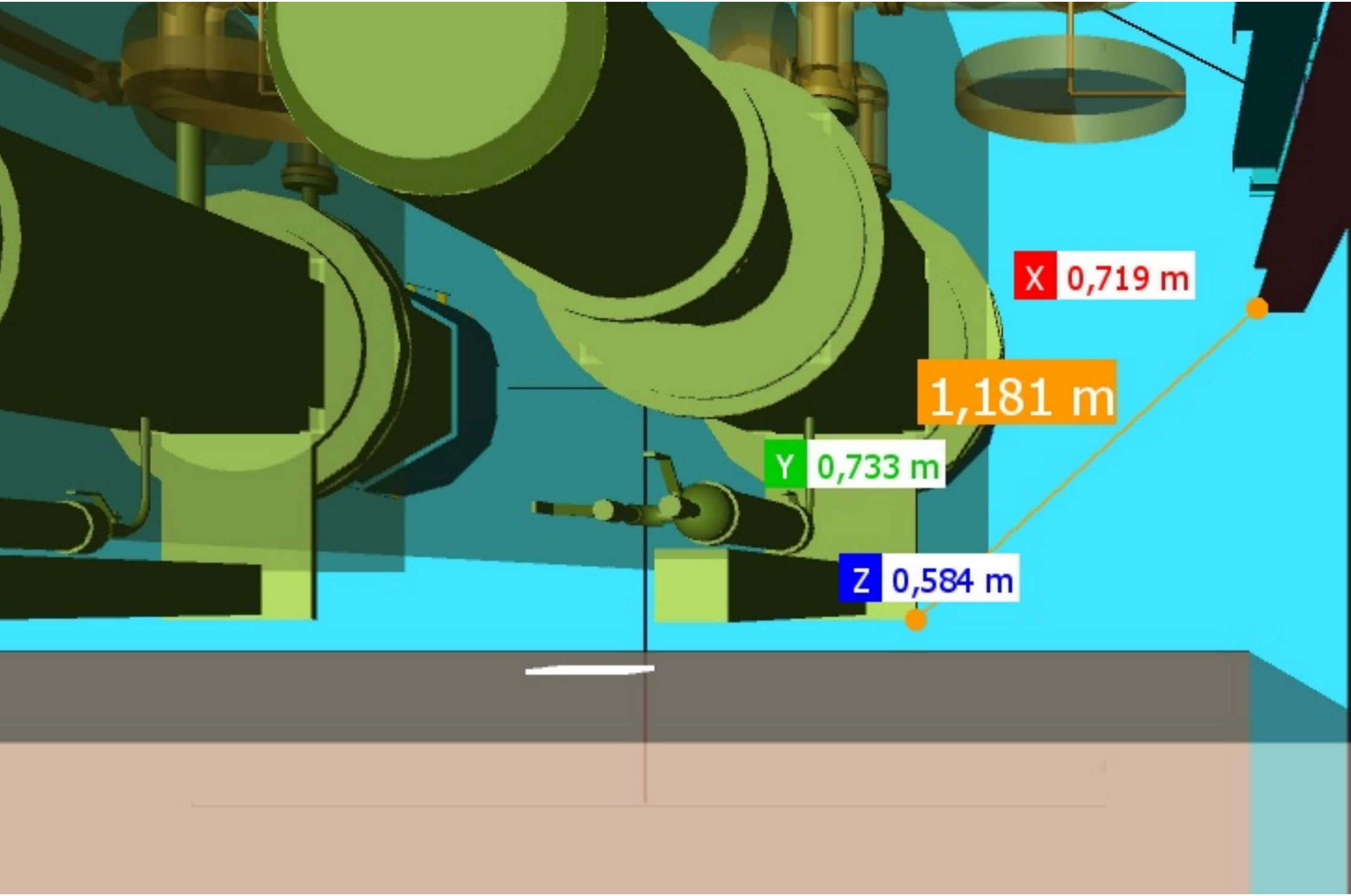
Assigned Respondent (By): Rosetti - Piping

Issue date: 27/02/2024

Action Response: **Adequate space for maintenance has been provided as shown in the 3D model, refer to below 3D model snapdhot.**

Approvals / Endorsement:

EPC Discipline Lead / Construction	**Date**	**Sign**
C. Bortolin	02-09-24	
EPC HSE Lead	**Date**	**Sign**
C. Caracciolo	02-09-24	CC
EPC Project Engineering Manager	**Date**	**Sign**
D. Lo Sterzo	04/09/2024	
Client	**Date**	**Sign**
N LE BRUN	04/09/2024	LE BRUN Signer ID: 5V/SEXLUIBO...


X 0,719 m
1,181 m
Y 0,733 m
Z 0,584 m

CROSSWIND

ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action Title: Human Factor Workshop

Action n.: 4

Reference Document n: 123A90-DDL-SAF-RE-30049

Item n.: BLPH Lower deck workplaces and equipment inspection activities

Cause: requirements from NORSOK S-002, Annex B

Are spaces between external diameter of flanges and fixed obstructions min. 250 mm?

Consequence: BL of WTP piping not finalized at the present project stage

Actions: Ensure adequate space for maintenance activities for flanges/ valves near the WTP

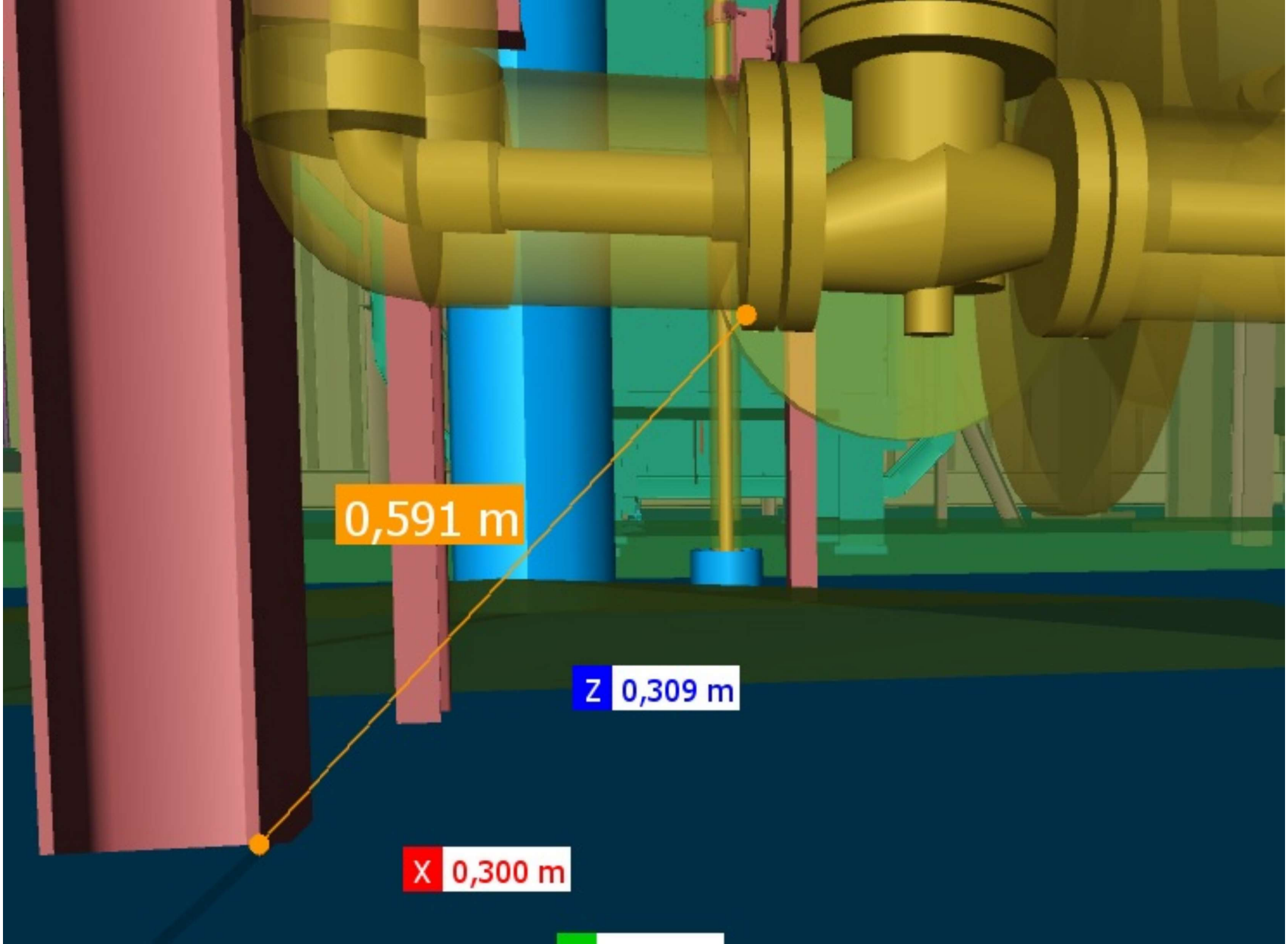
Assigned Respondent (By): Rosetti - Piping

