Base Load Power Hub (BLPH)

EQUIPMENT AND SYSTEM TAG NUMBERING

Document Number: 123A90-PML-DIG-PRO-00002

Document Class: 2

02	11/11/2025	Accepted for Construction (AFC)	M.W. Perfetto	G. Casolo	C. Giunchi
01	12/04/2024	Issue for Review (IFR)	M.W. Perfetto	G. Casolo	D. Lo Sterzo
00	21/12/2023	Issue for Review (IFR)	M.W. Perfetto	G. Casolo	D. Lo Sterzo
Rev.	Date	Description	Prepared	Reviewed	Approved

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Revision / Change Log

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

HOLDS LIST

No.	Description
1	
2	
3	
4	

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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.

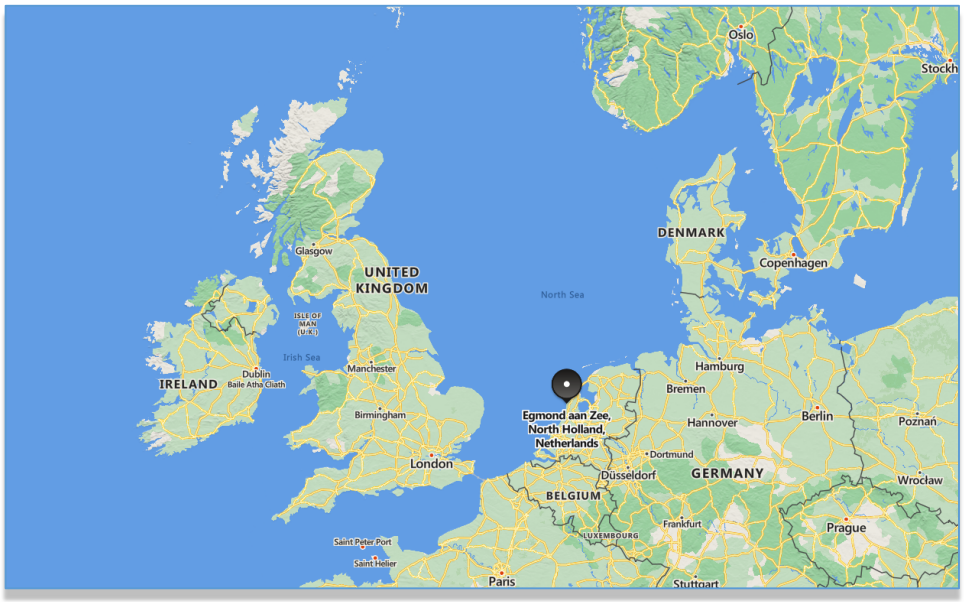


Figure 1 - HOLLANDSE KUST NOORD WIND PARK Location Map

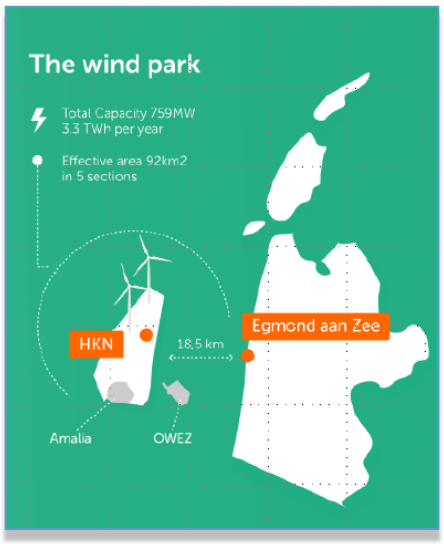


Figure 2 - Wind Park Details

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.

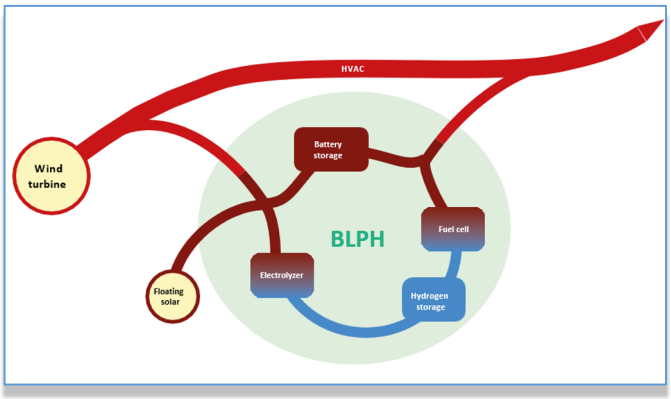


Figure 3 – BLPH Concept

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.

