Base Load Power Hub (BLPH)

HAZOP Terms of Reference

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

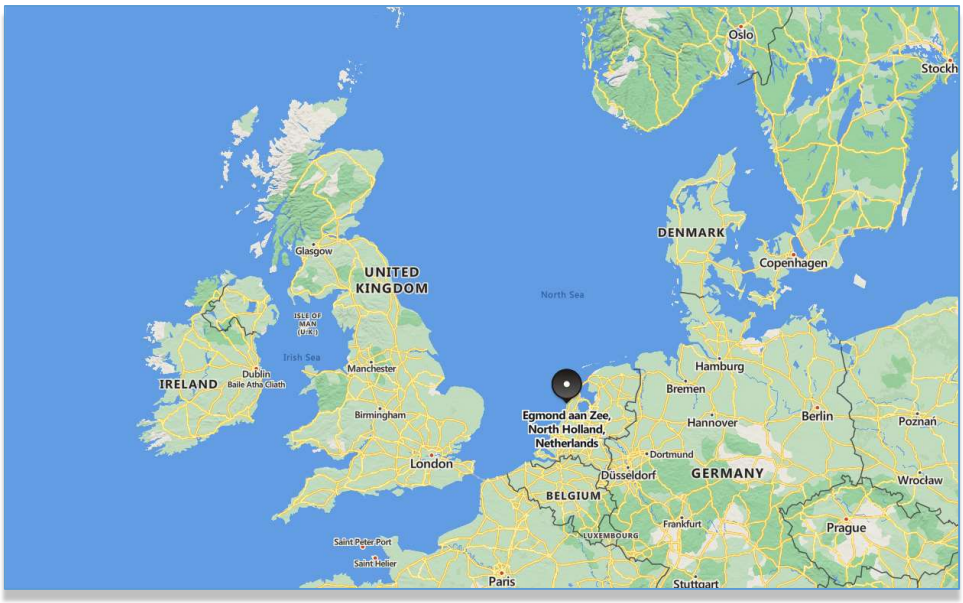


Figure 1 - HOLLANDSE KUST NOORD WIND PARK Location Map

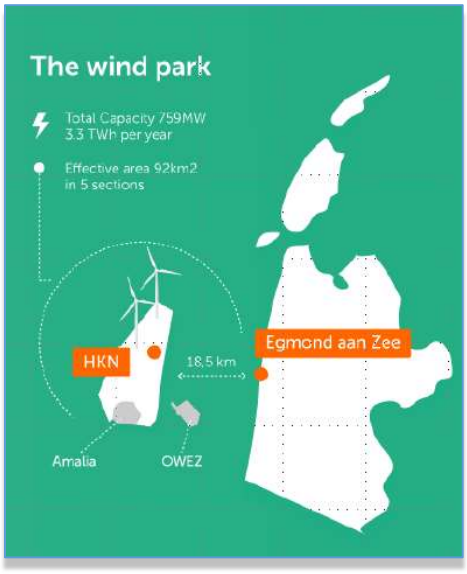


Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

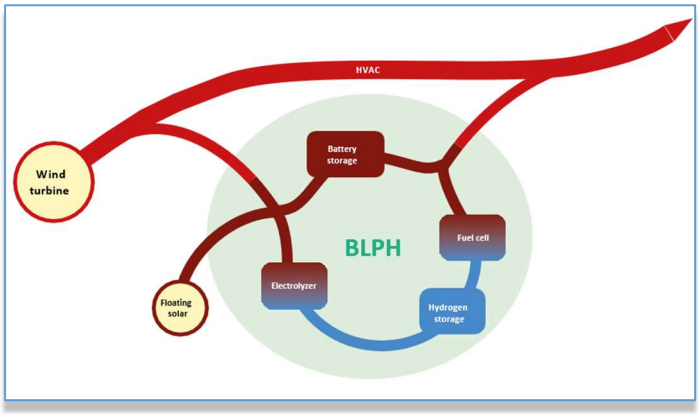


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

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2 DOCUMENT SCOPE

This document is the specific Hazard and Operability study (HAZOP) Terms of Reference (ToR) for the Integration Package Scope. The HAZOP study is integrated with the Layer of Protection Analysis (LOPA) for which a separate ToR has been issued.

2.1 TOR OBJECTIVES

The objectives of this Terms of Reference are to:

- Define the boundaries of the study;
- Present the workshop details and essential pre-read for the workshop attendees;
- Identify the appropriate disciplines and competencies required for the workshop team; and
- Collate the main documents to be used during the HAZOP workshop.

2.2 REFERENCES

Doc. No.	Description
DEP 80.00.00.15-Gen.	Hazard and Operability (HAZOP) Study
DEP 01.00.02.13	Layers of Protection Analysis (LOPA)
DEP 80.45.10.11	Overpressure and Underpressure – Prevention and Protection

Table 1 - Reference Documents

2.3 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY)	Crosswind
CONTRACTOR (CTR)	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project
ALARP	As Low As Reasonable Practicable
BESS	Battery Energy Storage System
BLPH	Base Load Power Hub
BPCS	Basic Process Control System
DEP	Design and Engineering Practice
HAZOP	Hazard and Operability
HER	Hazard and Effects Register
HKN	Hollandse Kust Noord
HSE	Health, Safety and Environment

HSSE	Health, Safety, Security and Environment
IEC	International
IPL	Independent Protection Layer
LOPA	Layer of Protection Analysis
LOPC	Loss of Primary Containment
PACO	Process Automation, Control & Optimisation
PEFS	Process Engineering Flow Sheets
PFD	Process Flow Diagram
RAM	Risk Assessment Matrix
SIF	Safety Instrumented Function
ToR	Terms of Reference

Table 2 - Definitions and Abbreviations

3 OBJECTIVES

The objectives of the HAZOP study are to:

- Review the design and consider whether any of the conditions which may occur from all operating modes (e.g. start-up/shutdown, maintenance), malfunction or mal-operation, can cause harm to people, environment, community or cause damage to equipment/plant.
- Review whether the precautions incorporated in the design are sufficient to prevent the consequence of the hazard occurring or reduce the residual risk As Low As Reasonably Practicable (ALARP).
- Consider whether the plant remains safely operable, goes to a safe hold state or shuts down safely under the circumstances described above.
- Ensure that the hazards of the substances and processes and their impact on the design, construction, testing, operation and maintenance of the plant are fully considered and that relevant safety measures are defined sufficiently.

3.1 MANAGING RISK TO ALARP

Identified hazards will be ranked in the HAZOP in accordance with the Project Hazards and Effects Register (HER) which is supplied by Shell. The project HER sets the expectation as to how HSE risks are to be managed to ALARP.

Key steps in managing risks to ALARP are:

- Eliminate or reduce the hazard by an inherently safer design;

Manage the risk by:

- Meeting laws and regulations and stakeholder expectations;
- Applying codes, Shell or industry standards, and best practices if the risk is well understood; and
- Performing hazard analysis (e.g. LOPA) if the risk is not well understood.
- Assess the risk and demonstrate that the barriers incorporated in design reduce the risk to a tolerable level as a minimum with additional barriers considered and applied to demonstrate ALARP.

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4 WORKSHOP

4.1 WORKSHOP SCHEDULE

The HAZOP workshops are scheduled for the 27th to 30th November 2023.

The workshop will be carried out face-to-face at the Rosetti Marino office in Milan, Italy. It is understood that a number of personnel will also be joining the workshops virtually using Microsoft Teams. As the workshops will utilise two displays concurrently, two Teams meetings should be arranged to allow virtual participation. Details on how to enter the meetings are provided in Attachment 4.

4.2 DAILY AGENDA

The following agenda is proposed. This will be adjusted on the basis of progress made at the discretion of the workshop team. The proposed schedule for analysis of the nodes is given in Section 5.5.

Time	Activity
09.00 – 09.15	Presentation, introduction to project, methodology / process review for HAZOP incl. documentation
09.15 – 11.00	Start HAZOP
11.00 – 11.15	Break
11.15 – 13.00	Continue HAZOP
13.00 – 14.00	Lunch Break
14.00 – 16.30	Continue HAZOP
16.30 – 16.45	Break
16.45 – 17.45	Continue HAZOP
17.45 – 18.00	Wrap-up / Conclusion

Table 3 – Workshop Daily Agenda

4.3 WORKSHOP ATTENDEES

The team members required for the Integration Package HAZOP/LOPA Workshop should as a minimum consist of the following members:

- Chairperson;
- Recorder (HAZOP Scribe);
- Process Engineer;
- Operations Representative;
- Technical Safety Engineer; and

- Process, Automation, Control and Optimisation (PACO)/Instrumentation Engineer.

4.4 DOCUMENTS REQUIRED

The documents presented in Table 4 & Table 5 are required for the HAZOP and should be made available to the HAZOP team prior to the workshops.

Doc. No.	Description
123A90-DDL-IN-CE-40000	Process Safety Cause & Effect Matrix
123A90-DDL-IN-LIS-40027	Master Alarm Database
123A90-DDL-PP-DL-70070	Plot Plan - Lower & Upper deck
123A90-DDL-PP-DL-70071	Plot Plan - Below Lower deck
123A90-DDL-PP-DL-70072	Plot Plan - Elevation looking north & East
123A90-DDL-PR-RE-80040	Process Design Philosophy
123A90-DDL-SAF-RE-30001	Fire Protection Philosophy
123A90-DDL-SAF-RE-30046	HSE Design Philosophy

Table 4 - DEFINE HAZOP Documents

The Process Engineering Flow Sheets (PEFS) listed below have been marked-up with the HAZOP nodes to be studied, and are contained in Attachment 1.

Doc. No.	Description
123A90-DDL-PR-PID-80011	ELECTROLYSER PACKAGE
123A90-DDL-PR-PID-80012	FUEL CELL PACKAGE
123A90-DDL-PR-PID-80013	HYDROGEN STORAGE VESSELS HEADER (INLET)
123A90-DDL-PR-PID-80014	HYDROGEN STORAGE VESSELS HEADER (OUTLET)
123A90-DDL-PR-PID-80015	HYDROGEN STORAGE VESSEL A
123A90-DDL-PR-PID-80016	HYDROGEN STORAGE VESSEL B
123A90-DDL-PR-PID-80017	HYDROGEN STORAGE VESSEL C
123A90-DDL-PR-PID-80018	HYDROGEN STORAGE VESSELD
123A90-DDL-PR-PID-80019	HYDROGEN STORAGE VESSEL E
123A90-DDL-PR-PID-80020	HYDROGEN STORAGE VESSEL F
123A90-DDL-PR-PID-80021	SEA-WATER INTAKE SYSTEM SHEET 1
123A90-DDL-PR-PID-80022	SEA-WATER INTAKE SYSTEM SHEET 2
123A90-DDL-PR-PID-80023	WATER TREATMENT PLANT SHEET 1

Doc. No.	Description
123A90-DDL-PR-PID-80024	WATER TREATMENT PLANT SHEET 2
123A90-DDL-PR-PID-80025	WATER DISPOSAL SHEET 1
123A90-DDL-PR-PID-80026	WATER DISPOSAL SHEET 2
123A90-DDL-PR-PID-80027	INSTRUMENT AIR PACKAGE
123A90-DDL-PR-PID-80028	HYDROGEN VENT HEADER
123A90-DDL-PR-PID-80029	HYDROGEN VENT DRUM
123A90-DDL-PR-PID-80009	GENERAL NOTES
123A90-DDL-PR-PID-80010	PIPING SYMBOLOGY
123A90-DDL-PR-PID-80011	ELECTROLYSER PACKAGE

Table 5 - List of Unit PFD, UFD and PEFS

5 HAZOP METHODOLOGY

5.1 INTRODUCTION

The HAZOP will be executed in accordance with the Shell HAZOP DEP.

5.2 PARAMETERS AND GUIDE WORDS

Table 6 shows the parameter – guide word combinations that shall be used for the HAZOP.

Parameter	Guide Words						
	No/ less/ low	More/ high	Mis-directed	Reverse	As well as	Other than	General
Flow	✓	✓	✓	✓	✓		
Pressure	✓	✓					
Temperature	✓	✓					
Level	✓	✓					
Phase						✓	
Composition/Contamination						✓	
Operations							✓
Start-up/ shutdown							✓
Catalysts							✓
Maintenance							✓
Utilities							✓
Corrosion/ erosion							✓
Other							✓

Table 6 - Parameters and Guide Words

5.3 RAM SCORE

The RAM Score recorded in the HAZOP shall be in accordance with the Project HER.

If the hazard being reviewed in the HAZOP scenario is not included in the HER, a recommendation to update the HER should be made. The ranking of the newly identified hazard may be carried out in the HAZOP if there is sufficient knowledge in the team to do so. If the ranking of a similar hazard is adopted, reference to the similar hazard should be made. A flammable hazard should not be used as reference for a non-flammable release.

Within the Integration Package the only anticipated Hazard is hydrogen which is ranked according to the project HER as:

- People, 5A;
- Asset, 4B;
- Community, 4B; and
- Environment, 3B.

5.4 GROUND RULES & ASSUMPTIONS

5.4.1 Consequence Development

The following ground rules & assumption are to be followed when developing the consequences:

- All Individual Basic Process Control System (BPCS) loops are assumed to be on manual to analyse the unmitigated consequence. The individual control system loops should be listed as a barrier and identified as "valid" if they meet the criteria in the LOPA DEP.
- In the HAZOP, it is allowed to make references to scenarios where the same consequence is fully developed and the same barriers apply. An additional barrier in the 'barrier' column can be added, if there is any.
- It is not allowed to make references to scenarios when the cause will lead to a scenario which has to be included in the LOPA, according to the LOPA DEP rules. If there is a scenario for LOPA and the initiating events/valid barrier combinations are not significant (Mitigated Event Frequency (MEF) at least one order of magnitude lower than the determining case) a reference is allowed. As an example, for inadvertent closure of manual valve around a control valve it is acceptable to make a reference in the HAZOP to the control valve and to record that the cause is not developed further in LOPA, including a justification indicating the reason (e.g., Initiating Event Frequency (IEF) is an order of magnitude lower than control valve failure and Initiating Event (IE) has one more valid barrier (alarm + operator action)).
- Where there is a Loss of Primary Containment (LOPC) as a result of the upset, it is not required to split the right hand side of the bowtie into separate consequences in the HAZOP. The hazard will be ranked on the material.
- Not all consequences need to be developed/LOPA'd separately if it is clear which one is determining. Note that depending on tolerability criteria, Control of Ignition Sources and equipment rupture probability, the determining consequence may not be intuitive (it may not be explosion, it may be leak rather than equipment rupture). A simulation (e.g. to determine release flow rate and validity of control of ignition sources) may help in some cases to determine quickly the determining case. When not all consequences are developed, a justification should be indicated in the HAZOP as to the reason why (e.g., equipment rupture not determining in view of its probability of 0.01, or,

for this scenario, there is no potential for 10+ fatalities. The tolerability criteria for fire and explosion is identical. Fire case is therefore determining).

5.4.2 Valves

All valves, both manual and actuated, shall be listed as separate causes. If there are multiple manual valves in the same line, these can be added together as one cause. Normally open valves will be recorded under the deviation "no flow". Normally closed valves shall be recorded under the deviation "mis-directed flow".

5.4.3 Blinds, Spectacle Plates & Caps

If a "blind", "closed spectacle plate" or "cap" is shown on a PEFS, then the HAZOP Team will not consider the "blind", "closed spectacle plate" or "cap" being in the incorrect position. However, the closed spectacle blind may be opened during a certain (transient) mode of operation (e.g., start-up). Use of the line-up during the transient mode and scenarios associated with the line-up will be identified and assessed.

5.4.4 Safeguards/Barriers

The following definitions will be applied when identifying barriers in the HAZOP:

- Barriers are engineered systems or administrative controls designed to prevent the causes or mitigate the consequences of deviations (e.g., process alarms, process controls, interlocks, SIFs); and
- Barriers shall only be taken into account if they are part of the design (e.g., already part of the design hardware, documentation or operating procedures).

The barriers identified have to satisfy the following criteria to be considered valid:

- Effective;
- Independent;
- Auditable; and.
- Dependable (applicable for Safety Instrumented Functions (SIFs) only - being designed, implemented, maintained, inspected and tested in accordance with IEC 61511.