Issue date: 27/02/2024

Action Response: **Requisite is complied with as shown on below extract from 3D model (eg. flange shown in the 3D model snapshot is at z = 309mm.**

Approvals / Endorsement:

EPC Discipline Lead / Construction	**Date**	**Sign**
C. Bortolin	**03-09-24**	
EPC HSE Lead	**Date**	**Sign**
C. Caracciolo	**03-09-24**	**CC**
EPC Project Engineering Manager	**Date**	**Sign**
D. Lo Sterzo	04/09/2024	
Client	**Date**	**Sign**
N LE BRUN	04/09/2024	LE BRUN Signer ID: 5VSEXLUIBQ...


0,591 m
Z 0,309 m
X 0,300 m

CROSSWIND

ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action Title: Human Factor Workshop

Action n.: 7

Reference Document n: 123A90-DDL-SAF-RE-30049

Item n.: BLPH Lower deck workplaces and equipment inspection activities

Cause: requirements from NORSOK S-002, Annex B

Are access opening in vertical partitions into cofferdam, tanks etc. equipped with hand grips on both sides above the opening?

Consequence: To date, the access is not yet defined in the 3D model.

Actions: Ensure that the access will be equipped with vertical ladder to reach equipment on top of TP

Assigned Respondent (By): Rosetti – Structural

Issue date: 27/02/2024

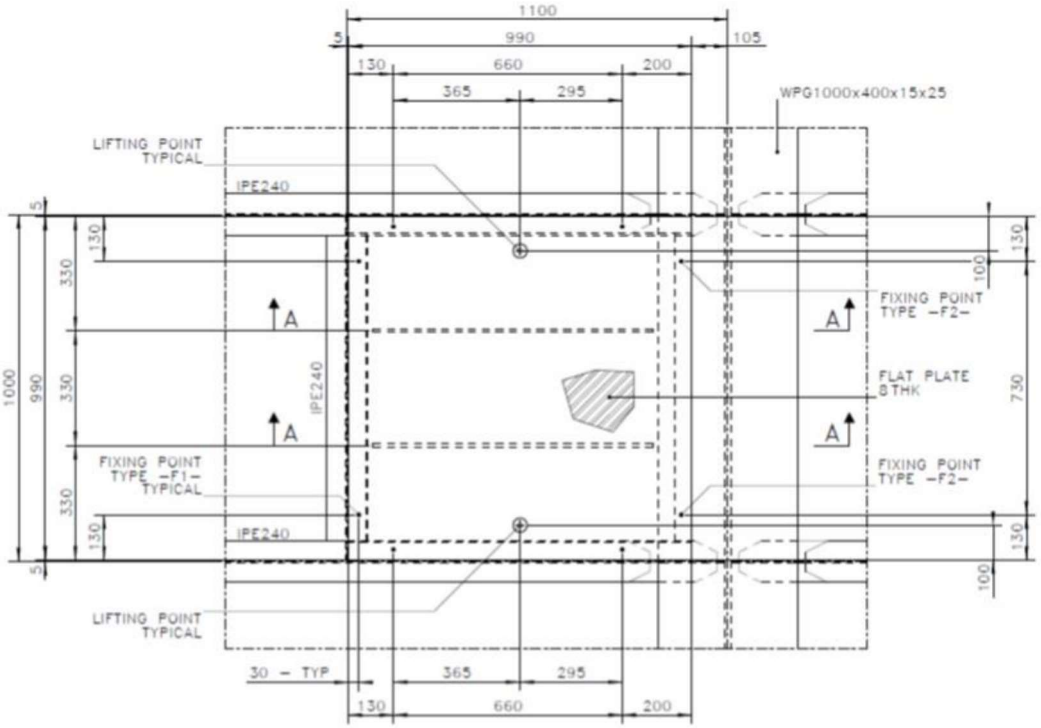
Action Response: Access to the top of the TP is through a removable cover on the lower deck. Access to the top of the TP is only foreseen in exceptional cases due to the overhead height of 600mm.

Therefore, no access ladder is provided, but a temporary aluminum ladder will be fitted if deemed necessary.

Ref drawing of temporary hatch is 123A90-DDL-ST-DD-90122_01

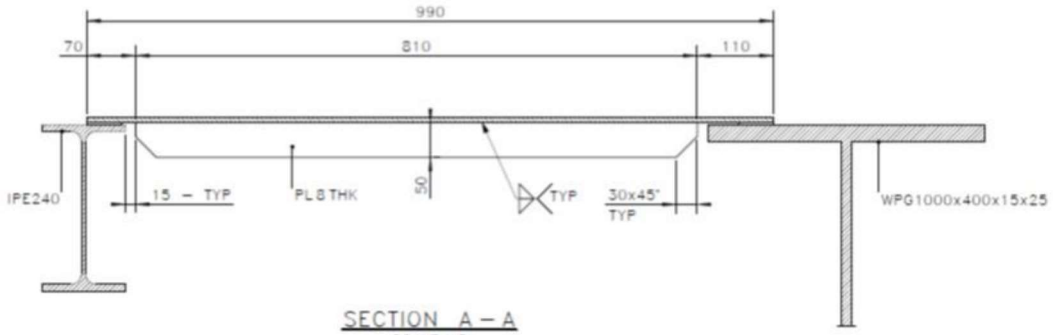
Approvals / Endorsement:

EPC Discipline Lead / Construction	**Date**	**Sign**
A.Balzarotti	**03-09-2024**	Alessandro Balzarotti Digitally signed by Alessandro Balzarotti DN: cn=Alessandro Balzarotti, o=Rosetti Marino, ou=Engineering, email=alessandro.balzarotti@teconsrl.it, c=IT Date: 2024.09.06 10:30:08 +02'00'
EPC HSE Lead	**Date**	**Sign**
C. Caracciolo	**03-09-2024**	
EPC Project Engineering Manager	**Date**	**Sign**
D. Lo Sterzo	**06/09/2024**	
Client	**Date**	**Sign**
N LE BRUN	06/09/2024	LE BRUN Signer ID: 5VSEXLUIBO...