2. DOCUMENT SCOPE

Scope of this document is to provide the equipment tagging system, defining the format and the syntax to be used by the CONTRACTOR and its vendors, for uniquely identifying tags on the BLPH Project.

2.1 REFERENCES

Ref. No.	Doc. No.	Description
[1]	K559-2254-PM-PLN-003	"Basic Design Engineering Package"
[2]	K559-2254-PM-PHI-001	"Equipment and System Tag Numbering"
[3]	DEP 01.00.09.10 Gen	Shell DEP, "Tagging Specification and Symbols"
[4]	DEP 37.01.10.10-Gen	Shell DEP, "Offshore production installations"
[5]	DEP 01.00.02.11-Gen	Shell DEP, "Process Flow Schemes and Process Engineering Flow Schemes"
[6]	Z-DP-002. Rev 03	NORSOK Design Principles Coding System standard

Table 1 - Reference Documents

2.2 DEFINITIONS

Term	Description
COMPANY or Client (CPY)	CrossWind C.V.
CONTRACTOR (CTR)	ROSETTI MARINO S.p.A.
PROJECT	HOLLANDSE KUST NOORD WIND PARK Project

Table 2 – Definitions and Abbreviations

2.3 ABBREVIATIONS

Acronym	Description
HVAC	Heating, Ventilation, Air Conditioning
HV	High Voltage
MV	Medium Voltage
LV	Low Voltage
UPS	Uninterruptible Power Supply
BESS	Battery Energy Storage System
PAS	Process Automation System

Table 3 - Acronyms

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3. PHILOSOPHY

3.1 GENERAL

This tag numbering system includes all the tagged items on the project:

- Process Equipment.
- Mechanical Equipment.
- Electrical Equipment.
- Instrumentation Equipment.
- Telecommunications Devices.
- Structural Equipment.
- Safety Equipment.
- HVAC Equipment.
- Handling Equipment.
- Manual and Check Valves.
- Piping Lines and Special Items.
- Main Electrical Cables.
- Instrument Cables.

The equipment tag numbers shall be applied to identify the function of the above equipment in order to design, maintain and operate with the item itself. A consistent and well understood set of rules aid the creation and subsequent deepening of the tagging structure.

- Each full tag number shall be unique within a Plant.
- The tagging specification shall ensure sufficient tag numbers are available for the size of the facility and potential expansion.
- A tag shall represent a sub function of the plant that requires individual identification.
- If a tag has multiple functions, such as for instrumentation, then the primary function shall be reflected in the tag.
- Tag numbers shall be compatible with the principal systems (e.g., PAS, CMMS). Constraints to consider are string length restrictions, special characters, language restrictions.
- Tag numbers shall not include Manufacturer, Equipment characteristics or Organization details to prevent the requirement to change a tag, not related to a change in function.
- If a tag is terminated for any reason, it shall not be reused unless the original function is reinstated.
- Tags should not be used to define hierarchical structures, to prevent the use of suffixes to the primary tag number.
- Tag numbers shall enable repeatable designs to be supported in engineering design tools (e.g., use of a train number where applicable).

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- Tag numbers shall be represented identically on physical labels, in software tools and as referenced in documents.
- The length of the tag should be minimized using a format that supports ease of recollection.
- Letters 'I' and 'O' should not be used, as the initial letter in any tagging schemes as they can easily be confused with '1' and '0'.

All equipment shall be identified using the following tag numbering format:

a-yzwwwk-(b-zz(k)), where:

- a – is a one or two letter code identifying the Process Equipment Function (See Table 4).
- yz – is a two-digit number used to identify the Process System (y) and Sub System (z) (See Table 5).
- www – is a three-digit serial or sequence number used to identify the specific item of equipment.
- k – is a one letter code to denote identical equipment used for the same purpose (either working in parallel or in series or as a spare), i.e. "A", "B", "C", etc.

b-zzk – Optional extended tag for Auxiliary Equipment tag associated with main equipment items, where appropriate, where:

- b - is a one or two letter Function Code for the Auxiliary Equipment (See Table 4),
- zz - is the serial or sequence number used to identify the specific item of Auxiliary Equipment
- k - Same as above only applied to the Auxiliary Equipment.

3.2 EQUIPMENT FUNCTION LETTER CODE IDENTIFICATION

As per Table 4, the Equipment Function code letter(s) shall be arranged as follows:

- The first letter of the letter code shall indicate the process function.
- The (optional) second letter shall indicate the supporting function.