In the HAZOP all safeguards (barriers) will be listed, both valid and non-valid. Barrier validity will be recorded in the HAZOP for yellow and red risks. Where a safeguard is identified as non-valid then the reason why shall be recorded. When the barrier is identified as valid, the checks made to ascertain validity will be recorded, e.g., nature of operator response (e.g. tag of the valve that the operator will close), which operator (field or control room) will act (when the initiating event is a human error), sufficient time for operator response, direction of failure of the valve for a control loop barrier, sensors and final elements for SIFs, clean service, etc.

Control actions for those BPCS loops (in or outside the unit being considered) that detect the deviation caused by the initiating event and react to it to restore normal conditions/resolve the upset will be recorded

as barriers in the HAZOP. Example: a level control loop in a vessel of which the inlet control valve fails open. Barrier validity must be assessed.

Control actions for those BPCS loops (in or outside the unit being considered) that do not detect the deviation caused by the initiating event and (therefore) do not react to it to restore normal conditions/resolve the upset are considered independent from the initiating event (of course only if they also have independent sensors and final elements). Example: a steam system pressure control loop is independent from the reflux control loop in the column the steam is used as reboiler medium.

The challenge of whether the BPCS can be claimed as an Independent Protection Layer (IPL), in accordance with the Shell LOPA DEP will be carried out in the HAZOP.

The challenge of whether the alarm can be claimed as an IPL, in accordance with the Shell LOPA DEP, will be carried out in the HAZOP.

5.4.5 SIFs

Only the final elements for each respective SIF which prevent the consequence shall be recorded, i.e. if the C&Es identifies several executive actions, only the primary actions which prevent the consequence shall be recorded against the SIF.

If a SIF is considered for a particular consequence (e.g. overpressure) but the SIF design intent does not include the consequence being discussed (e.g. prevent sending liquid to furnace), the SIF may be recorded in the HAZOP but the threat to consequence line will not take part in the LOPA to determine the SIL of the SIF. The SIF design intent should be recorded. If the final element that would be effective for the consequence being considered (e.g. valve in inlet) is not a primary final element (in SIFPro), the SIF will not be considered valid for this particular consequence.

5.4.6 Relief Valves

The following information shall be recorded for relief valves:

- Set points; and
- Correctly sized for the over-pressure event, with documentary evidence.

Passing relief valves shall not be taken as a "cause" unless the relief valve discharges to atmosphere.

5.4.7 Over-Pressure Consequences

In accordance with the Shell LOPA DEP, the HAZOP Team shall record over-pressure consequences as follows:

1. Consequence of rupture – this will have the highest severity
2. Consequence of flange leak – possibly a lower severity

Recording the consequences this way will allow the probability of rupture to be identified in the LOPA in accordance with the data in Table 7 and the leak hole size in accordance with the data in Table 8.

The consequence shall be written to clearly indicate the design pressure and the maximum pressure generated from the upset case so that over-pressure ratio can be clearly seen.

A suitably sized relief valve is the default minimum safeguarding solution for overpressure cases. Only if implementing an adequate relief system is not practicable, an alternative design approach may be adopted. See Shell Overpressure DEP Section 2.10.3 for definition of what is not practicable and for an alternative safeguarding approach. It is not the purpose of a HAZOP or LOPA to design safeguarding systems. However, if the team identifies an overpressure case without suitable relief system and no documented justification of the non-practicability of the relief system, a recommendation to review the design and comply with DEP requirements should be raised in the HAZOP.

Vessel Design Code	Safety Factor	Probability of equipment rupture (Note 1)		
		Prob = 0.01	Prob = 0.1	Prob = 1.0
ASME Section VIII Pre-2000	4:1	2.8≤PR<3.2	3.2≤PR<3.6	3.6≤PR
ASME Section VIII 2000 and newer	3.5:1	2.5≤PR<2.8	2.8≤PR<3.2	3.2≤PR
ASME Section VIII Div 2, Stoomwezen, or CODAP	3:1	2.2≤PR<2.4	2.4≤PR<2.7	2.7≤PR
EN-13445	2.4:1	1.8≤PR<2.0	2.0≤PR<2.2	2.2≤PR
AS-1210 or PD5500	2.35:1	1.8≤PR<2.0	2.0≤PR<2.2	2.2≤PR

Table 7 - Probability of Rupture

Vessel Design Code	Safety Factor	Pressure/MAWP ratio or design pressure (PR) that results in hole of given diameter (probability = 1) (Note 1)		
		7 mm (0.28 in) (Note 2)	25mm (1 in.)	100mm (4 in.) (Note 3)
ASME Section VIII Pre-2000	4:1	cHTP≤PR<1.9	1.9≤PR<3	3≤PR<3.6
ASME Section VIII 2000 and newer	3.5:1	cHTP ≤PR<1.9	1.9≤PR<2.7	2.7≤PR<3.2
ASME Section VIII Div 2, Stoomwezen, or CODAP	3:1	cHTP ≤PR<1.9	1.9≤PR<2.5	2.5≤PR<2.7
EN-13445	2.4:1	cHTP ≤PR<1.9	1.9≤PR<2.1	2.1≤PR<2.2
AS-1210 or PD5500	2.35:1	cHTP ≤PR<1.9	1.9 ≤PR<2.1	2.1 ≤PR<2.2

NOTES:

1. PR = Pressure ratio, this being the ratio of [vessel over-pressure] to [MAWP or design pressure].
2. cHTP = corrected Hydrotest Pressure= actual hydrotest pressure corrected for relief scenario or design temperature.
3. beyond the value of PR given in the 100mm (4 in) diameter hole size column, there is no need to assess a leak case as the probability for equipment rupture is considered to be 1 (i.e., leak case will not be determining).

Table 8 - Flange Hole Size

5.4.8 Locked Manual Valves

If inadvertent closure of a Locked Open (LO) valve causes "immediate" overpressure, verify compliance with ASME VIII Appendix M (North America) or corresponding (outside North America) Shell interpretation (single valve with or without lock is normally not accepted as an open system if closure of that valve can create an immediate overpressure case greater than 110% of the design pressure).

For locked valves, 2 human errors could occur:

1. The operator has intentionally operated the locked valve (e.g. for shutdown/start-up) and forgot to re-instate it in its normal, locked position. In this case, the lock is not a barrier since the valve was intentionally operated. Operating a locked valve should follow a procedure and therefore initiating event frequencies can be calculated based on LOPA DEP Table 5 and the expected frequency of operation of the locked valve. For this, it is important to understand why the valve was implemented and why it needs to be operated. It is quite different to have a valve that was put for construction

purposes only and will never be operated versus a valve that will be used for some special modes of operation.

2. Inadvertent operation of the wrong valve. Operator should close valve B but closes valve A instead. In this case, the lock is a barrier with PFD=0.1 as per LOPA DEP Table 2 Row 25 (Keyed Bypass /Interlock). In this case, the frequency of operation of the "other/right" valve (in this example valve B) should be considered. This could be a valve physically nearby or a valve on a parallel string/train.

In cases where the human error related to the locked valve is another reason for e.g. a path to be closed, it may not be significant mathematically (in a LOPA/SIF classification). However, it may be quite important to look at if the locked valve is not the only cause for the scenario to develop.

5.5 DEFINED NODES

The proposed nodes for the Interface Package are listed in Table 9 below. The schedule will be adjusted on the basis of progress made at the discretion of the workshop team.

Node #	Node Name	Scheduled
1	Hydrogen	27/11
2	Hydrogen vent system	28/11
3	Seawater and treated water systems	28/11
4	Air system	29/11
5	Nitrogen system	29/11
6	Brine discharge system	30/11
7	Wastewater discharge system	30/11

Table 9 - Node List

5.6 FOLLOW-UP

5.6.1 Reporting

A report of all content created by the workshop, including any required supporting material will be produced after the workshop for comment.

The report will contain the assumptions made and the main output of the workshop, as a detailed worksheet and the action-sheets for each recommendation raised during the sessions.

5.6.2 Actions

Recommendations raised will be collected with the close-out and tracked into a HSSE Action Tracking Register and Close out report, doc. No. 123A90-DDL-SAF-RE-30007 by Rosetti Marina. Each action-sheet

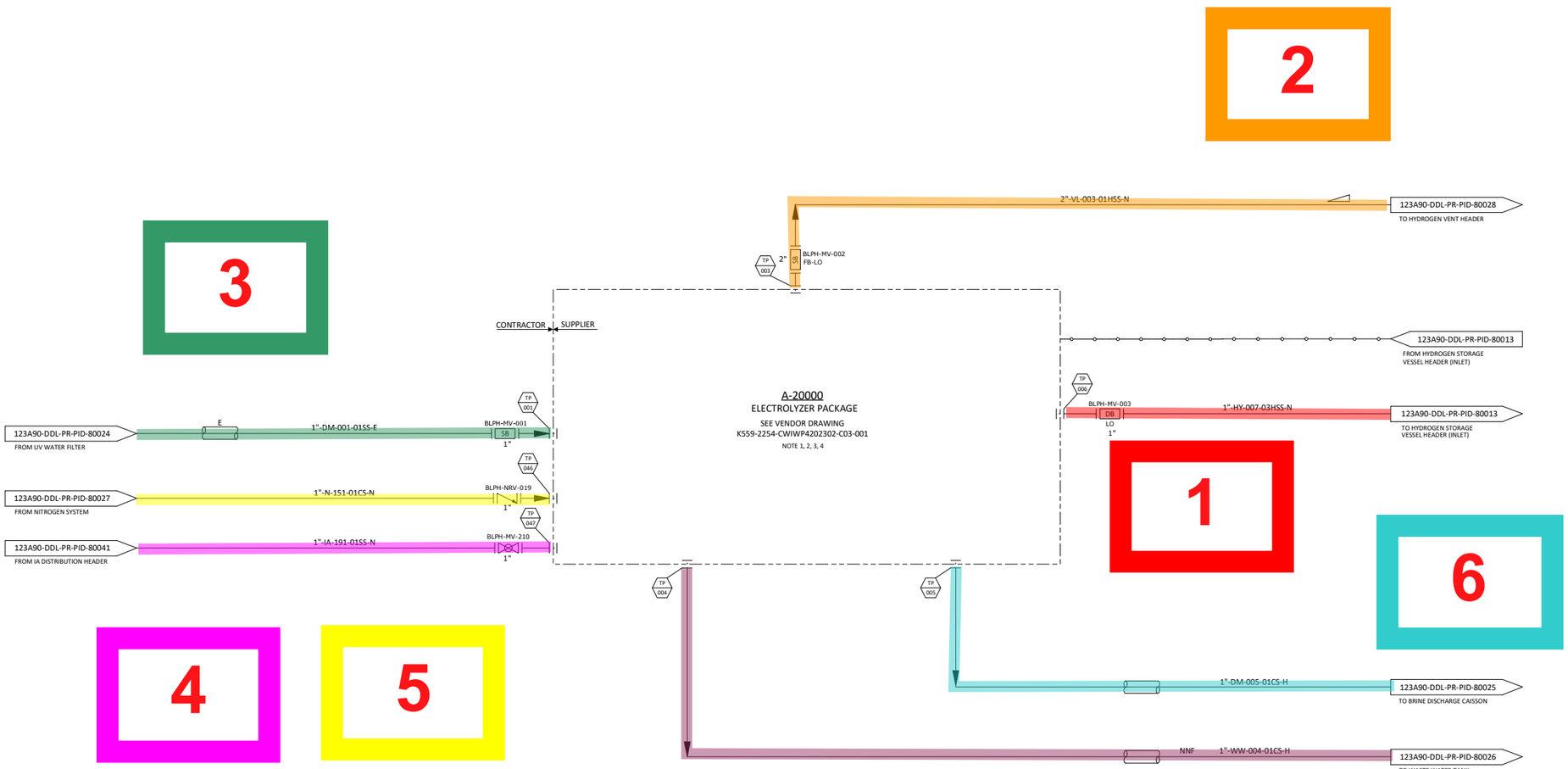
will indicate the recommendation, with the responsible of closing the action, the answer showing how the recommendation is properly closed.

ATTACHMENT 1 – MARKED-UP P&ID

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DRAWING NO. DRAWING_NO.

REV. REV



NOTES

1. PACKAGE SUPPLIED WITH POWER FROM THE BLPH ELECTRICAL SYSTEM.
2. PACKAGE VENDOR TO DEFINE DRAINAGE REQUIREMENTS.
3. PACKAGE DATA TO BE CONFIRMED BY VENDOR.
4. PACKAGE VENDOR TO DEFINE INTERFACE WITH CONTRACTOR AND CCS CONNECTION REQUIREMENTS.

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
ELECTROLYSER PACKAGE

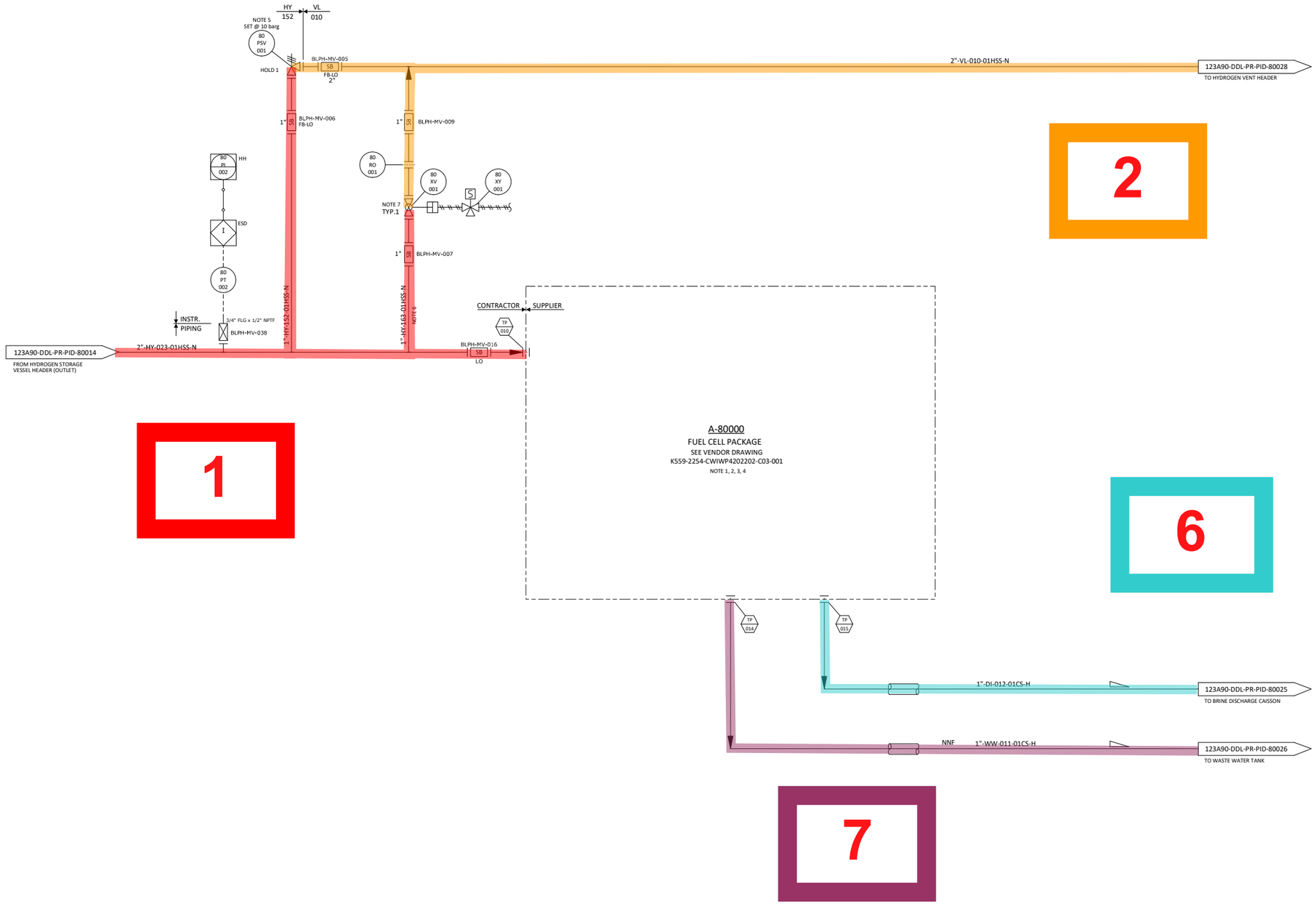
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DRAWN	CHECKED	APPROVED	DATE

A1	DRAWING NO.	SHEET	REV.
	123A90-DDL-PR-PID-80011	001	00

File Name : FILE_NAME

DRAWING NO. DRAWING_NO.