HATCH – PLAN VIEW

SCALE 1:10



SECTION A – A

SCALE 1:5

CROSSWIND

ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action Title: Human Factor Workshop

Action n.: 6

Reference Document n: 123A90-DDL-SAF-RE-30049

Item n.: BLPH Lower deck workplaces and equipment inspection activities

Cause: requirements from NORSOK S-002, 5.4.1, NORSOK S-DP-003

Are drip trays provided under all sampling / filling points and other places where spillage might occur?

Consequence: Drip trays are not provided under biocide sampling point, but deck is plated. The risk to spillage in the sea is negligible.

Actions: Rosetti to investigate if sample collection is needed to check biocide concentration.

Assigned Respondent (By): Rosetti - Process

Issue date: 27/02/2024

Action Response: As per water treatment package no sample collection point is included on tank biocide. Sample points are at intermediate system to ensure performance of the water treatment package.

Approvals / Endorsement:

EPC Discipline Lead / Construction	Date	Sign
F. Mura	03-09-24	
EPC HSE Lead	**Date**	**Sign**
C. Caracciolo	03-09-24	CC
EPC Project Engineering Manager	**Date**	**Sign**
D. Lo Sterzo	04/09/2024	
Client	**Date**	**Sign**
N LE BRUN	04/09/2024	LE BRUN Signer ID: 5VSEXLUIBO...

DRAWING NO. 1724000448-PR-PID-00013

REV. 02

MANUAL VALVES

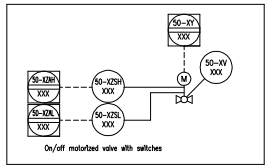
	GATE VALVE
	BALL VALVE
	CHECK VALVE
	NEEDLE VALVE
	"Y" TYPE FILTER
	DIAPHRAGM VALVE
	AUTOMATIC AIR VENT VALVE

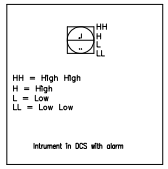
OPERATED VALVES

	MOTORIZED ACTUATOR ON-OFF BALL VALVE
	PRESSURE SAFETY VALVE

OTHER SYMBOLS

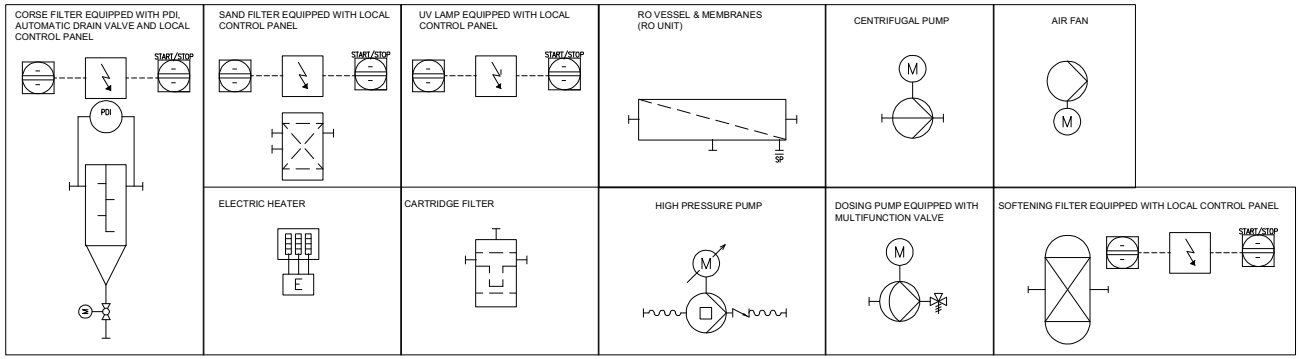
	Local instrument
	Instrument in DCS
	Interlock in DCS
	Software signal
	Electric signal





INSTRUMENTS IDENTIFICATION – REFER TO ISA S5.1 FOR DETAILS

Letter	FIRST LETTER	LETTERS FOLLOW		
	Measure or process variable	Modification	Letter or passive function	Output function
A	Analysis		Alarm	
B	Flame detection		Optional user	Optional user
C	Conductivity	Control		Regulation
D	Density	Differential		
E	Electrical voltage	Element	Primary el.	
F	Flow	Relationship		
G	Choice user			
H	Manual override			
I	Electricity		Indication	
J	Power	Scanation		
K	Time schedule or time	Rate of change		
L	Level		Light	
M	Choice user	Momentary or Instant.		
N	Choice user		Optional user	Optional user
O	Choice user		Orifice or restriction	
P	Pressure		Handheld	
Q	Quantity	Full or score.		
R	Radioactivity		Registration	
S	Speed or frequency	Security		Interruption
T	Temperature	Transmitter		Transmission
U	General alarm			Multifunction
V	Vibration or mechanical analysis	Valve	Valve	
W	Weight or force		Well or sheath	
X	Variable unclassified	X axis	Not rated	Not rated
Y	State or event	Y axis		Computing module
Z	Position or size	Z axis		



PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	22-AUG-24	UR	WR	RM	ISSUED FOR REVIEW
01	29-MAY-24	GG	WR	RM	ISSUED FOR REVIEW
00	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

ROSETTI MARINO

TITLE :
WATER TREATMENT PACKAGE
SEA WATER FINE FILTRATION
P&I DIAGRAM

CONTRACT NO./TITLE — SCALE –

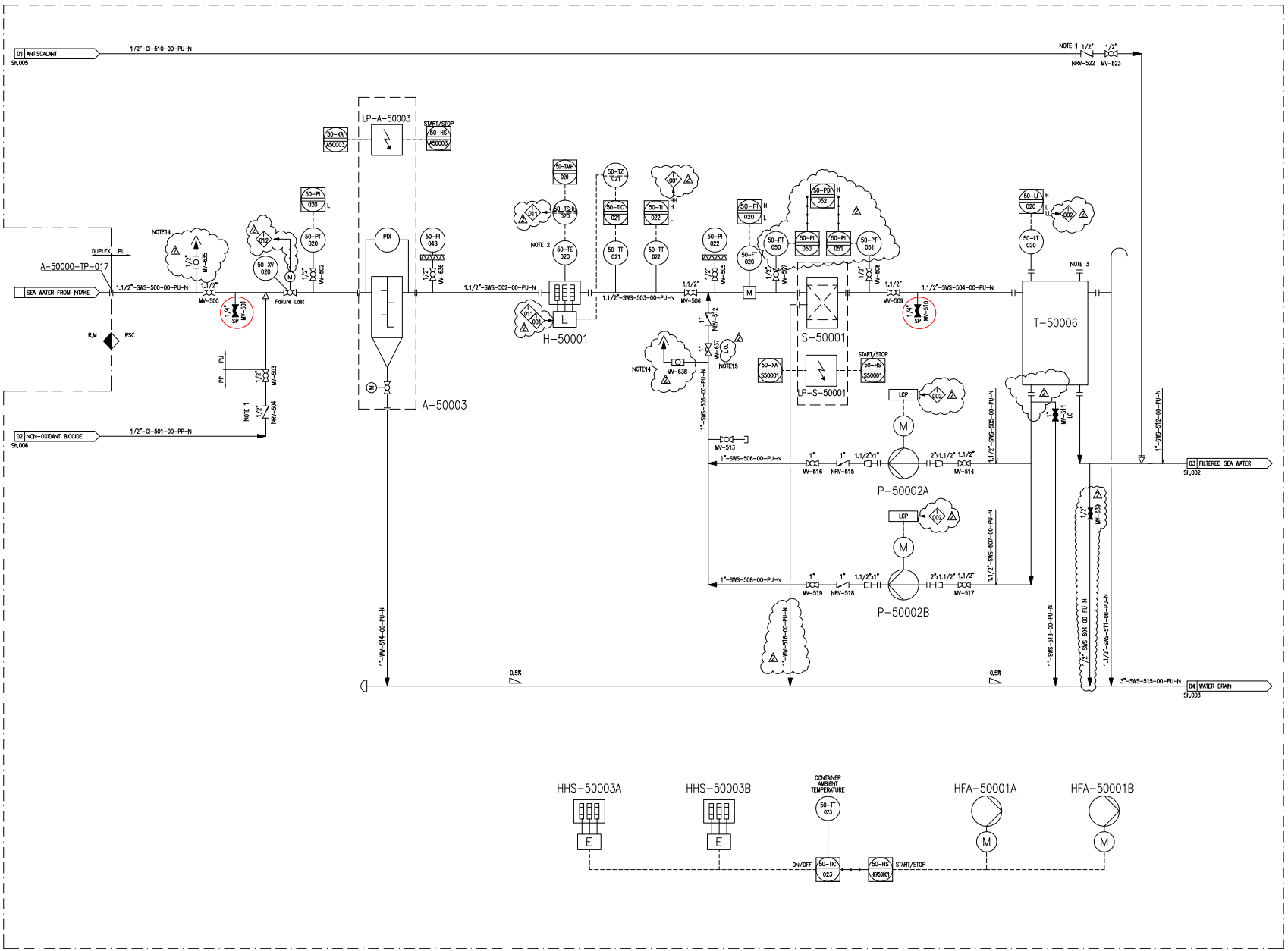
DRAWN UR | CHECKED WR | APPROVED RM | DATE 22/08/24