Letter Code	First Letter	Second Letter (Optional)
A	Packaged Units and miscellaneous equipment	Cleaning equipment
B	Enclosures / Containers / Structures	
C	Columns: tray columns; packed columns, rotating disc contactors	Chamber, Controls
D	Drying equipment	Diesel engine
E	Unfired heat transfers equipment: - heat exchangers, condensers, coolers, reboilers	Electrical lines
F	Fired furnaces, heaters, steam boilers	Fan, Fire
G	Generator	Gearbox
H	Heater – electrical	Hydraulic lines
J	Instrument / Controls	Flowlines
K	Compressors, blowers, fans	Manifolds

L	Light Fittings	Pipelines
M	Mixers, stirrers, mixing nozzles, inductors, blenders, steam desuperheaters, ejectors, eductors	Electric motor
P	Pumps (centrifugal, reciprocating, rotary, diaphragm)	Panel
Q		Vent
S	Gravity and mechanical separators: thickeners, cyclones, expeller, centrifuges, filters, dust collectors, sieves; switchboards	
T	Atmospheric storage tanks / Transformers	Turbine (steam or gas)
U	Uninterruptable Power Supply	Umbilical
V	Vessels, including pressure storage vessels, silos and hoppers	Vessel
W	Power Outlets, winch	
X	Material Handling Equipment	Crane details
Y	Communication equipment	
Z	Ventilation Dampers	Termination Block

Table 4 - Equipment Function Letter Codes

Examples of using the letter codes in Table 4:

- KT Turbine of compressor
- PD Diesel engine of pump
- PM Electric motor of pump
- HE Electrical tracing

Note: Where a choice has to be made between two or more letters, the most important function of the equipment must prevail.

3.3 PROCESS UNITS

Process Units are created to decompose the Plant function into more granular sub-functions. The first two digits of the process unit shall be used to reflect the process unit identification.

A two-digit number shall be used to identify the process systems "y" and sub-systems "z". The system numbers have been derived with reference to the NORSOK Design Principles Coding System standard [Ref. 6]. The process systems and sub-systems numbers are shown in Table 5 and will be applied to systems and sub-systems on the entire project.

Main Groups	System Numbers	Project Specific System Description
Process Systems	20	Electrolyser package
Process Systems	25	Hydrogen Storage
Process Support and Product Storage	43	Hydrogen Vent System
Utility Systems	50	Water Treatment

Utility Systems	55	Waste Water
Utility Systems	63	Instrument Air
Utility Systems	64	Nitrogen System
Safety and Facility Systems	70	Fire & Gas systems
Electrical – Telecomm – Instrumentation	72	NavAid System
Safety and Facility Systems	77	HVAC and Air handling systems
Safety and Facility Systems	79	Emergency Shutdown systems
Electrical – Telecomm – Instrumentation	80	Hydrogen Fuel Cell Package
Electrical – Telecomm – Instrumentation	81	HV Power and Distribution (66kV)
Electrical – Telecomm – Instrumentation	82	MV Power and Distribution (6.6kV)
Electrical – Telecomm – Instrumentation	83	LV Power and Distribution
Electrical – Telecomm – Instrumentation	84	UPS Power Generation and Distribution
Electrical – Telecomm – Instrumentation	85	BESS Package
Electrical – Telecomm – Instrumentation	87	Instrumentation System (PAS and field)
Electrical – Telecomm – Instrumentation	89	Communication system
Structural, Civil Systems	90	Structural and Civil Systems incl. piping layouts and plot plans
Structural, Civil Systems	99	Miscellaneous Systems

Table 5 - Process Units

3.4 SUB-SYSTEM BOUNDARIES

There may be some overlap and/or conflict as to which sub-system a particular item or piece of equipment belongs to. In these cases, the prime function of the item or piece of equipment should determine its most relevant sub-system. For example, the fire detection equipment inside the accommodation should be part of process unit 70 (Fire & Gas – reference Table 5) regardless of where it is installed. The system and sub-system breakdown shall be based on function and not area nor location.

Items or equipment between or linking two sub-systems shall be categorized into the sub-system of their origin as seen by the primary direction of flow. In the case of items or equipment entering a sub-system from a source that is not included in any other sub-system, they shall be categorized as part of the sub-system they enter. These two scenarios may be encountered particularly with equipment such as electrical cabling and piping.