REV. REV



NOTES

1. THE VENDOR PACKAGE WILL CONTAIN AIR INTAKE AND EXHAUST, SUITABLY SAFEGUARDED AND SEPARATED.
2. PACKAGE VENDOR TO DEFINE DRAINAGE REQUIREMENTS.
3. PACKAGE DATA TO BE CONFIRMED BY VENDOR.
4. PACKAGE VENDOR TO DEFINE INTERFACE WITH CONTRACTOR AND CCS CONNECTION REQUIREMENTS.
5. ONE UNINSTALLED SPARE PSV SHALL BE AVAILABLE.
6. LINE REQUIRED FOR PURGING OF PIPING WORK.
7. TIGHT SHUT-OFF VALVE.

HOLDS

1. PSV SIZE (BY VENDOR).
2. SIZE OF LINES UPSTREAM AND DOWNSTREAM PSV AND ORIFICE ARE IN HOLD.

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
FUEL CELL PACKAGE

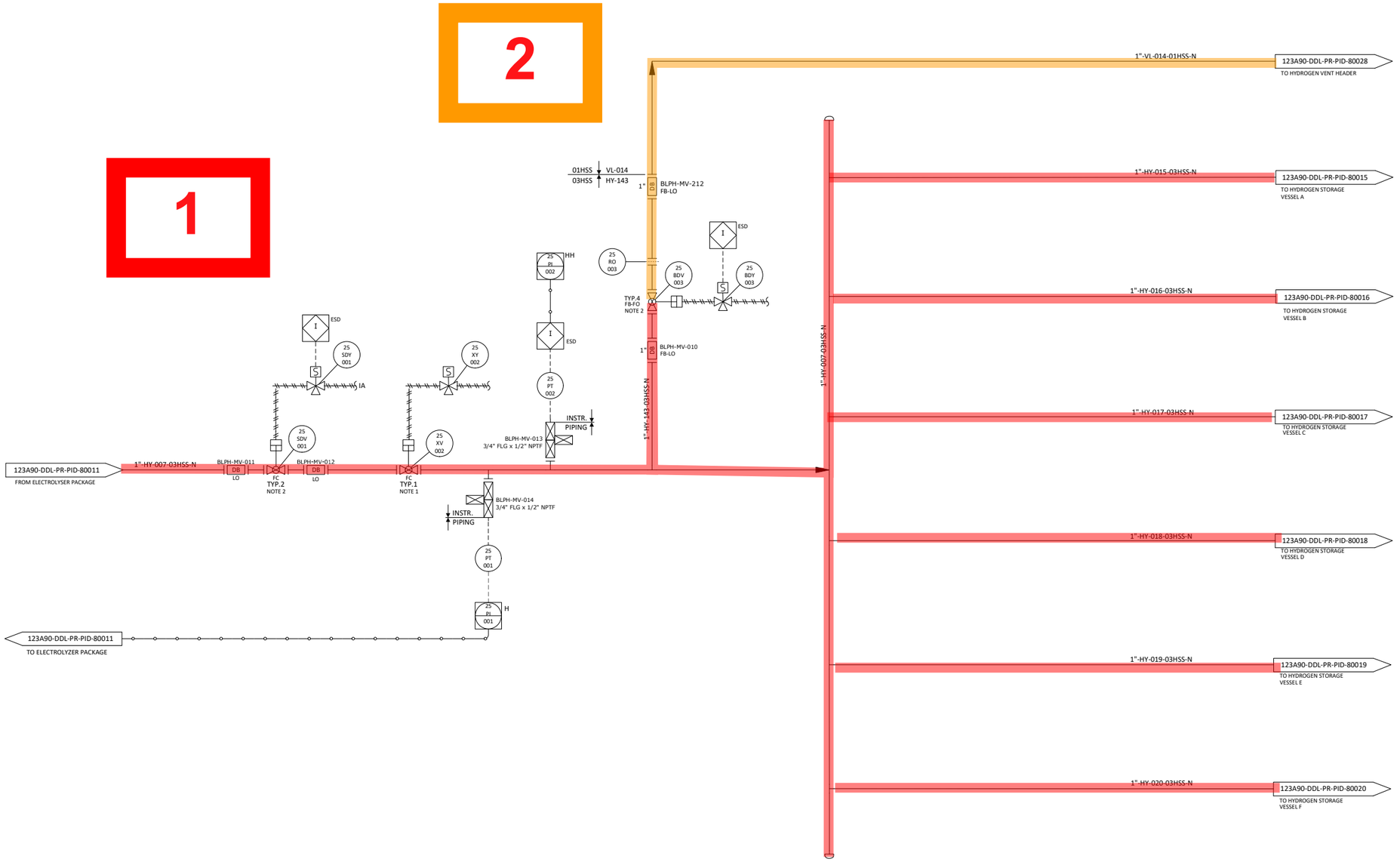
CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE NTS
DRAWN	CHECKED	APPROVED	DATE

	DRAWING NO.	SHEET	REV.
A1	123A90-DDL-PR-PID-80012	001	00

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 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

HOLDS

1. SIZE OF LINES UPSTREAM AND DOWNSTREAM PSV AND ORIFICE ARE IN HOLD.

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

CROSSWIND

ROSETTI MARINO

TITLE :

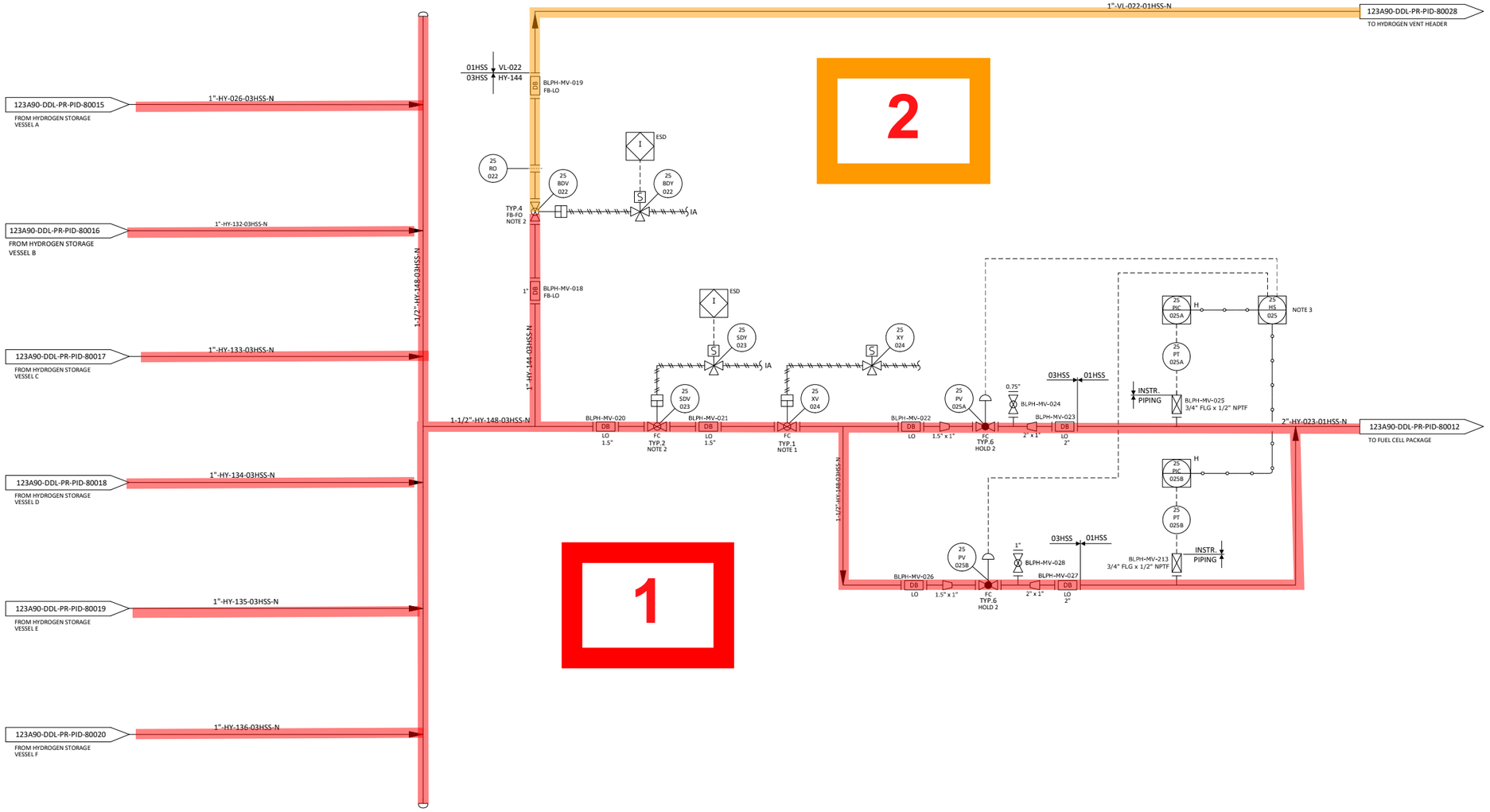
BLPH PIPING AND INSTRUMENTATION DIAGRAM HYDROGEN STORAGE VESSELS HEADER (INLET)

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. 00

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 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
3. HAND SELECTOR TO ALLOW THE OPERATOR TO SELECT THE CONTROL LOOP (REMOTELY).

HOLDS

1. SIZE OF LINES UPSTREAM AND DOWNSTREAM PSV AND ORIFICE ARE IN HOLD.
2. CONTROL VALVE SIZE (BY VENDOR).

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
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. 00

File Name : FILE_NAME

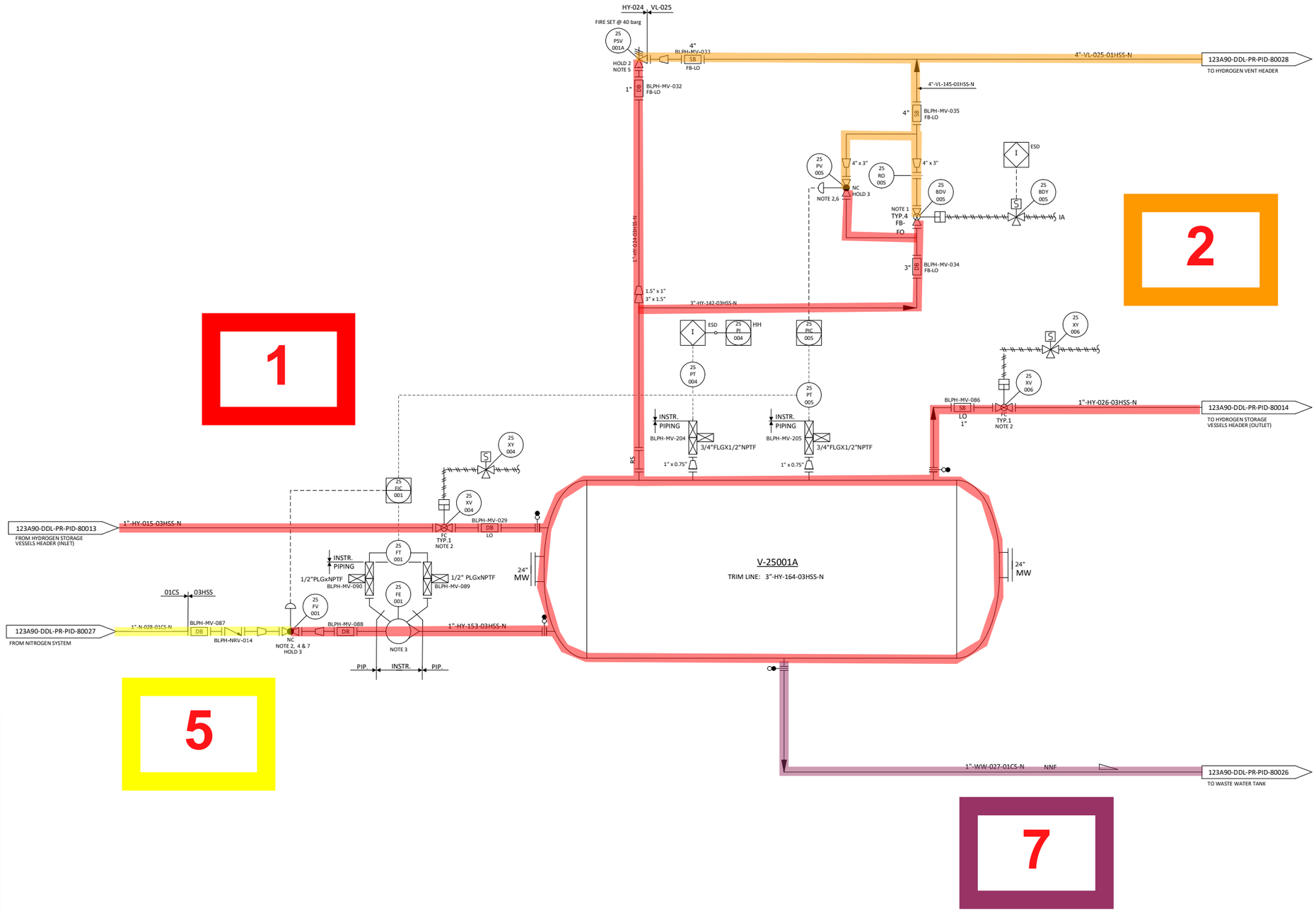
DRAWING NO. DRAWING_NO.

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 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.

HOLDS

1. SIZE OF LINES UPSTREAM AND DOWNSTREAM PSV AND ORIFICE ARE IN HOLD.
2. PSV SIZE (BY VENDOR).
3. CONTROL VALVE SIZE (BY VENDOR).

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 HYDROGEN STORAGE VESSEL A

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

	DRAWING NO.	SHEET	REV.
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File Name : FILE_NAME

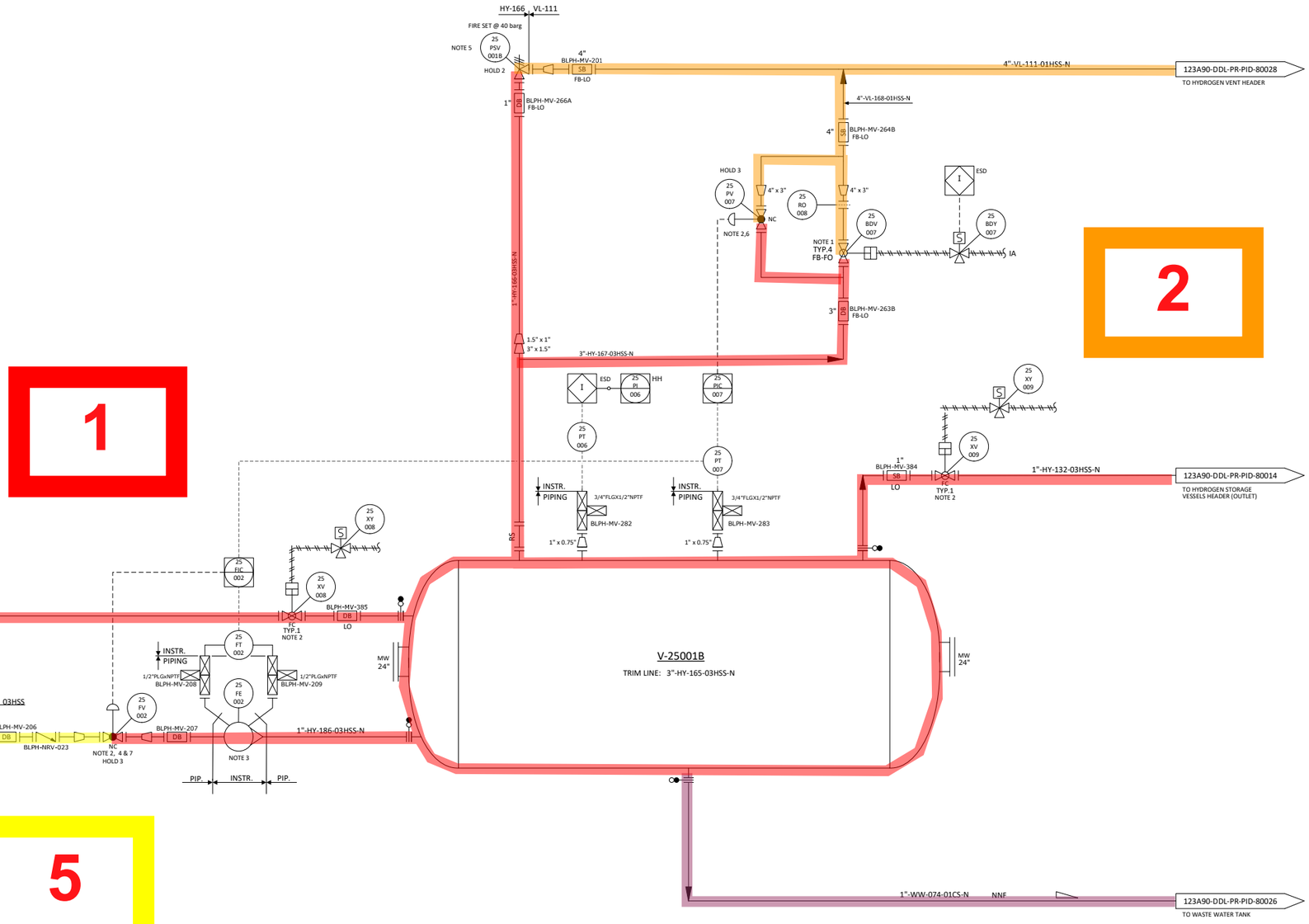
DRAWING NO. DRAWING_NO.