A1 | DRAWING NO. 1724000448-PR-PID-00013 | SHEET 001 | REV. 02

File Name : 1724000448-PR-PID-00013 Rev02

DRAWING NO. 1724000448-PR-PID-00013

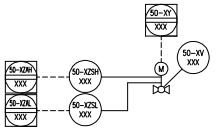
REV. 2



TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-002	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-003	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-005	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTAKE
TP-006	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-007	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

TYPICAL FOR ON/OFF BALL VALVES



NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOUS BIOCIDE DOSAGE TO INTAKE PUMP: CONTINUOUS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOUS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE
14	AUTOMATIC AIR VENT VALVE
15	POSITION TO BE DEFINED DURING COMMISSIONING
16	POLYAMIDE TUBING (RILSAN TYPE)
17	CHECK VALVE (NO SPRING TYPE)
18	DRAIN PAN FOR ANALYZER. DRAIN PAN VOLUME= 5 L

A-50003	
SEA WATER COARSE FILTER	
FILTRATION RATE	125 µm
CAPACITY	2,5 m3/h
DES. PRESS.	5 barg
DES. TEMP.	50° C
MATERIAL	PLASTIC MAT.

H-50001	
ELECTRIC HEATER	
POWER	30 kW
CAPACITY	2,5 m3/h
DES. PRESS.	6 barg
DES. TEMP.	60° C
MATERIAL	PVC-TITANIUM

S-50001	
SAND FILTER	
TYPE	PRESSURE,VERTICAL
CAPACITY	2,5 m3/h
DES. PRESS.	7 barg
DES. TEMP.	50° C
MATERIAL	FRP

T-50006	
FILTERED WATER TANK	
VOLUME	3 m3
DES. PRESS.	ATM
DES. TEMP.	50° C
MATERIAL	FRP

P-50002A/B	
BACKWASH PUMP	
TYPE	CENTRIFUGAL
DES. PRESSURE	6 barg
CAPACITY	5 m3/h
HEAD	0,50 barg
DES. TEMP.	60 °C
MATERIAL	PP

HHS-50003A/B	
CONTAINER ELECTRICAL HEATER	
POWER	8,4 kW
DES. PRESS.	ATM
DES. TEMP.	65°C

HFA-50001A/B	
CONTAINER AIR FAN	
POWER	110 W
DES. PRESS.	ATM
DES. TEMP.	60°C

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	22-AUG-24	UR	WR	RM	ISSUED FOR REVIEW
01	29-MAY-24	GG	WR	RM	ISSUED FOR REVIEW
00	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

ROSETTI MARINO

TITLE :
WATER TREATMENT PACKAGE
SEA WATER FINE FILTRATION
P&I DIAGRAM

CONTRACT NO./TITLE | SCALE –

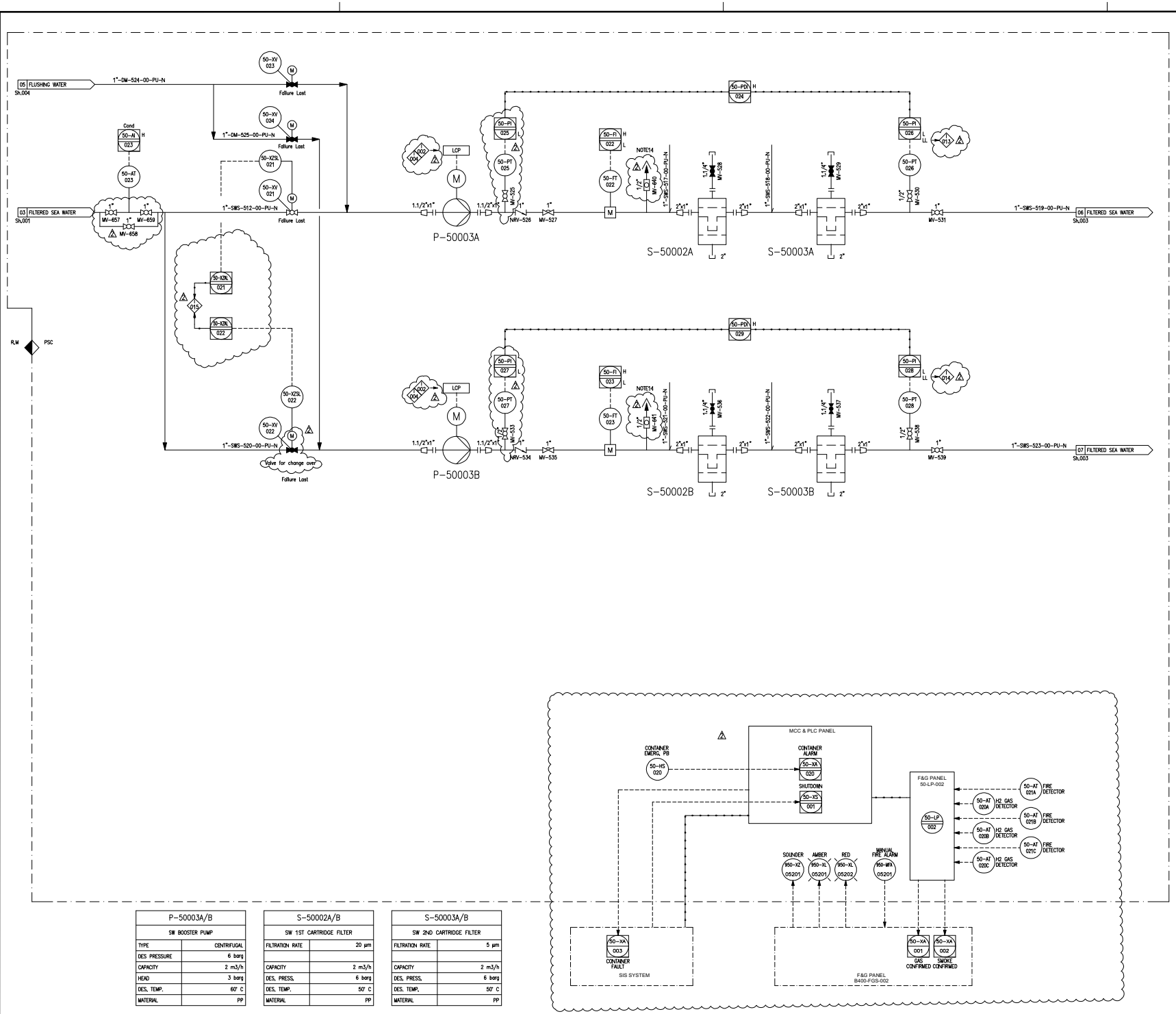
DRAWN UR | CHECKED WR | APPROVED RM | DATE 22/08/24