3.5 IDENTICAL EQUIPMENT TAG LETTER CODE (OPTIONAL)

The letter "k" in the numbering format shall be used to denote identical equipment for the same purpose (i.e. working in parallel, in series or duty / standby) and shall end with one of the letters: "A", "B", "C", "D", etc. The letters "S" shall be used to denote common spare equipment. The letter code "k" should not be

used when only one unique piece of equipment is used for a particular purpose. Where the letters are insufficient to cover the identical equipment tag, two letters shall be used instead. E.g. A bank of air-fin coolers with 30 coolers where the 26 alphabet letters are insufficient in describing them, then use "A", "B", "Y", "Z", "AA", "AB" etc.

3.6 EXAMPLES OF PROCESS EQUIPMENT TAGGING

The following are examples of the tagging for the Process Equipment.

Tag number	Description
P-50001A/B	Seawater Intake Pump
P-50009A/B	Fresh Water Pump
S-50010	UV Water Filter
T-50006	Filtered Seawater Tank
T-50008	Fresh Water Tank
T-55001	Waste Water Tank
V-43001	Hydrogen Vent KO Drum
V-25001 A-F	Hydrogen Storage Vessel

Table 6 - Examples of Process Equipment

4. MECHANICAL EQUIPMENT

All main mechanical equipment shall be uniquely identified by a tag number of the format shown in Table 7. The mechanical equipment structure shall follow the function equipment codes as outlined in Table 4.

	Equipment Function Code		Process Unit	Sequence Number	Identical Equipment Code
Reference Table	Table 4	-	Table 5	-	Section 3.5
Example	P	-	20	001	A

Table 7 - Mechanical tag format

The sequence number shall consist of a three-digit number, running consecutively from 001 for each equipment function code group in accordance with Table 7, unless flexibility for the addition of future equipment within the same sequence is required.

4.1 PACKAGED UNITS

A unique tag number will be assigned to each "packaged unit". The function code for a "packaged unit" shall be the letter "A". Where the packaged unit is designed and engineered by the Vendor, it may be necessary to allocate a block of serial or sequence numbers ("ww") to a particular "packaged unit or units".

4.2 EXAMPLES OF MECHANICAL EQUIPMENT TAGGING

The following are examples of the tagging for the Mechanical Equipment.

Tag number	Description
Electrolyser	
A-20000	Electrolyser 40' (Electrical)
A-20000	Electrolyser 40' (TCU)
A-20000	Electrolyser 40'
Fuel Cell	
A-80000	Fuel Cell 20' Container 1
A-80000	Fuel Cell 20' Container 2
A-80000	Fuel Cell 20' Electrical
E-80006	Fuel Cell Air Cooler
BESS	
A-85000	BESS Battery container 40'
A-85000	BESS Battery container 20'
A-85000	BESS Electrical container 40'
A-50007	Desalination Unit (SWRO)
A-50005	Ultra Filtration Unit
A-50002	Electro-Chlorination Unit
A-63000	Instrument Air Package

Table 8 - Tagging for Mechanical Equipment

4.3 TIE-IN TAGGING RULE

All the piping connections to the "packaged units" are uniquely identified by a tag which includes the package tag, the code "TP" and a 3-digit progressive sequence number.

An example of the tie-in tag is the following:

A – 80000 – TP – 010

Where:

- A-80000 is the Fuel Cell Package tag
- TP is the tie-in code
- 010 is the sequence number

5. ELECTRICAL EQUIPMENT

Electrical equipment shall be identified by a tag number following the format shown in Table 9 (N stands for Number, L for Letter; () are for optional digits). Electrical drawings and documents will utilise IEC symbology.

Electric motors shall be identified based on the driven equipment tag number in accordance with Table 9.

	Electrical Equipment Function Code		Substation Number / Process Unit	Voltage Identification	Sequence Number	Identical Equipment Code
Reference	Table 10		-	Table 11	-	Section 3.5
Character Type	LL	-	NNN	L (L)	(N)N	(L)
Example	TR	-	200	A	02	A

Table 9 - Electrical Distribution Systems tag format

The Electrical Equipment Function Codes shall be in line with Table 10.

Electrical Equipment Function Code	Equipment Type
AP	Alarm Panel
AU	AC UPS
BA	Battery
BC	Battery Charger / Rectifier
BD	Bus Duct
CA	Capacitor Bank
CB	Circuit Braker Box
CN	Cathodic Protection
CP	Control Panel
DP	Distribution Panel

DU	DC UPS
EE	Earth Electrode
IR	Interposing Relay
JB	Junction Box
MC	Motor Control Center
NC	Navigational Aid Central Control Panel
RR	Resistor (earthing)
RX	Reactor
SB	Switchboard
SG	Switchgear
TR	Transformer
UP	Uninterruptible Power Supply unit
VS	Variable Speed Drive

Table 10 - Electrical Equipment function codes

Substation numbers shall generally follow the format below where 'A' is a character and 'N' a unique number.