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



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.

HOLDS

1. SIZE OF LINES UPSTREAM AND DOWNSTREAM PSV AND ORIFICE ARE IN HOLD.
2. PSV SIZE (BY VENDOR).
3. CONTROL VALVE SIZE (BY VENDOR).

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
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.	SHEET	REV.
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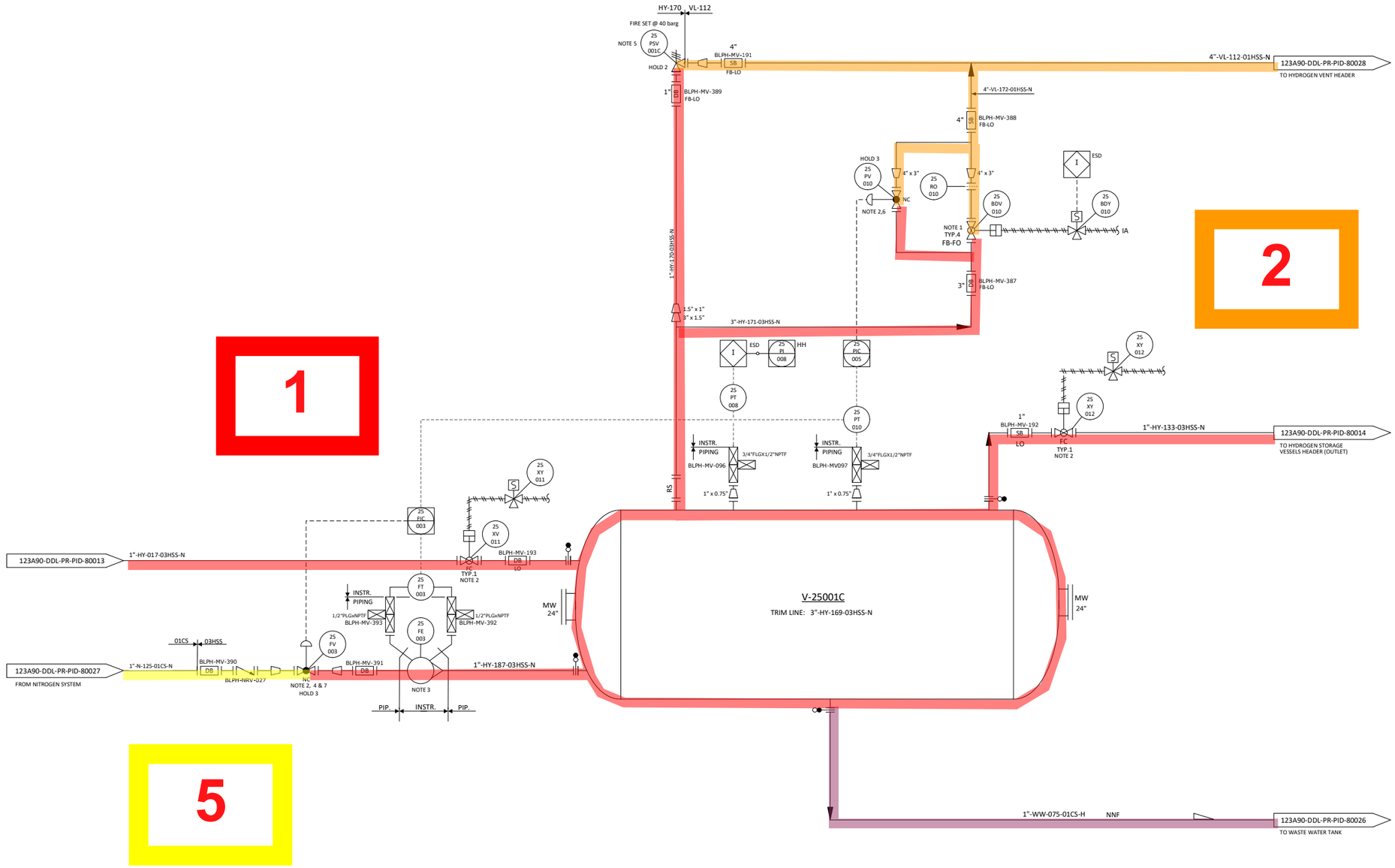
DRAWING NO. DRAWING_NO.

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



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.

HOLDS

1. SIZE OF LINES UPSTREAM AND DOWNSTREAM PSV AND ORIFICE ARE IN HOLD.
2. PSV SIZE (BY VENDOR).
3. CONTROL VALVE SIZE (BY VENDOR).

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
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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File Name : FILE_NAME

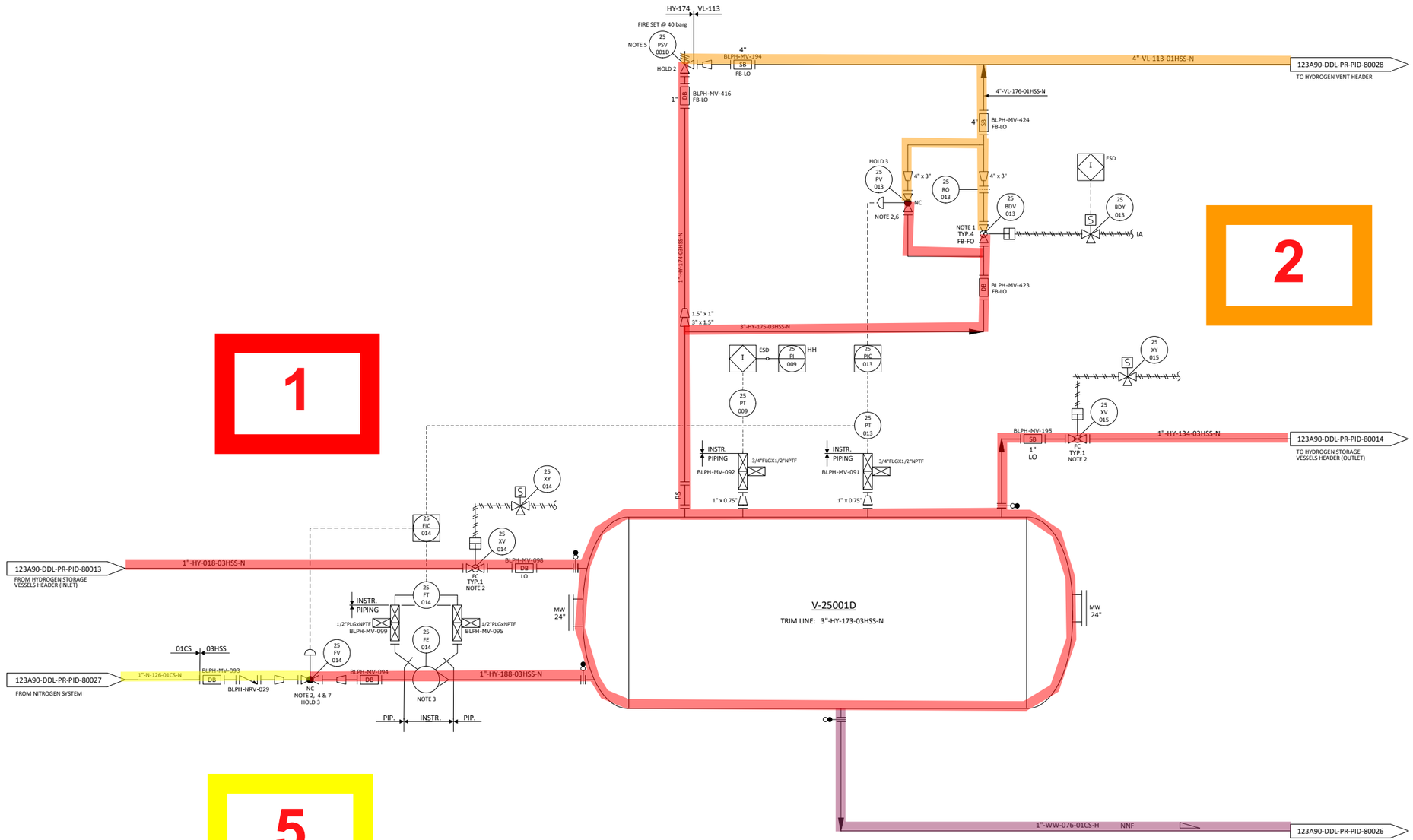
DRAWING NO. DRAWING_NO.

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.

HOLDS

1. SIZE OF LINES UPSTREAM AND DOWNSTREAM PSV AND ORIFICE ARE IN HOLD.
2. PSV SIZE (BY VENDOR).
3. CONTROL VALVE SIZE (BY VENDOR).

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
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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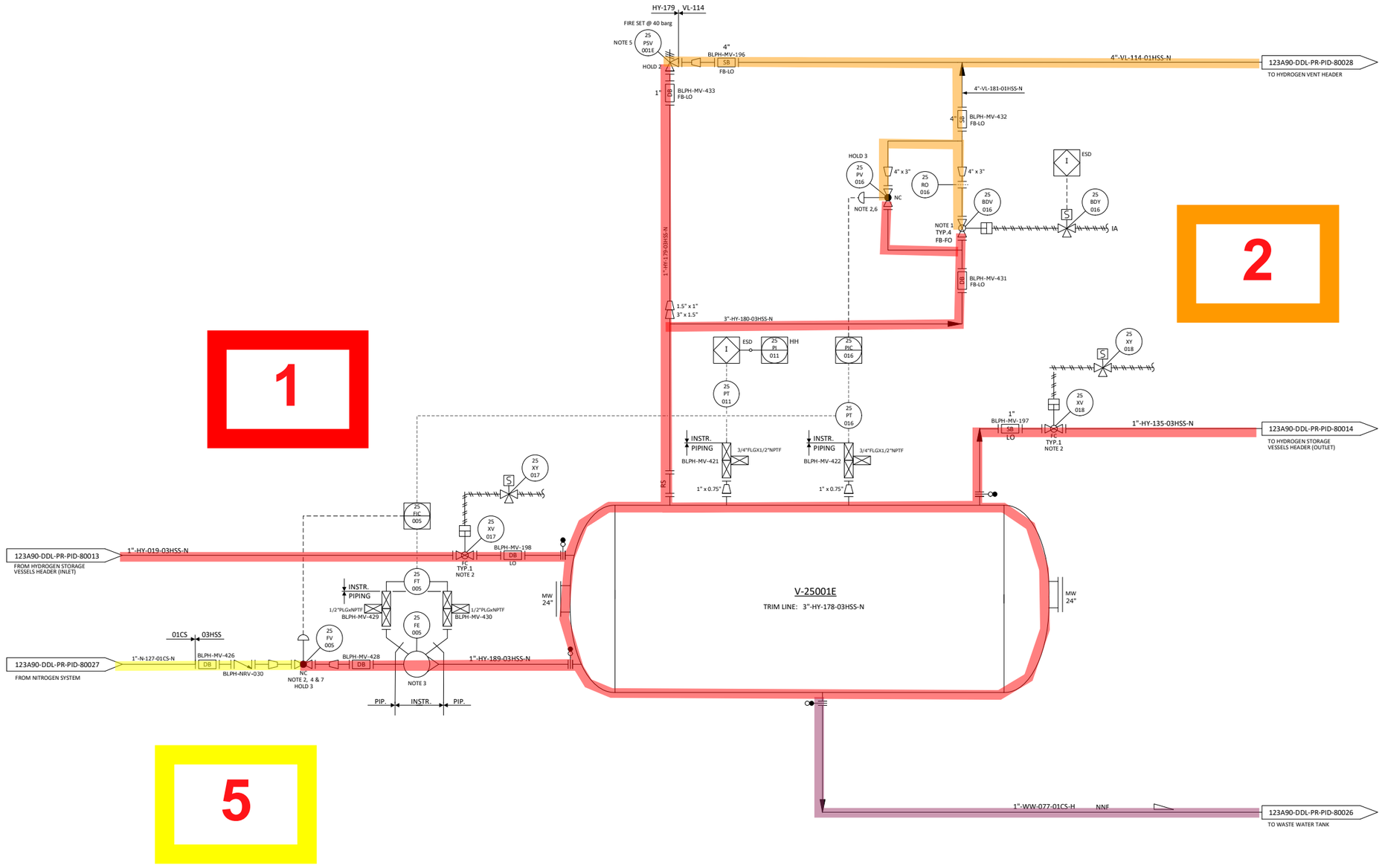
DRAWING NO. DRAWING_NO.

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.

HOLDS

1. SIZE OF LINES UPSTREAM AND DOWNSTREAM PSV AND ORIFICE ARE IN HOLD.
2. PSV SIZE (BY VENDOR).
3. CONTROL VALVE SIZE (BY VENDOR).

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 HYDROGEN STORAGE VESSEL E

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

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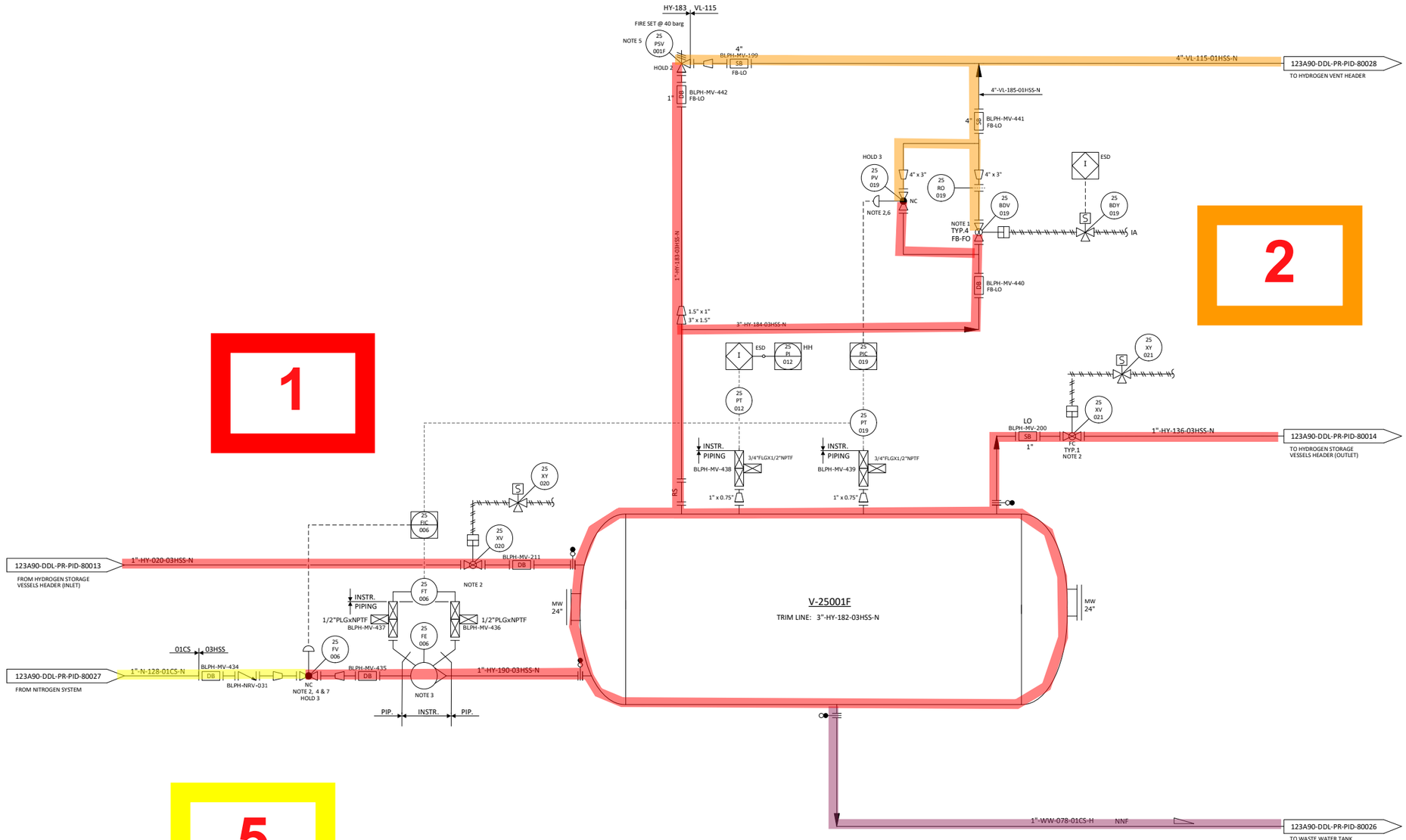
DRAWING NO. DRAWING_NO.