A1 | DRAWING NO. 1724000448-PR-PID-00013 | SHEET 002 | REV. 02

File Name : 1724000448-PR-PID-00013 Rev02

DRAWING NO. 1724000448-PR-PID-00013

REV. 2



P-50003A/B	
SW BOOSTER PUMP	
TYPE	CENTRIFUGAL
DES PRESSURE	6 barg
CAPACITY	2 m3/h
HEAD	3 barg
DES. TEMP.	60° C
MATERIAL	PP

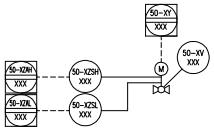
S-50002A/B	
SW 1ST CARTRIDGE FILTER	
FILTRATION RATE	20 µm
CAPACITY	2 m3/h
DES. PRESS.	6 barg
DES. TEMP.	50° C
MATERIAL	PP

S-50003A/B	
SW 2ND CARTRIDGE FILTER	
FILTRATION RATE	5 µm
CAPACITY	2 m3/h
DES. PRESS.	6 barg
DES. TEMP.	50° C
MATERIAL	PP

TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-002	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-003	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-005	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTAKE
TP-006	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-007	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

TYPICAL FOR ON/OFF BALL VALVES



NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: ELPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOUS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOUS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOUS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE
14	AUTOMATIC AIR VENT VALVE
15	POSITION TO BE DEFINED DURING COMMISSIONING
16	POLYAMIDE TUBING (RILSAN TYPE)
17	CHECK VALVE (NO SPRING TYPE)
18	DRAIN PAN FOR ANALYZER. DRAIN PAN VOLUME= 5 L

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	22-AUG-24	UR	WR	RM	ISSUED FOR REVIEW
01	29-MAY-24	GG	WR	RM	ISSUED FOR REVIEW
00	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

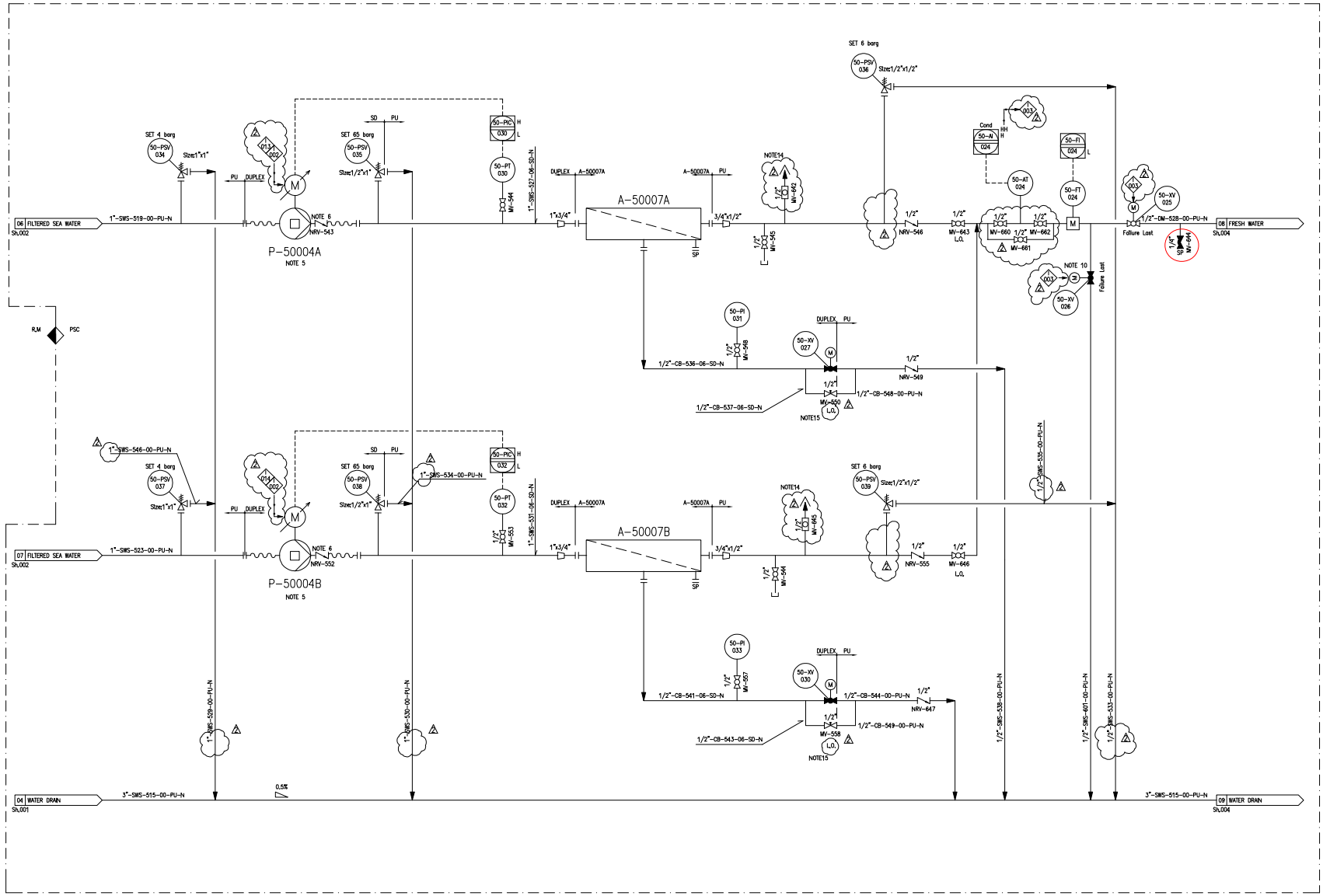
ROSETTI MARINO

TITLE :

WATER TREATMENT PACKAGE
SEA WATER FINE FILTRATION
P&I DIAGRAM

CONTRACT NO./TITLE			SCALE –
DRAWN UR	CHECKED WR	APPROVED RM	DATE 22/08/24
A1	DRAWING NO. 1724000448-PR-PID-00013	SHEET 003	REV. 02

File Name : 1724000448-PR-PID-00013 Rev02



P-50004A/B	
HP PUMP	
TYPE	AXIAL ROTATING PISTONS
DES PRESSURE	83 barg
CAPACITY	2 m3/h
HEAD	63,5 barg
DES. TEMP.	50° C
MATERIAL	SS DUPLEX

A-50007A/B	
SEA WATER REVERSE OSMOSIS UNITS	
CAPACITY	0.8 m3/h
DES. PRESS.	69 barg
DES. TEMP.	45° C
MATERIAL	FRP

TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-002	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-003	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-005	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTAKE
TP-006	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-007	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: ELPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOUS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOUS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOUS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE
14	AUTOMATIC AIR VENT VALVE
15	POSITION TO BE DEFINED DURING COMMISSIONING
16	POLYAMIDE TUBING (RILSAN TYPE)
17	CHECK VALVE (NO SPRING TYPE)
18	DRAIN PAN FOR ANALYZER. DRAIN PAN VOLUME= 5 L