Main Electrical Intake Station (MIS) and Power Station Switchboard (PSS) shall be uniquely identified by a tag number of the format: A A A (N).

HV and LV substations fed from the main power sources or from other substations shall be uniquely identified by a tag number of the format: A A – N N N.

For HV substations fed directly from these substations, the first digit shall be a sequence number (e.g., AA-100, AA-200).

For HV substations fed from another HV substation, of the second digit shall be a sequence number (e.g., AA-110, AA-210).

For LV substations fed from an HV substation, the third digit shall be a sequence number (e.g., AA-201).

5.1 VOLTAGE IDENTIFICATION

A one or two letter code shall be used to identify the handled voltage.

Two letters are used for transformers (one for each winding voltage).

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The references in Table 11 shall be used to identify the nominal voltage levels of the equipment.

Letter	Equipment Type
A	60kV and above
B	20kV – 33kV
C	10kV and 11kV
D	3kV - 6.6kV
E	LV (interruptible, maintained)
F	LV (uninterruptable)
N	LV (essential and non-essential)
X	LV (controls, alarms and indications)

Table 11 - Voltage identification

5.2 EXAMPLES OF ELECTRICAL EQUIPMENT TAGGING

The following are examples of the tagging areas of the Electrical system.

AC ARRANGEMENT TAGS						
66kV						Crosswind Tag
6.6kV	SG	-	100	D	1	
400V Non-Essential	SG	-	200	N	1	
TR #1 66/6.9kV	TR	-	100	A D	1	
TR #2 6.6/0.42kV	TR	-	200	D E	1	
TR #3 6.6/0.8kV	TR	-	200	E D	1	
Battery System (DC UPS)	UP	-	200	F	1	
UPS - NAV AIDS	UP	-	200	F	2	
AC UPS - PAS	UP	-	200	F	3	
AC UPS - PAGA / FGS / EMCS	UP	-	200	F	4	

Table 12 - Electrical Equipment tagging

5.3 INTERFACE WITH CROSSWIND ELECTRICAL EQUIPMENT

For areas of the Electrical system that interface with the Crosswind Electrical system, the tagging philosophy from the existing Crosswind system shall prevail. Sample of a typical electrical cable with Crosswind philosophy is as detailed in Table 13.

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WTG String ID	WTG Location ID	OHV GIS Bay	IAC From	IAC To	Segment Name	String Letter	Cable ID code	ID Code HV Core Phase 1	Splice Box Numbers in OHVS and WTGs
HNA6	CW70	AFA12	HNA5	HNA6	HNA5-HNA6	A	HNA5-HNA6	HNA5-HNA6-L1	HNA6-SB

Table 13 - Crosswind Electrical Cable tagging

Examples of using the letter codes in Table 13:

- HNA6-AFA70 = the tag number for the switchgear on the splice box coming from wind farm 6.
- HN = wind farm
- A = string (similar to "process trains")
- CW70 = BLPH location
- HNA6 = wind farm 6 location.

6. MAIN ELECTRICAL CABLES

Main electrical cables shall be uniquely identified by a tag number of the format in table 14.

The sequence identification numbers should be three digits, running consecutively from 001 to 999 for process unit, sub-divided into blocks (e.g. 1000-1999 for HV cables, 2000-2999 for LV cables, 3000-3999 for control cables).

A block of electrical cable numbers should be allocated for site use (e.g. 1900-1999 for HV cables across the site).

	Process Unit		Sequence Number				Electrical Cable		System code		Parallel		Phase
Reference	Table 5		-				-		Table 15		-		Table 19
Character Type	N	N	N	N	N	-	C	E	L	-	(N)	-	LN
Example	1	0	0	6	1	-	C	E	M	-		-	L1

Table 14 - Main Electrical Cable tag format

6.1 SYSTEM CODE

The system code shall be a single character using the values shown in Table 15.

System codes		
C	Control	
H	High Voltage	IEC – Over 1000V For this project considered over 52000V
L	Low Voltage	IEC – Under 1000V
M	High Voltage	Between 1000V and 52000V

Table 15 - Electrical system codes

An optional numerical character should be used to indicate if a parallel cable exists.