REV. REV

V-25001_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.

HOLDS

1. SIZE OF LINES UPSTREAM AND DOWNSTREAM PSV AND ORIFICE ARE IN HOLD.
2. PSV SIZE (BY VENDOR).
3. CONTROL VALVE SIZE (BY VENDOR).

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

CROSSWIND

ROSETTI MARINO

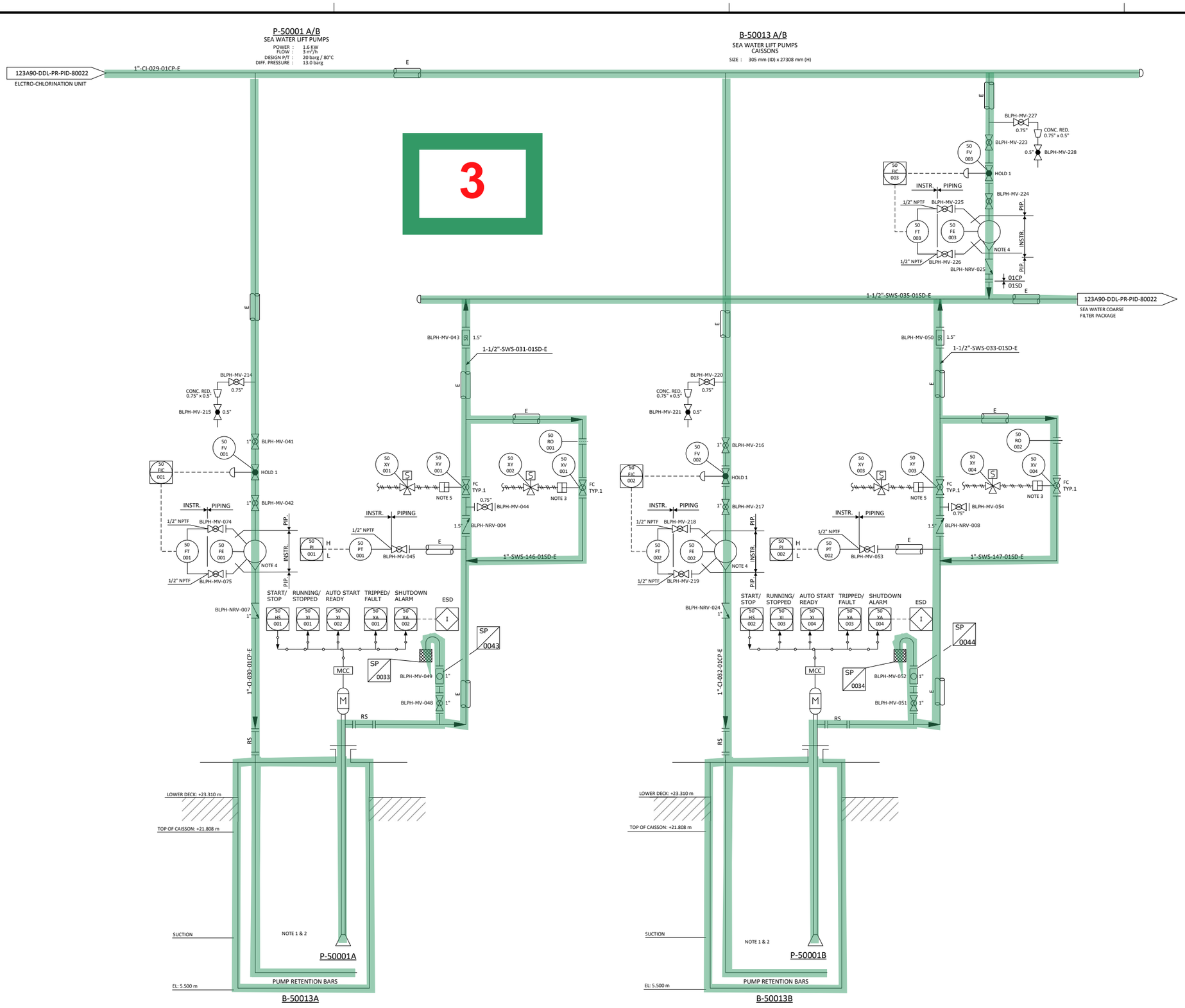
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BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN STORAGE VESSEL F

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

DRAWING NO. DRAWING_NO.

REV. REV.



NOTES

1. SEAWATER LIFT PUMPS ARE RATED 2 X 100%
2. AUTO START OF DESIGNATED STANDBY PUMP ON LOSS OF RUNNING STATUS OF DUTY PUMP.
3. VALVE TO BE OPENED WHEN PUMP IS OFFLINE TO DOSE CAISSON WITH TREATED SEAWATER TO PREVENT BIOLOGICAL GROWTH.
4. VARIABLE AREA FLOWMETER TO BE INSTALLED VERTICALLY WITH DIRECTION OF FLOW UPWARDS.
5. SOFTWARE INTERLOCK PREVENTS PUMPS FROM STARTING UNLESS DISCHARGE XV IS FULLY CLOSED.
6. CAISSONS ARE OPEN TOPPED.

HOLDS

1. CONTROL VALVE SIZE (BY VENDOR)

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

CROSSWIND

ROSETTI MARINO

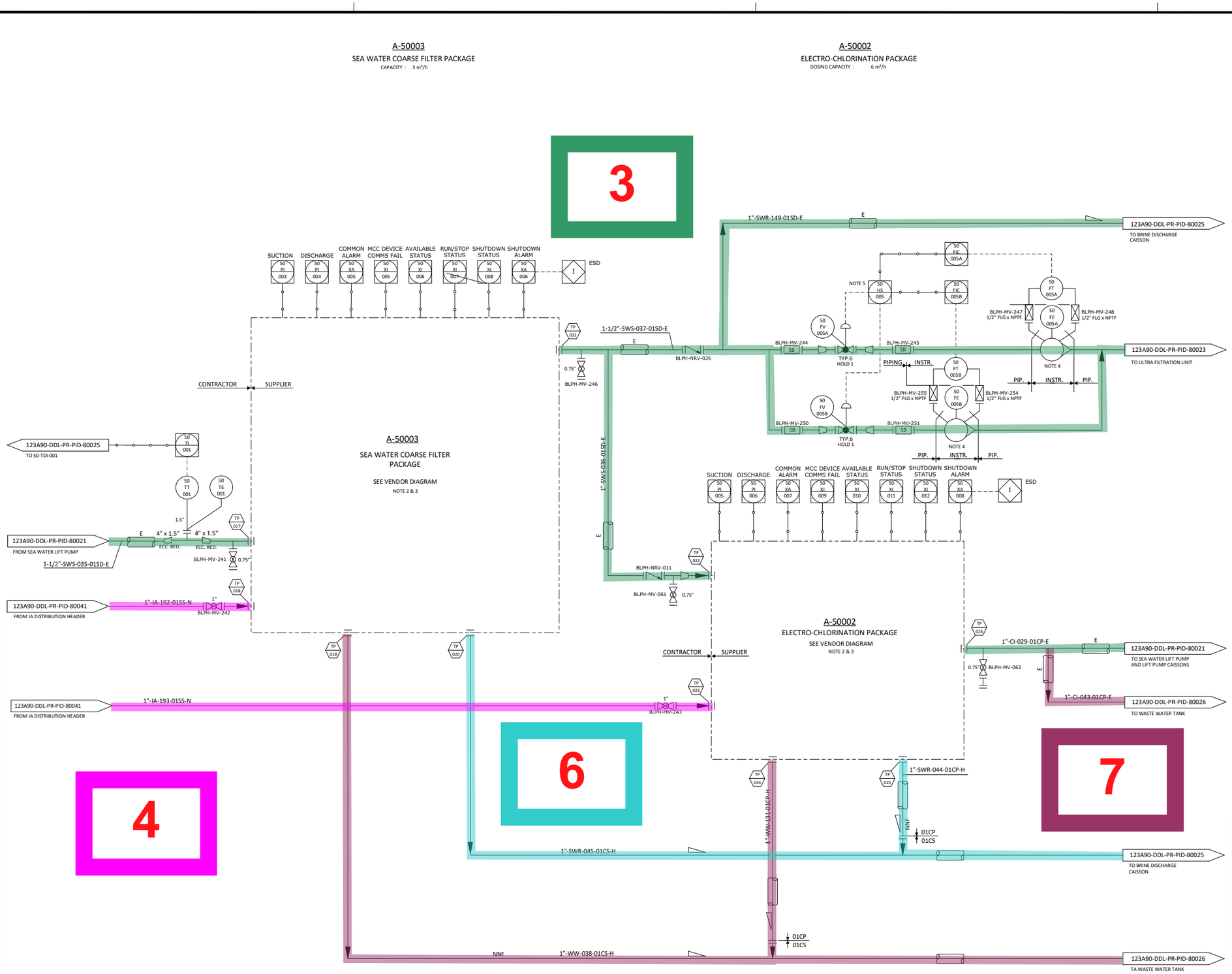
TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
SEA-WATER INTAKE SYSTEM SHEET 1

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-80021	SHEET 001	REV. 00

File Name : FILE_NAME

DRAWING NO. DRAWING_NO.

REV. REV



NOTES

1. DESIGNED FOR CONTINUOUS DOSING OF THE SEAWATER SUPPLY AND INTERMITTENT DOSING OF THE RUNNING SEAWATER AND STAND-BY SEAWATER LIFT PUMP CAISSONS.
2. PACKAGE DATA AND DESIGN TO BE CONFIRMED BY VENDOR AND DRAWING MADE AVAILABLE.
3. PACKAGE VENDOR TO DEFINE INTERFACE WITH CONTRACTOR AND CCS CONNECTION REQUIREMENTS.
4. VARIABLE AREA FLOWMETER TO BE INSTALLED VERTICALLY WITH DIRECTION OF FLOW UPWARDS.
5. HAND SELECTOR TO ALLOW THE OPERATOR TO SELECT THE CONTROL LOOP (REMOTELY).

HOLDS

1. CONTROL VALVE SIZING (BY VENDOR).

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
SEA-WATER INTAKE SYSTEM SHEET 2

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

A1	DRAWING NO.	SHEET	REV.
	123A90-DDL-PR-PID-80022	001	00

File Name : FILE_NAME

DRAWING NO. DRAWING_NO.

REV. REV

A-50005
ULTRA FILTRATION UNIT
CAPACITY : 2 m³/h

T-50006
FILTERED SEA WATER TANK
SIZE : 1600 mm (ID) x 2500 mm (H T/T)
CAPACITY : 5 m³
DESIGN P/T : 3.5 barg / 80°C

A-50007
DESALINATION UNIT
CAPACITY : 1 m³/h

50 LV 006A
BLPH-MV-101 SB
BLPH-MV-102 SB
FC TYP.6 HOLD 1
50 LV 006B
BLPH-MV-103 SB
BLPH-MV-104 SB
FC TYP.6 HOLD 1
E
ESD I
NOTE 4
50 HS 006
BLPH-MV-105 0.75"
50 LIC 006A H L
SP 0035
RS

SUCTION 50 PI 007
DISCHARGE 50 PI 008
COMMON ALARM 50 XA 009
MCC DEVICE COMMS FAIL 50 XI 013
AVAILABLE STATUS 50 XI 014
RUN/STOP STATUS 50 XI 015
SHUTDOWN STATUS 50 XI 016
SHUTDOWN ALARM 50 XA 010

1"-IA-194-01SS-N
TP 027
1" BLPH-MV-256
123A90-DDL-PR-PID-80041
FROM IA DISTRIBUTION HEADER
CONTRACTOR SUPPLIER
1-1/2"-SWS-037-01SD-E
TP 028
E
123A90-DDL-PR-PID-80022
FROM SEA WATER COARSE FILTER PACKAGE
BLPH-MV-249 0.75"
1-1/2"-SWS-046-01SD-E
TP 031
BLPH-MV-100 0.75"

A-50005
ULTRA FILTRATION UNIT
SEE VENDOR DIAGRAM
NOTE 1, 2 & 3

PIPING INSTR.
E 1" BLPH-MV-267 SB
50 LIT 006A
1"-SWR-155-01SD-N
OVERBOARD
PIPING INSTR.
E 1" BLPH-MV-268 SB
50 LIT 006B
50 LIC 006B H L

T-50006
TRIM LINE: 1.5"-SWS-199-01SD-E

RS
50 LI 002 LL
ESD I
BLPH-MV-109 0.75"
PIPING INSTR.
BLPH-MV-264 SB 1" 1"
CONC. RED. 1" x 0.5"
BLPH-MV-265 0.5"
SAMPLE CONNECTION
E 1" BLPH-MV-266 SB
50 LT 002
24" MW
BLPH-MV-269

123A90-DDL-PR-PID-80024
FROM LIC-007A/B
ESD I
SUCTION 50 PI 009
DISCHARGE 50 PI 010
COMMON ALARM 50 XA 011
MCC DEVICE COMMS FAIL 50 XI 017
AVAILABLE STATUS 50 XI 018
RUN/STOP STATUS 50 XI 019
SHUTDOWN STATUS 50 XI 020
SHUTDOWN ALARM 50 XA 012
1-1/2"-SWS-009-01SD-H
SUPPLIER CONTRACTOR
BLPH-MV-110 0.75"

A-50007
DESALINATION UNIT
SEE VENDOR DIAGRAM
NOTE 1, 2 & 3

TP 045
BLPH-MV-257 1"
1"-IA-195-01SS-N
123A90-DDL-PR-PID-80041
FROM IA DISTRIBUTION HEADER
1"-SWR-048-01CS-H
NNF
TP 033
TP 034
TP 035
1"-WW-051-01CS-H
1"-CB-052-01CS-H
NNF
E
1"-DM-050-01SS-E
BLPH-MV-111 0.75"
123A90-DDL-PR-PID-80024
TO FRESH WATER TANK
1"-SWR-053-01CS-H
123A90-DDL-PR-PID-80025
TO BRINE DISCHARGE CAISSON
NNF 1"-WW-054-01CS-H
123A90-DDL-PR-PID-80026
TO WASTE WATER TANK
TP 029
TP 030

3
4
6
7

NOTES

1. RELEVANT CHEMICAL DOSING WILL BE CONTAINED WITHIN THE PACKAGE.
2. PACKAGE DATA AND DESIGN TO BE CONFIRMED BY VENDOR AND DRAWING MADE AVAILABLE.
3. PACKAGE VENDOR TO DEFINE INTERFACE WITH CONTRACTOR AND CCS CONNECTION REQUIREMENTS.
5. HAND SELECTOR TO ALLOW THE OPERATOR TO SELECT THE CONTROL LOOP (REMOTELY).

HOLDS

1. CONTROL VALVE SIZE (BY VENDOR)

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 TREATMENT PLANT 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-80023	SHEET 001	REV. 00

File Name : FILE_NAME

DRAWING NO. DRAWING_NO.