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	22-AUG-24	UR	WR	RM	ISSUED FOR REVIEW
01	29-MAY-24	GG	WR	RM	ISSUED FOR REVIEW
00	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

ROSETTI MARINO

TITLE :
WATER TREATMENT PACKAGE
SEA WATER REVERSE OSMOSIS
P&I DIAGRAM

CONTRACT NO./TITLE | SCALE –

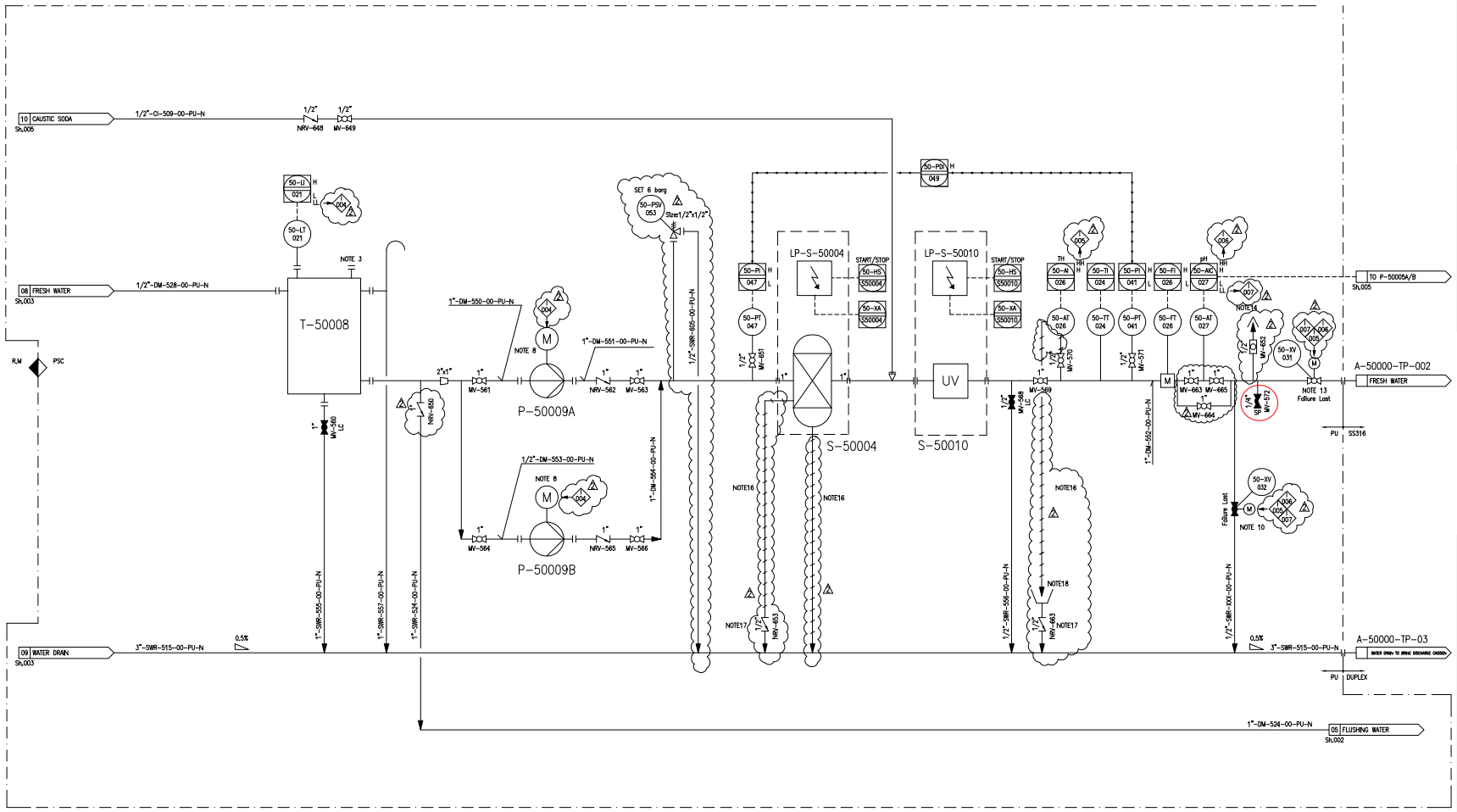
DRAWN UR | CHECKED WR | APPROVED RM | DATE 22/08/24

A1 | DRAWING NO. 1724000448-PR-PID-00013 | SHEET 004 | REV. 02

DRAWING NO. 1724000448-PR-PID-00013 REV. 2

File Name : 1724000448-PR-PID-00013 Rev02

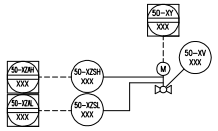
DRAWING NO. 1724000448-PR-PID-00013 REV. 2



TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-002	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-003	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-005	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTAKE
TP-006	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-007	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

TYPICAL FOR ON/OFF BALL VALVES



NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: ELPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOUS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOUS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOUS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE
14	AUTOMATIC AIR VENT VALVE
15	POSITION TO BE DEFINED DURING COMMISSIONING
16	POLYAMIDE TUBING (RILSAN TYPE)
17	CHECK VALVE (NO SPRING TYPE)
18	DRAIN PAN FOR ANALYZER. DRAIN PAN VOLUME= 5 L

T-50008	
FRESH WATER TANK	
VOLUME	2,2 m3
DES. PRESS.	ATM
DES. TEMP.	50° C
MATERIAL	FRP

P-50009A/B	
FRESH WATER PUMP	
TYPE	CENTRIFUGAL
DES PRESSURE	25 barg
CAPACITY	0,8 m3/h
HEAD NOTE 11	4,2 barg
DES. TEMP.	120° C
MATERIAL	SS 316L