6.2 EXAMPLES OF MAIN ELECTRICAL CABLE TAGGING

An example of Electrical Cable tag is the following:

40153 – CEH – L1

Where:

- 40 is the Process Unit
- 153 is the Cable progressive identification number
- CE is the Electrical Cable code
- H is the High Voltage identification character
- L1 is to identify the Phase

7. LIGHTING AND SMALL POWER DEVICES, JUNCTION BOXES, SECONDARY EQUIPMENT AND RELATED CABLES

All maintainable electrical fittings (e.g. lights, sockets and switches) shall be uniquely identified by a tag number of the format in Table 16 (N stands for Number, L for Letter; () are for optional digits).

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	Power and Control Cable Type	Lighting and Small Power Equipment Function Code				"From" Reference					Identical Equip-ment Code		Feeder			Phase			Progressive Number		Identi-cal Cable Code
Reference	Table 18	Table 17				-					-		-			Table 19					
Character Type	(L)	E	L	L	-	N	N	N	A	N	(L)	-	(N)	(N)	-	(L)	(N)	-	(N)	(N)	(L)
Example	P	E	H	F	-	2	0	0	N	1		-	0	1	-	L	1	-	0	1	A

Table 16 - Lighting, small power devices and related cables tag format

7.1 LIGHTING AND SMALL POWER EQUIPMENT FUNCTION CODE

The lighting and small power equipment code shall be in accordance with Table 17.

Function Code	Description
EAT	Ambient Thermostat
EBB	Battery Bank
ECJ	Cable Joint (splice)
ECP	Miscellaneous Control Panel
ECW	Cableway
EEO	Welding Electrical Outlet
EFH	Fog Horn
EIS	Isolator
EJB	Junction Box (excluding trace heating RTD)
ELC	Local Control Panel
ELF	Light Fixture
ELP	Unit Control Panel
ELS	Light Switch
EML	Marine Light
EOL	Obstruction Light
EPH	Photocell
EPP	Protection Relay Panel
ESH	Electrical Space Heater
ESL	Status Light

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ESO	Socket Outlet
ESW	Socket Welding
ETB	Trace Heating Junction Box
ETE	Trace Heating End Termination
ETP	Transformer Panel
EUA	AC UPS Distribution Panel
EUD	DC UPS Distribution Panel
EVM	Visibility Meter

Table 17 - Lighting and small power devices function code

7.2 "FROM" REFERENCE

The "from" reference shall be referred to the origin point of the cable (e.g. switchboard) and shall be tagged with five digits.

7.3 FEEDER

The feeder shall be tagged as a maximum four alphanumeric characters, referring to the circuit number feeding the device.

7.4 SEQUENCE NUMBER

Cable and device numbering shall follow the circuit number with an incremental extender.

The incremental extender shall be alphabetical for the cable and numerical for the equipment.

Extenders shall be logically allocated to equipment and associated cables.

7.5 PHASE

The phase lettering shall be as the Phase column in Table 19.

7.6 PROGRESSIVE NUMBER

Progress Numbers shall revert back to '1' for each different device in the circuit.

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7.7 POWER AND CONTROL CABLE TYPE

The cable type shall be in accordance with Table 18.

Cable Type	Description
C	Control Cable
H	Heat Trace Cable
P	Power Cable

Table 18 - Cable type

7.8 PHASES

Phase code	
L1	Phase 1
L2	Phase 2
L3	Phase 3

Table 19 - Phases

8. INSTRUMENTATION AND CONTROL EQUIPMENT

All instrumentation components and their functionalities shall be uniquely identified into the P&IDs through a tag number.

All components and functions of a loop shall carry the same instrument loop number. The instrument loop numbers shall be unique at site level and shall have the same number of alphanumerical characters.

The instrument tagging of the process plants shall be done indicating functionality of loop components derived from ISA-5.1.

Character Type "N" stands for numbers, "L" stands for letters.

	Process Unit		Measured Variable Code	Function Code		Sequence No	Suffix
Reference	Table 5		Table 18	Table 18		Section 8.3	Section 8.4
Character Type	NN	-	L (variable length)	L (variable length)	-	NNN	(L) (variable length)
Example	87	-	P	V	-	100	A

Table 20 - Instrument tag format

8.1 MEASURED VARIABLE CODE

The measured variable code shall indicate the process condition, property measured or initiating variable in accordance with the ISA 5.1.

8.2 FUNCTION CODE

The function code shall indicate the component/loop functions in accordance with the ISA 5.1.