REV. REV

T-50008
FRESH WATER TANK
SIZE : 1125 mm (ID) x 2200 mm (H T/T)
CAPACITY : 2.2 m3
DESIGN P/T : 3.5 barg / 80°C

P-50009 A/B
FRESH WATER PUMPS
FLOW : 1 m3/h
DIFF. PRESSURE : 4.8 barg
DESIGN P/T : 10 barg / 80°C
INSTALLED POWER : 0.2 KW

S-50010
UV WATER FILTER
CAPACITY : 1 m³/h

123A90-DDL-PR-PID-80023
TO DESALINATION UNIT

123A90-DDL-PR-PID-80023
FROM DESALINATION UNIT

1"-DM-050-01SS-E

50 HS 007

50 LV 007A

50 LV 007B

BLPH-MV-119 SB

BLPH-MV-120 SB

BLPH-MV-117 SB

BLPH-MV-118 SB

FC TYP.6

TYP.6

50 LIC 007A H L

50 LIC 007B H L

SP 0036

1"-DM-162-01SS-E

1"-DM-161-01SS-E

50 HS 013B
NOTE 5

50 PV 013A

50 PV 013B

BLPH-MV-124 SB

BLPH-MV-123 SB

BLPH-MV-125 SB

BLPH-MV-126 SB

BLPH-MV-121 0.75"

BLPH-MV-122 0.75"

RS

1"-DM-156-01SS-N

OVERBOARD

PIPING INSTR.

BLPH-DM-001 SB

50 LIT 007A

BLPH-DM-002 SB

50 LIT 007B

E 1"

T-50008
TRIM LINE: 1"-DM-198-01SS-N

50 LI 004 LL

BLPH-MV-279 SB

50 LT 004

BLPH-MV-280 SB

CONC. RED. 1" x 0.5"

BLPH-MV-281 0.5"

SAMPLE CONNECTION

MW 24"

0" BLPH-MV-287

01SS
01CS

ESD

1"-DM-059-01SS-E

TP 036

BLPH-MV-135 0.75"

S-50010
UV WATER FILTER
SEE VENDOR DIAGRAM
NOTE 3 & 4

50 PIC 013B

50 PIC 013A

50 PT 013B

50 PT 013A

INSTR. PIPING

BLPH-MV-286 3/4" FLG x 1/2" NPTF

BLPH-MV-128 3/4" FLG x 1/2" NPTF

123A90-DDL-PR-PID-80011
TO ELECTROLYSER PACKAGE

1"-DM-001-01SS-E-1

TP 038

BLPH-MV-127 0.75"

BLPH-MV-284 0.75"

CONC. RED. 0.75" x 0.5"

BLPH-MV-285 0.5"

SAMPLE CONNECTION

TP 037

START/ STOP 50 HS 003

RUNNING/ STOPPED 50 XI 021

AUTO START READY 50 XI 022

TRIPPED/ FAULT 50 XA 013

SHUTDOWN ALARM 50 XA 014

BLPH-MV-136 SB

BLPH-NRV-016

50 PI 011 H L

50 PIT 011

0.75" BLPH-MV-137

BLPH-MV-138 3/4" FLG x 1/2" NPTF

PIPING INSTR.

1" x 0.5" HOLD 1

1"-DM-057-01SS-E

MCC

1"-DM-060-01SS-E

BLPH-MV-132 0.75"

BLPH-MV-131 1" SB

RS

1" x 0.5" HOLD 1

BLPH-MV-130 0.5"

P-50009A
NOTE 1 & 2

BLPH-MV-141 SB

50 PI 012 H L

50 PIT 012

BLPH-NRV-017

0.75" BLPH-MV-140

BLPH-MV-139 1"

INSTR. PIPING

3/4" FLG x 1/2" NPTF

1"-DM-061-01CS-H

NNF

START/ STOP 50 HS 004

RUNNING/ STOPPED 50 XI 023

AUTO START READY 50 XI 024

TRIPPED/ FAULT 50 XA 015

SHUTDOWN ALARM 50 XA 016

ESD

MCC

1"-DM-058-01SS-E

1" x 0.5" HOLD 1

BLPH-MV-134 SB

BLPH-MV-133 0.5"

P-50009B
NOTE 1 & 2

NNF

1"-DM-056-01CS-H

123A90-DDL-PR-PID-80025
TO BRINE DISCHARGE CAISSON

3

6

NOTES

1. FRESH WATER PUMPS ARE RATED 2 X 100%.
2. AUTO START OF DESIGNATED STANDBY PUMP ON LOSS OF RUNNING STATUS OF DUTY PUMP.
3. PACKAGE DATA AND DESIGN TO BE CONFIRMED BY VENDOR AND DRAWING MADE AVAILABLE.
4. PACKAGE VENDOR TO DEFINE INTERFACE WITH CONTRACTOR AND CCS CONNECTION REQUIREMENTS.
5. HAND SELECTOR TO ALLOW THE OPERATOR TO SELECT THE CONTROL LOOP (REMOTELY).

HOLDS

1. SUCTION AND DISCHARGE NOZZLE SIZE TO BE CONFIRMED BY VENDOR.

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 TREATMENT PLANT 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-80024

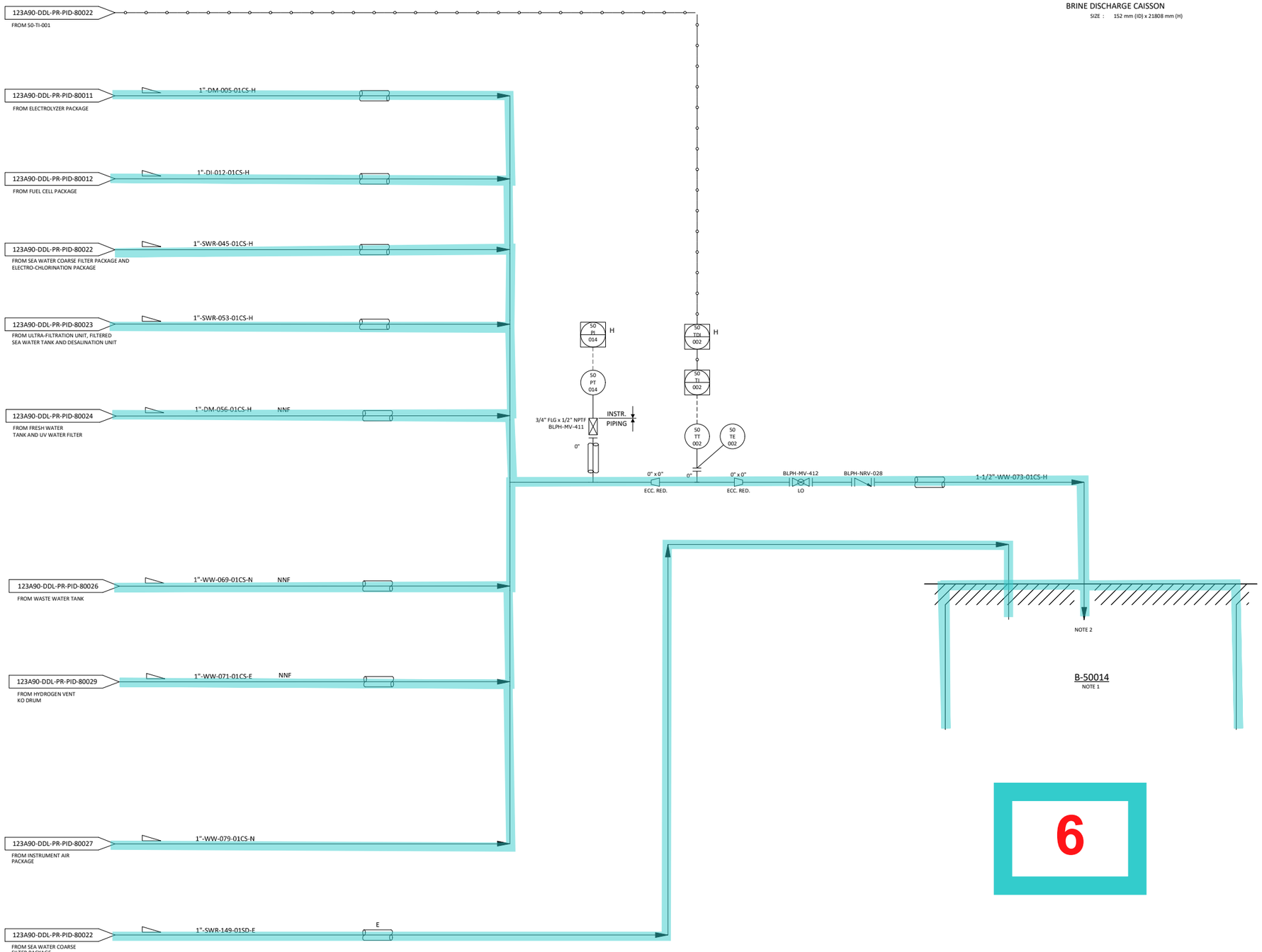
SHEET 001

REV. 00

File Name : FILE_NAME

DRAWING NO. DRAWING_NO.

REV. REV



NOTES

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

6

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 1

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

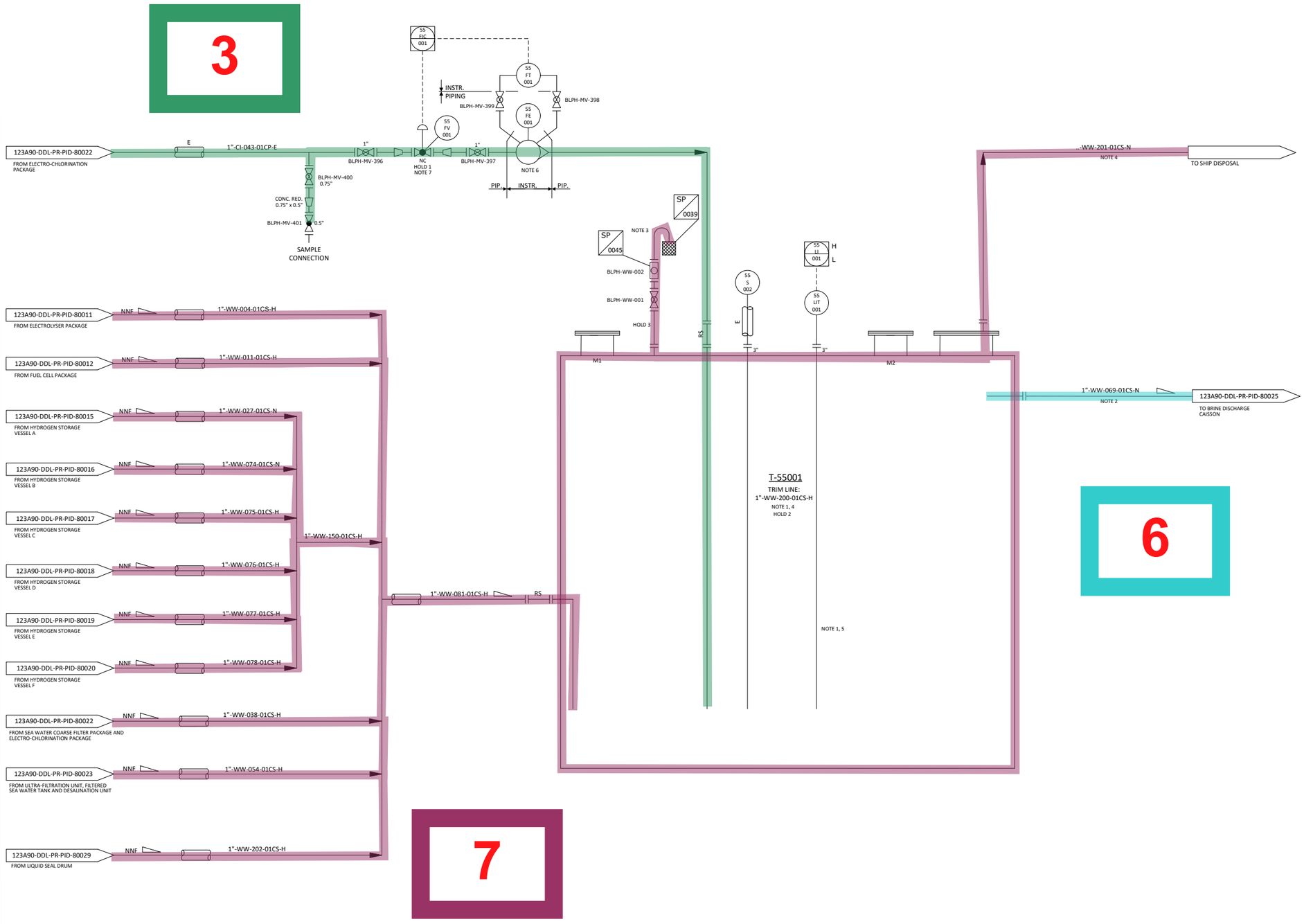
A1	DRAWING NO.	SHEET	REV.
	123A90-DDL-PR-PID-80025	001	00

File Name : FILE_NAME

DRAWING NO. DRAWING_NO.

REV. REV

T-55001
WASTE WATER TANK
SIZE : 4000 mm (L) x 4000 mm (W) x 1000 mm (H)
CAPACITY : 16 m3
DESIGN P/T : 3.5 barg / 80°C



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

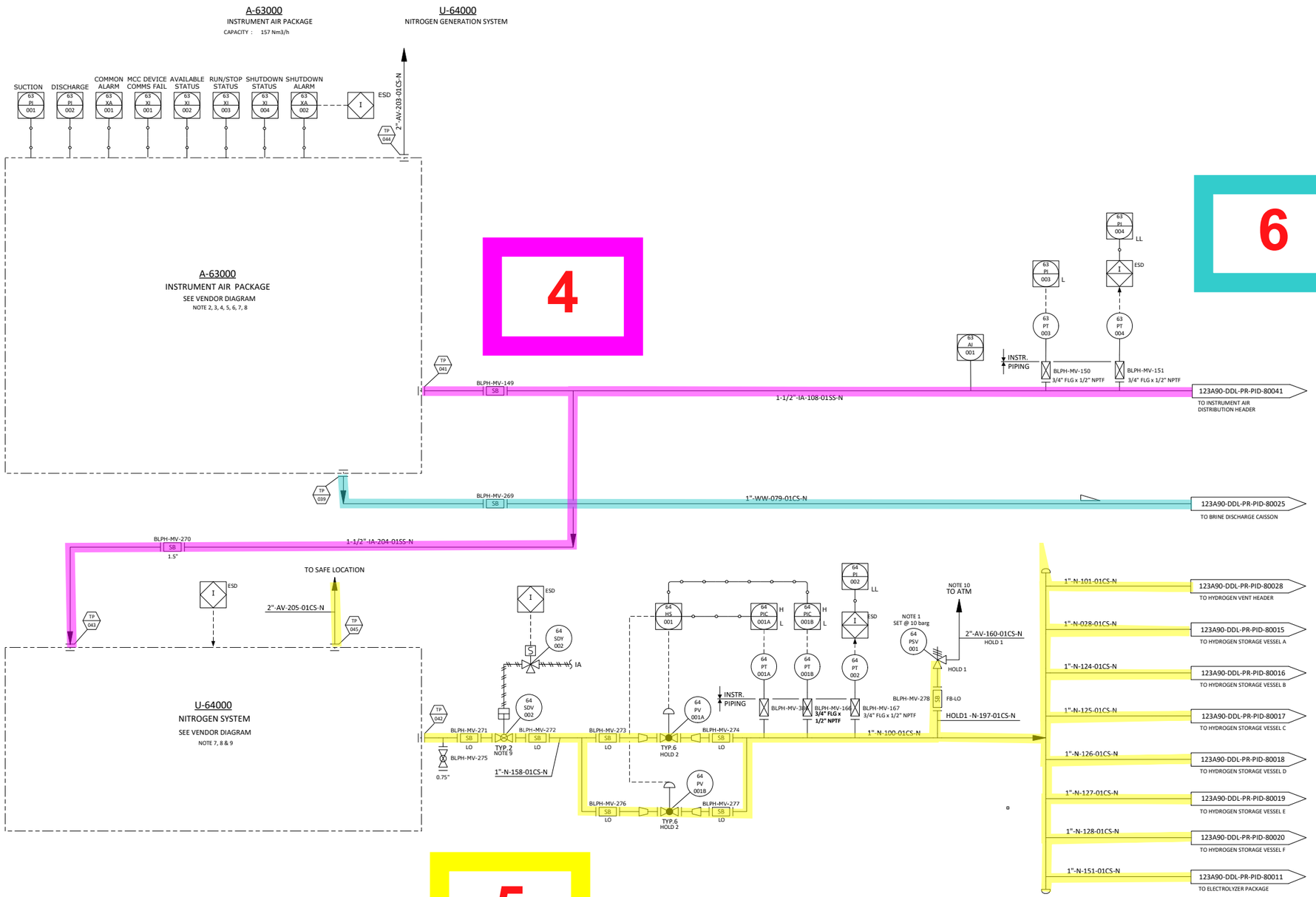
TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
WATER DISPOSAL SHEET 2

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

DRAWING NO. DRAWING_NO.