S-50010	
UV STERILIZER	
CAPACITY	0,8 m3/h
DES. PRESS.	8 barg
DES. TEMP.	50° C
MATERIAL	SS 316

S-50004	
SOFTENING FILTER	
CAPACITY	0,8 m3/h
DES. PRESS.	6 barg
DES. TEMP.	40° C
MATERIAL	FRP-PLASTIC

PSC DOC. REF: PK2885-B-001

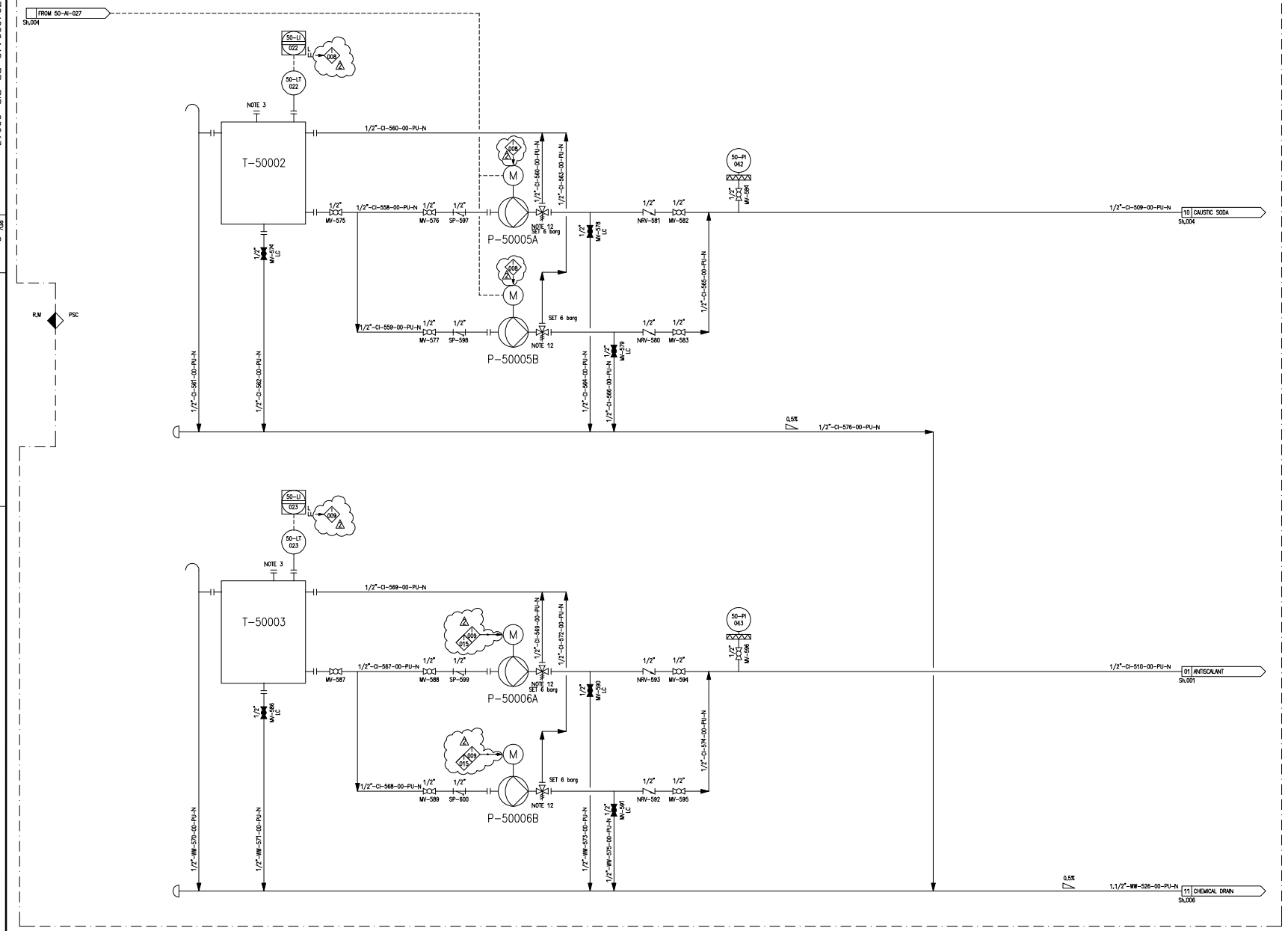
REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	22-AUG-24	UR	WR	RM	ISSUED FOR REVIEW
01	29-MAY-24	GG	WR	RM	ISSUED FOR REVIEW
00	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND ROSETTI MARINO

TITLE : WATER TREATMENT PACKAGE
FRESH WATER STORAGE
P&I DIAGRAM

CONTRACT NO./TITLE | SCALE –
DRAWN UR | CHECKED WR | APPROVED RM | DATE 22/08/24
A1 | DRAWING NO. 1724000448-PR-PID-00013 | SHEET 005 | REV. 02

File Name : 1724000448-PR-PID-00013 Rev02



T-50002	
CAUSTIC SODA DOSING TANK	
VOLUME	0,05 m3
DES. PRESS.	ATM
DES. TEMP.	45° C
MATERIAL	PE

P-50005A/B	
CAUSTIC SODA DOSING PUMP	
TYPE	METERING DIAPHRAGM
DES PRESSURE	10 barg
CAPACITY	0,05 l/h
HEAD	3 barg
DES. TEMP.	45° C
MATERIAL	PVC

T-50003	
ANTISCALANT DOSING TANK	
VOLUME	0,05 m3
DES. PRESS.	ATM
DES. TEMP.	45° C
MATERIAL	PE

P-50006A/B	
ANTISCALANT DOSING PUMP	
TYPE	METERING DIAPHRAGM
DES PRESSURE	10 barg
CAPACITY	0.01 l/h
HEAD	3 barg
DES. TEMP.	45° C
MATERIAL	PVC

TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-002	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-003	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-005	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTAKE
TP-006	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-007	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOUS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOUS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOUS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE
14	AUTOMATIC AIR VENT VALVE
15	POSITION TO BE DEFINED DURING COMMISSIONING
16	POLYAMIDE TUBING (RILSAN TYPE)
17	CHECK VALVE (NO SPRING TYPE)
18	DRAIN PAN FOR ANALYZER. DRAIN PAN VOLUME= 5 L

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	22-AUG-24	UR	WR	RM	ISSUED FOR REVIEW
01	29-MAY-24	GG	WR	RM	ISSUED FOR REVIEW
00	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