Process automation systems offer standard facilities that make the specific definition by function code unnecessary (e.g., all such systems offer indication, alarm, switching and recording facilities for every analogue measurement point without specific design requirements being specified). It is therefore no longer necessary to identify such requirements on the P&IDs by the function code.

	MEASURED VARIABLE CODE		FUNCTION CODE		
	Initiating Variable	Modifier	Passive Function	Output Function	Modifier
A	Analysis		Alarm		
C				Control	
E			Sensor (Primary) 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	

Table 21 - Measured Variable Codes and Function Codes

8.3 SEQUENCE NUMBER

Sequence numbers shall be unique in each group of instruments and shall consist of a three-digit number, running from 001 to 999 in each instrument group.

Future expansions of sequence numbers may be accommodated through allocation of unused numbers. Example-1: flow instruments in unit 25 are tagged 25-FC-201, 25-FG-202, 25-FP-204, 25-FZ-206. In this

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example, loop numbers 25-F-203 and 25-F-205 are intentionally left unused to allow for unforeseen future expansions.

8.4 SUFFIX

When the P&IDs presentation of the loop shows more than one similar component, a suffix letter shall be used to make the P&ID identification of each component unique.

Example: If two (redundant) transmitters are installed in loop 25-P - 056 for maintenance purposes and a manual selector is provided to select one of them, the transmitters are shown on the PEFS as 25-PT-056A and 25-PT-056B.

Where multiple transmitters are required to cover the full measurement range, suffix 'A' shall be assigned for the low range transmitter, with 'B' for the mid-range and 'C' for the high range transmitter, i.e., as the suffix increases with the range.

Example: If loop 25-F-201 is provided with a low and high range transmitter, the transmitters are shown on the P&ID as 25-FT-201A for the low range transmitter and 25-FT-201B for the high range transmitter.

The suffix may also be used to identify stream numbers and components of analysers.

The suffix applies only to tag numbers used on P&ID. The tag number structures for PAS, Engineering Tools and CMMS require unique tagging at component/function level.

9. JUNCTION BOXES

Junction boxes for process related signals shall be uniquely identified by a tag number as shown in Table 22:

	Process Unit		Junction Box	Signal Category	Intrinsecally Safe Code		Process Group No	Process String No	Sequence No	Suffix
Reference	Table 5		Section 9	Section 9			Section 9	Section 9	Section 9	
Character Type	NN	-	J	E	(I)	-	N	N	NNN	(L)
Example	00	-	J	E		-	1	1	001	

Table 22 - Instrument Junction Box tag format

Where:

- Process Unit, due to the small plant dimensions, shall be 00 since most of the JBs will be mixed type (while shall be 950 for Fire & Gas detection system and device).
- Junction Boxes identification letter will be J, while Signal Category will be E.

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- Process Group will be 1 for PCS, 2 for SIS.
- Process String will be 1 for AI/AO, 2 for DI or 3 for DO Sov/Power Supply.
- Sequential No will be progressive from 001 to 999.
- Suffix will be a letter to identify two similar JBs (eg. A or B).

Same examples:

PCS JB for **AI/AO** signals -> 00-JE-11001.

PCS JB for **DI** signals -> 00-JE-12001.

SIS JB for **DO** for Sov -> 00-JE-23001.

Junction Boxes for Fire & Gas System shall be uniquely identified by a tag number as shown in Table 23:

	Process Unit		Junction Box	Signal Category	Intrinsecally Safe Code		FGS Area	FGS Sub-Area	Sequence No	Suffix
Reference	Table 5		Section 9	Section 9			Section 9	Section 9	Section 9	
Character Type	NNN	-	J	E	(I)	-	NN	N	NNN	(L)
Example	950	-	J	E		-	01	1	001	

Table 23 - Instrument Cabinet for Fire & Gas detection System

Where:

- Process Unit shall be **950** for Fire & Gas detection system and device.
- Junction Boxes identification letter will be **J**, while Signal Category will be **E**.
- FGS Areas will be from 01 to 08.
- FGS Sub-Area will be 1 for open area, 2 for indoor area.
- Sequential No will be progressive from 001 to 999.
- Suffix will be a letter to identify two similar JBs (eg. A or B).

Example: 950 – JE – 012001 (JB 001, non-intrinsically safe, installed in Fire Zone 01, in a container)

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10. INSTRUMENT CABINET

Instrumentation cabinets shall be uniquely identified by a tag number as shown in Table 24:

	Sector Code		Cabinet/ Machine Type		Sequence Number
Character Type	LNLNLN(LN)		LLL(L)		NNN
Example	B400	-	PCS	-	001
Cabinet group number	B400	-	PCS	-	

Table 24 - Instrument Cabinet tag format

Example: B400-PCS-001 shall be the tag for PCS cabinet 001 in B-400 container.