REV. REV



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	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

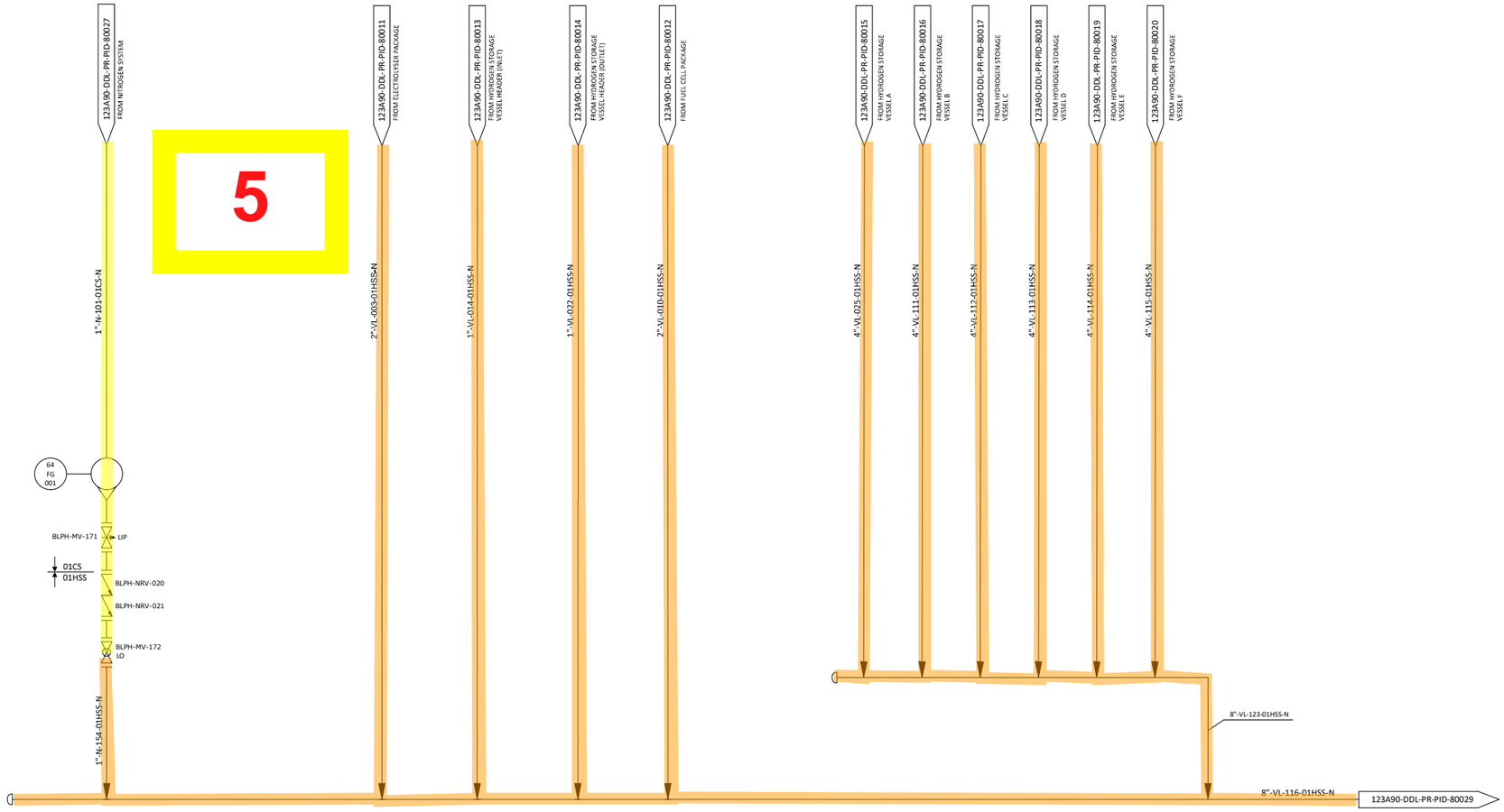
TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
INSTRUMENT AIR PACKAGE

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. 00

File Name : FILE_NAME

DRAWING NO. DRAWING_NO.

REV. REV



5

2

NOTES

HOLDS

1. VENT LINES 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
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

File Name : FILE_NAME

DRAWING NO. DRAWING_NO.

REV. REV

V-43001

HYDROGEN VENT KO DRUM

SIZE : 1000 mm (ID) X 3000 mm (H)

DESIGN P/T : 3.5 barg / -10 / 80°C

Q-43004

HYDROGEN VENT NOTE 1

SIZE : 254 mm (ID) x 14690 mm (H)

DESIGN P/T : 3.5 barg / -10 / 80°C

2

7

6

123A90-DDL-PR-PID-80028

FROM HYDROGEN VENT HEADER

8"-VL-116-01HSS-N

BLPH-MV-402

43 PI 001 H

43 PT 001

INSTR. PIPING

3/4" FLG x 1/2" NPTF

BLPH-MV-407

1" x 0.75" CONC. RED.

V-43001

TRIM LINE: 8"-VL-220-01HSS-N

MW

2"

BLPH-MV-403

LO

PIPING INSTR.

1"

BLPH-MV-404

1"

BLPH-MV-405

2"

BLPH-MV-406

LO

NOTE 5

43 FT 001

43 PI 001 H

43 FE 001

8"-VL-117-01HSS-N

43 LT 002

I

43 LI 002 HH LL

INSTR.

3" PIPING

3" HOLD 3

43 LT 001

43 LIC 001 H

3" x 2"

2" x 0.75"

BLPH-MV-408 0.75"

43 LV 001

E

BLPH-MV-409 SB

HOLD 2

BLPH-MV-410 SB

NOTE 4

1"-WW-071-01CS-E

123A90-DDL-PR-PID-80025

TO BRINE DISCHARGE CAISSON

Q-43004

NOTE 2

LIQUID REFILLING

NOTE 8

1"

BLPH-MV-419

NOTE 7

NOTE 9

HANDHOLE

NOTE 6

NOTE 11

NOTE 3, 5, 10, 12

E

E

BLPH-MV-417

BLPH-MV-418

LC 1"

1"-WW-202-01CS-E

NNF

123A90-DDL-PR-PID-80026

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	20/10/2023	CIM	RZI	DLO	ISSUE FOR ACCEPTANCE (IFA)

CROSSWIND

ROSETTI MARINO

TITLE :

BLPH PIPING AND INSTRUMENTATION DIAGRAM
HYDROGEN VENT DRUM

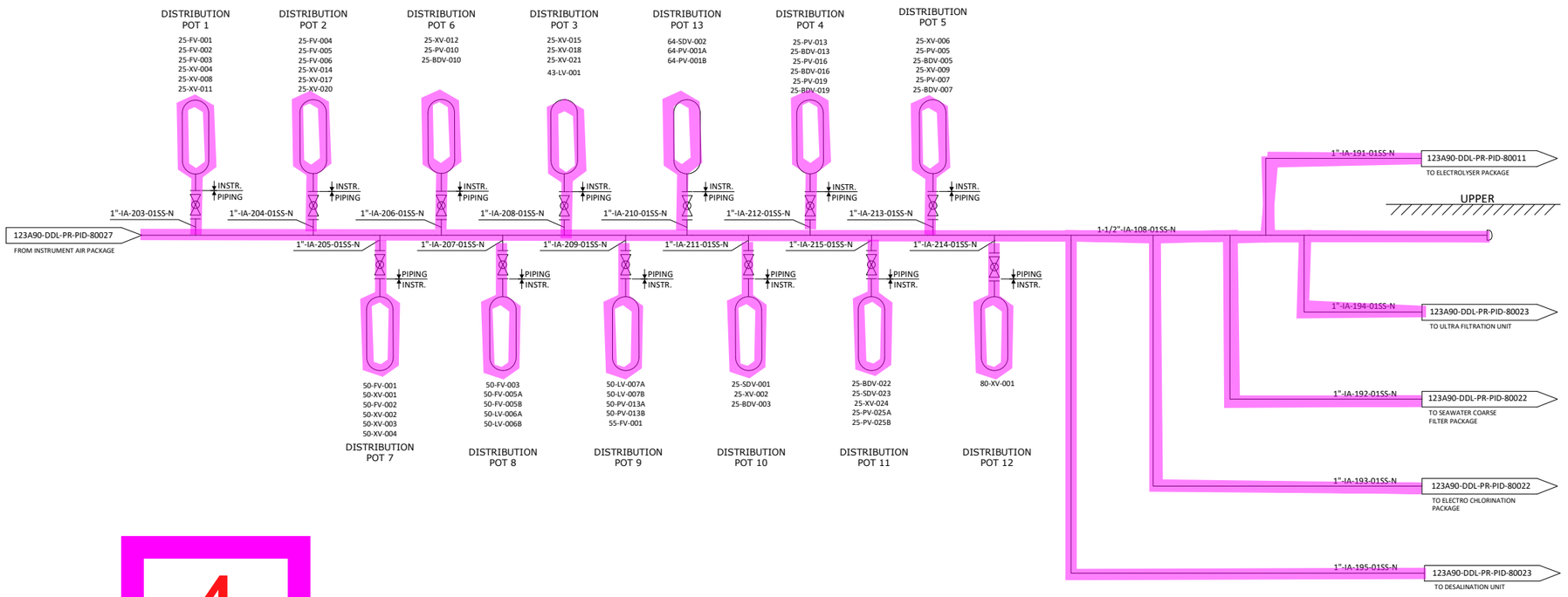
CONTRACT NO./TITLE	CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK		SCALE NTS
DRAWN	CHECKED	APPROVED	DATE

A1	DRAWING NO. 123A90-DDL-PR-PID-80029	SHEET 001	REV. 00

File Name : FILE_NAME

DRAWING NO. DRAWING_NO.

REV. REV



4

NOTES

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

CROSSWIND

ROSETTI MARINO

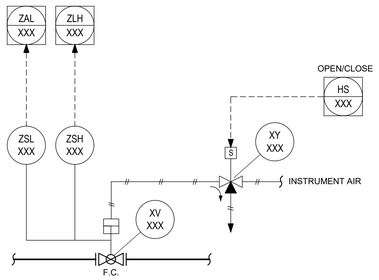
TITLE :
BLPH PIPING AND INSTRUMENTATION DIAGRAM
INSTRUMENT AIR DISTRIBUTION HEADER

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-80041	SHEET 001	REV. 00

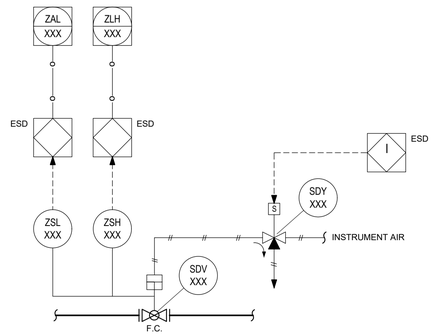
File Name : FILE_NAME

TYPICAL INSTRUMENTATION VALVE

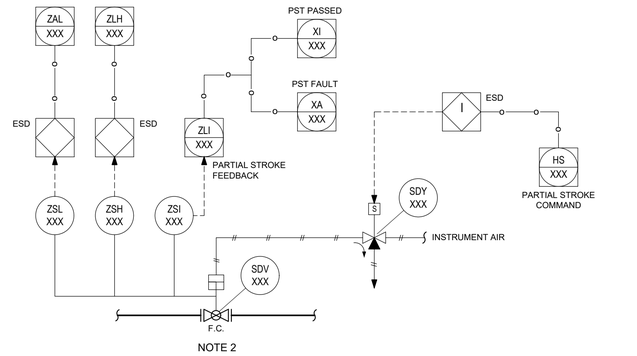
TYP.1 (XV - ON OFF VALVES)



TYP.2 (SDV - SAFETY NO CRITICAL VALVES)

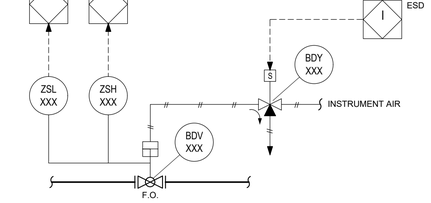


TYP.3 (SDV - SAFETY CRITICAL VALVES WITH PARTIAL STROKE)

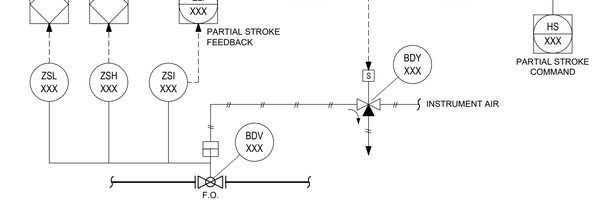


NOTE 2

TYP.4 (BDV - SAFETY NO CRITICAL VALVES)

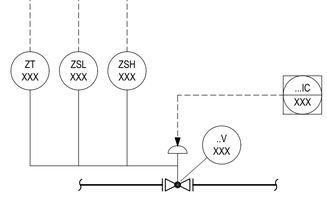


TYP.5 (BDV - SAFETY CRITICAL VALVES WITH PARTIAL STROKE)



NOTE 2

TYP.6 (CONTROL VALVE WITH POSITION TRANSMITTER)



INSTRUMENT SYMBOLOGY DEFINITION

MEANINGS OF IDENTIFICATION LETTERS
THIS TABLE APPLIES TO THE FUNCTIONAL IDENTIFICATION OF INSTRUMENTS

	FIRST- LETTER		SUCCEEDING-LETTER		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
C				CONTROL	
E			SENSOR (PRIMARY ELEMENT) ELEMENT		
F	FLOW RATE	RATIO (FRACTION)			
G			GLASS VIEWING DEVICE		
H	HAND				HIGH
I			INDICATE		
L	LEVEL				LOW
O			ORIFICE, OPEN		
P	PRESSURE, VACUUM				
R		RELIEF			
S		SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
V				VALVE, DAMPER, LOUVER	

NOTE: FOR FURTHER EXPLANATORY NOTES, REFER TO KBR STANDARDS AND ANSI/ISA-5.1

NOTES

1. FOR GENERAL NOTES AND PIPING SIMBOLOGY SEE DRAWINGS: 123A90-DDL-PR-PID-80009 AND 123A90-DDL-PR-PID-80010.
2. THE TYPICAL WILL BE CONFIRMED.

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
INSTRUMENTATION SYMBOLOGY

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-80042	SHEET 001	REV. 00

DOCUMENT NO.

REV. 00

File Name :

DRAWING_NO.

REV.

GENERAL NOTES

1. ALL VENTS AND DRAINS SHOWN BY THE FOLLOWING SYMBOLS REPRESENT A 3/4" VALVE.

   EXPECT AS NOTED.

   VENT/DRAIN
   WITH BLIND FLANGE

2. ALL VALVED CONNECTION TO ATMOSPHERE IN PROCESS SERVICE WILL BE PLUGGED OR BLIND FLANGED.
3. HIGH POINT VENTS AND LOW POINT DRAINS USED FOR HYDROTEST PURPOSES ONLY ARE PROVIDED BUT ARE NOT SHOWN ON
4. FOR GENERAL PIPING REQUIREMENTS SEE THE RELEVANT DESIGN SPECIFICATION.
5. DEFINITIONS:

   SLOPE → ELEVATION CHANGES ARE CONSTANTLY DOWNWARD ONLY, NO POCKETS ARE PERMITTED. SPECIFIC SLOPES REQUIRED ARE SHOWN BY SYMBOLS.

   WHERE NO GRADIENT IS SHOWN IT IS ASSUMED THAT THE MINIMUM PREFERED GRADIENT OF 1:100 IS USED.

   I / X

   WHERE X HAS UNITS THE SAME AS I

   GRAVITY DRAINING ELEVATION CHANGES ARE DOWNWARD ONLY. NO POCKETS ARE PERMITTED.