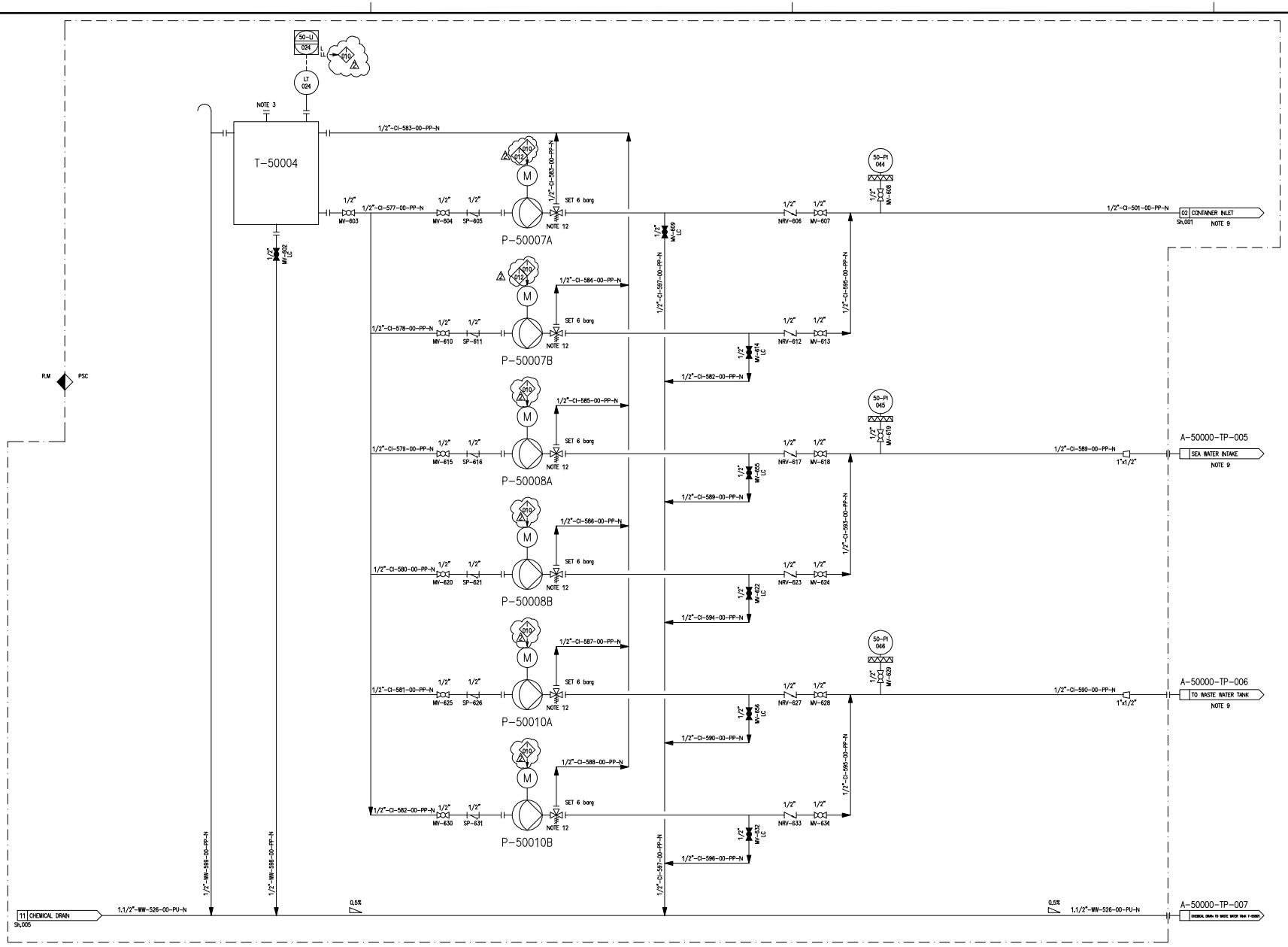
ROSETTI MARINO

TITLE :
WATER TREATMENT PACKAGE
ACID & ANTISCALANT DOSAGES
P&I DIAGRAM

CONTRACT NO./TITLE			SCALE –
DRAWN UR	CHECKED WR	APPROVED RM	DATE 22/08/24
A1	DRAWING NO. 1724000448-PR-PID-00013		SHEET 006 / REV. 02

DRAWING NO. 1724000448-PR-PID-00013 REV. 2

File Name : 1724000448-PR-PID-00013 Rev02



TERMINAL POINT

TP No.	NPS	FINISH	RATING	FACE	MATERIAL	DESCRIPTION
TP-017	1.1/2"	FLG.	150#	RF	DUPLEX	SEA WATER FROM INTAKE PUMPS
TP-002	1"	FLG.	150#	RF	SS 316	PRODUCT WATER
TP-003	3"	FLG.	150#	RF	DUPLEX	SEA WATER DRAIN
TP-005	1"	FLG.	150#	RF	PP	BIOCIDE TO SEA WATER INTAKE
TP-006	1"	FLG.	150#	RF	PP	BIOCIDE TO WASTE WATER TANK
TP-007	1.1/2"	FLG.	150#	RF	PVC	CHEMICAL DRAIN

NOTES

No.	DESCRIPTION
1	SPRING LOADED CHECK VALVE.
2	SUPPLIED WITH EQUIPMENT.
3	INSPECTION COVER.
4	FILTER WITH PANEL AND AUTOMATIC MULTIPORT VALVE.
5	PUMP EQUIPPED WITH FLUSHING VALVE.
6	CHECK VALVE SUPPLIED WITH THE PUMP.
7	ALL MANUAL VALVES TAGS ARE PRECEDED BY: BLPH-
8	LOGIC FOR CONTROL OF P50009A/B THAT PREVENTS SIMULTANEOUS RUNNING OF A PUMP A AND B IS PROVIDED.
9	BIOCIDE DOSAGE TO CONTAINER INLET: CONTINUOUS BIOCIDE DOSAGE TO INTAKE PUMP: DISCONTINUOUS BIOCIDE DOSAGE TO WASTE WATER TANK: DISCONTINUOUS
10	OFF SPEC ON/OFF VALVE
11	SHUT OFF PRESSURE OF P-50009A/B = 6 barg
12	MULTIFUNCTIONAL VALVE BY PUMP SUPPLIER: BACKPRESSURE, PRESSURE RELIEF, ANTI-OVERFLOW AND SAFETY VALVE FUNCTION.
13	OUTLET VALVE
14	AUTOMATIC AIR VENT VALVE
15	POSITION TO BE DEFINED DURING COMMISSIONING
16	POLYAMIDE TUBING (RILSAN TYPE)
17	CHECK VALVE (NO SPRING TYPE)
18	DRAIN PAN FOR ANALYZER. DRAIN PAN VOLUME= 5 L

T-50004	
NON-OXIDANT BIOCIDE DOSING TANK	
VOLUME	0,1 m3
DES. PRESS.	ATM
DES. TEMP.	45° C
MATERIAL	PE

P-50007A/B	
NON-OXIDANT BIOCIDE DOSING PUMP – CONTAINER INLET	
TYPE	METERING DIAPHRAGM
DES PRESSURE	10 barg
CAPACITY	0,03 l/h
HEAD	3,5 barg
DES. TEMP.	45° C
MATERIAL	PVC

P-50008A/B	
NON-OXIDANT BIOCIDE DOSING PUMP – SEA WATER INTAKE	
TYPE	METERING DIAPHRAGM
DES PRESSURE	10 barg
CAPACITY	0,85 l/h
HEAD	3,5 barg
DES. TEMP.	45° C
MATERIAL	PVC

P-50010A/B	
NON-OXIDANT BIOCIDE DOSING PUMP – WASTE WATER TANK	
TYPE	METERING DIAPHRAGM
DES PRESSURE	10 barg
CAPACITY	0,33 l/h
HEAD	3,5 barg
DES. TEMP.	45° C
MATERIAL	PVC

PSC DOC. REF: PK2885-B-001

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	22-AUG-24	UR	WR	RM	ISSUED FOR REVIEW
01	29-MAY-24	GG	WR	RM	ISSUED FOR REVIEW
00	24-APR-24	UR	RC	RM	ISSUED FOR REVIEW

CROSSWIND

ROSETTI MARINO

TITLE :
WATER TREATMENT PACKAGE
BIOCIDE DOSAGE
P&I DIAGRAM

CONTRACT NO./TITLE | SCALE –

DRAWN UR | CHECKED WR | APPROVED RM | DATE 22/08/24

A1 | DRAWING NO. 1724000448-PR-PID-00013 | SHEET 007 | REV. 02

DRAWING NO. 1724000448-PR-PID-00013 | REV. 2

File Name : 1724000448-PR-PID-00013 Rev02

CROSSWIND

ROSETTI MARINO

HOLLANDSE KUST NOORD WIND PARK Project

Base Load Power Hub (BLPH)

Action Title: Human Factor Workshop

Action n.: 7

Reference Document n: 123A90-DDL-SAF-RE-30049

Item n.: BLPH Lower deck technical rooms

Cause: requirements from NORSOK S-002, Annex B

Are centre heights of control devices for standing operations (including valve handles) max. 1800 mm above base?

Are the centre heights of control devices for normal operation controls and for controls where access in an emergency is required 900-1500 mm above base?

Consequence: Requirement partially satisfied (all cabinets are installed > 1800 mm).

Actions: Rosetti to provide portable step ladders in case of operation in the top of cabinets.

Assigned Respondent (By): Rosetti - Architectural

Issue date: 27/02/2024

Action Response: **Height of the steps will be adjustable in order to adapt to each container door. The ladders weight will not exceed a normal weight to be lifted from/to inside containers.**

Approvals / Endorsement:

EPC Discipline Lead / Construction	**Date**	**Sign**
M. Gatti	**03-09-24**	Maurizio Gatti Autore firma digitale: Maurizio Gatti Nome distintivo: CN = Maurizio Gatti email = maurizio.gatti@rosetti.it C = IT O = Rosetti Marino SpA Data: 2024.09.04 12:59:13 +02'00'
EPC HSE Lead	**Date**	**Sign**
C. Caracciolo	**03-09-24**	**CC**
EPC Project Engineering Manager	**Date**	**Sign**
D. Lo Sterzo	**04/09/2024**	
Client	**Date**	**Sign**
N LE BRUN	06/09/2024	LE BRUN Signer ID: 5VSEXLUIBO...