6. INLET LEADS TO PRESSURE RELIEF DEVICES EXCEEDING 15 m IN LENGTH OR HAVING MORE THAN TWO ELBOWS, UNLESS OTHERWISE NOTED, MUST BE APPROVED BY PROCESS ENGINEERING.
7. ALL CLOSED PRESSURE RELIEF VALVE DISCHARGE LEADS SHALL BE FREE DRAINING FROM THE PRESSURE RELIEF VALVE TO THE TOP OF THE DISCHARGE HEADER. EACH LEAD IS TO BE CHECKED FOR A DOWNWARD SLOPE AFTER CONSTRUCTION.
8. ALL PRESSURE RELIEF VALVES DISCHARGING TO ATMOSPHERE AT SAFE LOCATION SHALL CONFORM TO THE RELEVANT DESIGN SPECIFICATION.
9. FOR UNSPARED PRESSURE RELIEVING DEVICES, WHEN AN INLET BLOCK VALVE IS PROVIDED BETWEEN A VESSEL AND ITS PRESSURE RELIEVING DEVICE OR WHEN A DISCHARGE BLOCK VALVE IS PROVIDED BETWEEN A PRESSURE RELIEVING DEVICE AND A COMMON DISCHARGE HEADER, THE BLOCK VALVE SHALL BE ARRANGED SO THAT IT CAN BE LOCKED OR SEALED OPEN. UNDER NO CONDITION SHALL A DISCHARGE BLOCK VALVE BE CLOSED, WHILE THE VESSEL IS IN OPERATION, BEFORE THE INLET BLOCK VALVE IS CLOSED. THE OWNER ASSUMES RESPONSIBILITY FOR ADMINISTRATIVE CONTROL OF THESE VALVES IN STRICT ACCORDANCE WITH ASME SECTION VIII, APPENDIX M.
10. SPACE AND ACCESS IS REQUIRED FOR ON-LINE SET-POINT VERIFICATION (OLSPV) OF ALL PSV's.
11. WHEN PIPE STRAINERS ARE INDICATED, THE STRAINER BODY, SCREEN AND SIZE OF OPENINGS ARE AS SPECIFIED BY THE RELEVANT SPECIFICATION.
12. 6 MM WEEP HOLES ARE PROVIDED AT LOW POINTS OF PRESSURE RELIEF VALVE AND RUPTURE DISC DISCHARGE LINES TO ATMOSPHERE.
13. REDUCERS IN PRESSURE RELIEF VALVE INLET OR OUTLET PIPING SHALL BE MINIMUM DISTANCE FROM THE PRESSURE RELIEF VALVES.
14. DOCUMENTED ADMINSTRATIVE PROCEDURES SHALL ENSURE THAT WHENEVER SELECTED EQUIPMENT ITEMS (FOR EXAMPLE, EXCHANGERS OR FILTERS) ARE ISOLATED FOR MAINTENANCE, THEY SHALL BE VENTED AND DRAINED IMMEDIATELY.
15. LOCAL START-STOP SWITCH AT THE MOTOR ARE NOT SHOWN. DCS START-STOP FUNCTIONS ARE SHOWN AS REQUIRED.
16. TSO FOR A CONTROL VALVE WILL RESULT IN CLASS V MINIMUM SHUT OFF. ON-OFF VALVES WILL MEET API598.
17. OWNER AND DETAILED ENGINEERING CONTRACTOR SHALL DESIGN THE SAFETY INSTRUMENTED SYSTEM (SIS) IN ACCORDANCE WITH APPLICABLE PROCESS INDUSTRY STANDARDS, SUCH AS ISA S84, IEC 61511 AND IEC 61508. OWNER AND DETAILED ENGINEERING CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR DEVELOPING AND IMPLEMENTING THE SAFETY INSTRUMENTED FUNCTIONS (SIF) AND PERFORMING SAFETY INTEGRITY LEVEL (SIL) DETERMINATION TO ALL SAFETY INSTRUMENTED FUNCTIONS IN ACCORDANCE WITH OWNER'S RISK MANAGEMENT POLICY.
18. THE DETAILS PROVIDED BY KBR ARE TO BE CONSIDERED AS "FOR INFORMATION ONLY" AND IS NOT REPRESENTED BY KBR TO BE IN COMPLIANCE WITH THE OWNER'S RISK MANAGEMENT CRITERIA, OR ISA S84 OR THE APPLICABLE IEC DOCUMENTS.
19. THE OWNER IS RESPONSIBLE FOR ESTABLISHING ADMINISTRATIVE CONTROLS AND PROCEDURES OF USE OF ANY SHUTDOWN SYSTEM BYPASS FEATURES FOR TESTING OR MAINTENANCE OF THE SYSTEM. ANY PROCESS INTERLOCK OF SAFETY INTEGRITY LEVEL SIL-3 SHALL NOT BE BYPASSED UNDER ANY CIRCUMSTANCES.
20. ALL THERMOWELL CONNECTIONS ARE FLANGED CONNECTIONS UNLESS OTHERWISE NOTED.
21. NEITHER FLOW INDUCED VIBRATION (FIV) NOR ACOUSTIC INDUCED VIBRATION (AIV) HAVE BEEN CONSIDERED AS A PART OF BASIC ENGINEERING DESIGN. THESE DESIGN ASPECTS ARE TO BE CONSIDERED DURING THE DETAIL ENGINEERING DESIGN PHASE.

LINE SERVICE

AV	ATMOSPHERIC VENT
CB	CONCENTRATED BRINE
CI	CHEMICAL INJECTION
DI	DEIONISED WATER
DM	DEMINERALIZED WATER
HY	HYDROGEN
IA	INSTRUMENT AIR
N	NITROGEN GAS
SWR	SEA WATER RETURN
SWS	SEA WATER SUPPLY
VL	LP VENT
WW	WASTE WATER

ABBREVIATIONS

ATM.	ATMOSPHERE
BDV	BLOWDOWN VALVE
BRS	BIRDSCREEN
CCS	CENTRAL CONTROL SERVICE
DIFF.	DIFFERENTIAL
DWG	DRAWING
ESD	EMERGENCY SHUTDOWN
FB	FULL BORE
FC	FAIL CLOSED ON LOSS OF MOTIVE POWER OR SIGNAL
FO	FAIL OPEN ON LOSS OF MOTIVE POWER OR SIGNAL
FGS	FIRE & GAS SYSTEM
GVC	GOOSENECK VENT
HH	HIGH HIGH ALARM TRIP
H	HIGH ALARM
ID	INSIDE DIAMETER
IA	INSTRUMENT AIR
L	LOW ALARM
LIP	LOCKED IN PLACE
LL	LOW LOW ALARM AND TRIP
LO	LOCKED OPEN
LP	LOW PRESSURE
M	ELECTRIC MOTOR
MCC	MOTOR CONTROL CENTER
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NPS	NOMINAL PIPE SIZE
PSV	PRESSURE SAFETY VALVE
P/T	PRESSURE/TEMPERATUE
RO	RESTRICTION ORIFICE
RS	REMOVABLE SPOOL
SAM	SAMPLE CONNECTION
SP	SPECIALITY PIPING ITEM
SPB	SPECTACLE BLIND
STR	STRAINER
TSO	TIGHT SHUT-OFF
T/T	TANGENT TO TANGENT
VB	VORTEX BREAKER

EQUIPMENT

PUMPS

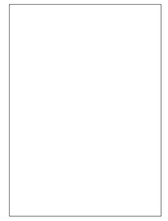


CENTRIFUGAL PUMP



LIFT INLINE

STORAGE TANK



TANK

VESSEL



HORIZONTAL TANK

MISCELLANEOUS



MOTOR

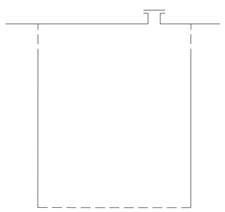


MOTOR



PACKAGE ITEM

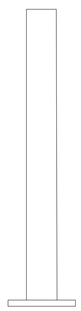
OTHERS



CAISSON



CAISSON



VENT STACK

NOTES

1. FOR PIPING AND INSTRUMENTATION SYMBOLOGY, SEE DRAWINGS: 123A90-DDL-PR-PID-80010 AND 123A90-DDL-PR-PID-80042

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
GENERAL NOTES

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

A1	DRAWING NO.	SHEET	REV.
	123A90-DDL-PR-PID-80009	001	00

File Name : DRAWING_NO.

DRAWING NO. DRAWING_NO.

REV. REV

PIPING SYMBOLS

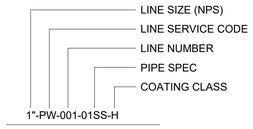
PRIMARY PIPING

SECONDARY PIPING

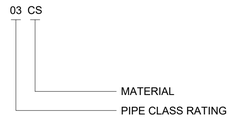
INSULATED PIPING

E — ELECTRICALLY HEAT TRACED PIPING

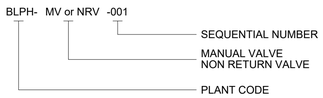
LINE NOMENCLATURE



PIPING SPECIFICATION (NOTE 4)



VALVE IDENTIFICATION CODE



PIPE CLASS RATING

01	CLASS 150# ACCORDING TO ASME B31.3
03	CLASS 300# ACCORDING TO ASME B31.3
06	CLASS 600# ACCORDING TO ASME B31.3
01H	CLASS 150# ACCORDING TO ASME B31.12
03H	CLASS 300# ACCORDING TO ASME B31.12

MATERIAL

CS	CARBON STEEL
SS	STAINLESS STEEL
SD	SUPER DUPLEX STAINLESS STEEL

INSULATION CLASS

H	HEAT CONSERVATION
P	PERSONNEL PROTECTION
E	ELECTRICALLY HEAT TRACED
N	NOT INSULATED (PAINTED)

PIPING CONNECTORS

DRAWING CONTINUATION ARROW

CONNECTOR NUMBER — XXXX | DWG NUMBER
TO/FROM EQUIPT NO.

DWG NUMBER
TO/FROM EQUIPT NO.

3RD PARTY BATTERY LIMIT

CONTRACTOR — SUPPLIER

TIE-IN LABEL

TP 100

INSTRUMENTATION CONNECTOR

DRAWING CONTINUATION ARROW

CONNECTOR NUMBER — XXXX | DWG NUMBER
TO/FROM INSTRUMENT NO.

DWG NUMBER
TO/FROM INSTRUMENT NO.

VALVES, CONTROL VALVES AND RELIEF VALVES

SYMBOL	DESCRIPTION
	CHECK VALVE
	GLOBE VALVE
	BUTTERFLY VALVE
	NEEDLE VALVE
	BALL VALVE
	ANGLE VALVE
	GATE
	3-WAY
	PRESSURE RELIEF VALVE
DB	DOUBLE BLOCK AND BLEED VALVE
SB	SINGLE BLOCK AND BLEED VALVE
	SINGLE BLOCK AND BLEED VALVE (MONOFLANGE)
	DOUBLE BLOCK AND BLEED VALVE (MONOFLANGE)

PIPING SEGMENT BREAKS & LABELS

PIPE SPEC BREAK
INDICATES CHANGE PIPE SPEC

01CS — 03HCS

01SS — 01SD

SPECIALTY LABELS

SP 0001 — 0001 = SP SEQUENCE NO.

FITTINGS

	FLANGE
	CAP
	REDUCER
	HOSE CONNECTION

SPECIALTY ITEMS

BRS		BIRD SCREEN
STR		Y-TYPE STRAINER
	RS	REMOVABLE SPOOL
SAM	S	SAMPLE CONNECTION (SAM) SAMPLE STATION NOTE 3
GVC		GOOSENECK VENT W/MESH NOTE 3
RO		RESTRICTION ORIFICE NOTE 3
SPS		SPECTACLE BLIND (BOTTOM CIRCLE DENOTES NORMAL POSITION)
VB		VORTEX BREAKER NOTE 2

EQUIPMENT NOZZLE CONNECTIONS

	FLANGED NOZZLE
	FLANGED NOZZLE ON SIDE OF VESSEL
MW	MANWAY
	MANWAY

INSTRUMENT LABELS

2F3
SET @ 40 barg — SET PRESSURE

PRV SIZE (INLET, ORIFICE, OUTLET)

ACTUATORS

	DIAPHRAGM ACTUATOR
	SINGLE/DOUBLE ACTING CYLINDER ACTUATOR
S	SINGLE SOLENOID ACTUATOR
S	OFF-LINE 3-WAY SOLENOID VALVE WITH SINGLE ACTUATOR

INSTRUMENT SIGNAL LINES

	INSTRUMENT TO PROCESS
	ELECTRIC
// //	PNEUMATIC
o o o	SOFTWARE OR CCS LINK

PRIMARY INLINE ELEMENT SYMBOLS

	VARIABLE AREA METER
	ULTRASONIC

OTHER INSTRUMENTATION

	INSTRUMENT COMPONENT LABEL SYMBOL WITH NO DATA
10 PV 100 A	10 = UNIT NUMBER P = MEASURED VARIABLE CODE V = INSTRUMENT TYPE MODIFIER 100 = INSTRUMENT SEQUENCE NUMBER A = SUFFIX
FV	CONTROL VALVE LABEL
FV, 2" FO	CONTROL VALVE WITH NOMINAL DIAMETER AND FAIL ACTION LABEL
FIC — HH, H, L, LL	ALARM HIGH HIGH LABEL ALARM HIGH LABEL ALARM LOW LABEL ALARM LOW LOW LABEL
FT — M	IF PRIMARY ELEMENT HAS INTEGRAL TRANSMITTER SHOW FT INSTEAD OF FE INSIDE OF TAG

INSTRUMENT OR FUNCTION SYMBOLS

	FIELD MOUNTED INSTRUMENT
	INSTRUMENT MOUNTED ON CENTRAL CONTROL ROOM PANEL
	DCS DISPLAY ACCESSIBLE TO OPERATOR
	CRITICAL INTERLOCK

NOTES

1. FOR GENERAL NOTES AND INSTRUMENTATION SIMBOLOGY SEE DRAWINGS: 123A90-DDL-PR-PID-80009 AND 123A90-DDL-PR-PID-80042
2. ITEMS ARE SHOWN UNDER SPECIALITY ITEMS FOR SYMBOLOGY REFERENCE ONLY. ITEMS ARE NOT SP ITEMS.
3. ITEMS ARE NOT SPECIALITY ITEMS UNLESS OTHERWISE SPECIFIED.
4. PIPE SPECIFICATION AND PIPING MATERIAL CLASS INDEX TO BE CONFIRMED IN NEXT PHASE.

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
PIPING SYMBOLOGY

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-80010	SHEET 001	REV. 00

File Name : DRAWING_NO.

ATTACHMENT 2 – HAZOP WORKSHEET

Deviation	Cause	Consequence	IPF Summation - Threat	Hazard Register	RAM Score				LOPA?	Barrier	Recommendation	Responsibility	ALARP Determination
					Rec	S	L	RR					

ATTACHMENT 2 – RECOMMENDATION CLOSE-OUT SHEET

BLPH SHEAMS SIGNATURE FORM

Action Title: **Ref. Doc.**	
Item No.	
Cause:	
Consequence:	
Safeguards:	
Actions:	
Assigned Respondent (By)	
RESPONSE	
Attachments:	
Issue Date (dd/mm/yy)	

Approvals / Endorsements	
EPC Discipline Lead	**Sign**
EPC HSE Lead	**Sign**
EPC Project Manager	**Sign**
Client	**Sign**

ATTACHMENT 4 – VIRTUAL MEETING INSTRUCTIONS

Two meeting invitations will be sent out containing Microsoft Teams links to allow personnel attending virtually to view both the HAZOP/LOPA minutes and other documents such as the PEFS simultaneously. Please accept both meeting invitations.

Personnel attending the meeting face-to-face do not need to join the virtual meetings as a room microphone and audio will be available via the office facilities.

For those joining virtually:

- Open Teams meeting [1] in the Teams Application and select 'use computer audio''.
- Meeting [1] will be used for audio and for display of the workshop minutes.
- Open Teams meeting [2] in a web browser – either use the:
    - 'Join on the web' link along with the Meeting ID and passcode;

      or
    - 'Copy & Paste' the 'Click here to join the meeting' link into a web browser;
- Cancel the 'Open in Microsoft Teams?' pop-up, then select 'Continue on this browser';
- Select 'Don't use Audio' and join the meeting;
- Please leave you microphone on mute unless you wish to say something to minimise background noise;
- Following breaks, please 'raise your hand' to indicate that you have re-joined;

We will have a round of introductions at the start of the first meeting when we will have video cameras active. Following these introductions video cameras should be switched off to minimise bandwidth.