10.1 CABINET TYPES

Code	Type
PCS	*Process Control System*
EMCS	*Electrical Monitoring Control System*
SIS	*Safety Instrumented System*
FGS	*Fire & Gas System*
NET	*Network*
SRV	*Server*
SYN	*Synchronizer Cabinet*

Table 25 - Instrument Cabinet type codes

11. LOCAL PANELS

Local Panels or process related functions shall be uniquely identified by a tag number as shown in Table 26:

	Process Unit		Local Panel			Sequence Number
Character Type	NN	-	L	P	-	NNN
Example	25	-	L	P	-	001
LP group number	25	-	L	P		

Table 26 - Local Panel tag format

Sequence numbers shall be unique in each local panel group: a group of local panels consists of all local panels that carry the same combination of process unit + local panel letters 'LP'.

The sequence number shall consist of a three-digit number, running from 001 to 999 in each local panel group.

12. SINGLE INSTRUMENT CABLES

Single cables are used to connect field instruments to field mounted junction boxes.

Single cables shall be uniquely identified by a tag number as shown in Table 27:

	Cable Identifier		Instrument Tag Number		Termination point
Reference	Section 12		Section 12.1		Section 12.2
Character Type	L	-	LN (Variable length)	/	LN (Variable length)
Example	C	-	25-PT-035	/	00-JE-11001

Table 27 - Single Cable tag format

The following cable identifier codes shall apply:

a. 'PD' for devices that require external DC powering via a 4-wire cable (for signal and power supply);

b. 'PA' for devices that require external AC powering via a 4-wire cable (for signal and power supply);

c. 'C' for all other single cables.

12.1 INSTRUMENT TAG NUMBER

The instrument tag number in Table 27 is the tag number of the instrument as used by the engineering tool.

12.2 TERMINATION POINT

The termination point of the single cable shall be specified. This is usually the junction box, but might also be the power source or another instrument device (e.g., cable between a thermocouple head and its remote transmitter).

13. MULTICORE AND FIBRE OPTIC CABLES

Multicore cabling connects junction boxes or local panels to instrument cabinets in for instance Field Auxiliary Rooms (FARs) or Control Room Auxiliary Rooms (CRARs). Multicore cabling is also used to connect junction boxes to other and cascaded junction boxes. Multicore cables (including system cables) or fibre optic cables are used to interconnect instrument cabinets.

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Multicore and fibre optic (FO) cables shall be uniquely identified by a tag number as shown in Table 28:

	Plant Code		Tag of source		Tag of destination
Reference		-	Section 13		Section 13.1
Character Type	(LN)(LN)LNLN	-	LN (Variable length)	/	LN (Variable length)
Example	40	-	00-JE-11001	/	B400-PCS-003

Table 28 - Multicore and Fibre Optic Cable tag format

Multicore/FO cabling typically carries a mixture of input and output signals, so the term source and destination cannot be linked to signal direction. The source is therefore defined as the part that is closest to the instrument. This is usually a junction box, but can also be local panel, an equipment control panel or an instrument/electrical interface cabinet.

13.1 TAG OF DESTINATION

For interconnecting, cabling between consoles and cabinets source and destination should be selected in alphabetic-numeric order.

The tag formats of instrument sources are defined in Table 20 and those from other sources (e.g., Electrical) are covered by the other sections of this document.

Rationale: Multicore/FO cabling typically carries a mixture of input and output signals, so the term source and destination cannot be linked to signal direction. The source is therefore defined as the part that is closest to the instrument. This is usually a junction box, but can also be local panel, an equipment control panel or an instrument/electrical interface cabinet.

14. TELECOMMUNICATION EQUIPMENT

All Telecommunications equipment and cables shall be uniquely identified by a tag number of the format as Table 29 (N stands for Number, L for Letter; () are for optional digits):

	Process Unit			Telecom System Code			Telecom Equipment Function Code				Sequence Number		
Character Type	N	N	-	N	N	-	T	L	L	-	N	N	N
Example	8	9	-	7	3	-	T	S	P	-	0	0	1

Table 29 - Telecom Equipment tag format

14.1 TELECOM SYSTEM CODE

The telecoms system shall be identified by a two-digit code in accordance with Table 30:

Telecoms System Code	System Name
00	VOICE
06	Operations VHF/UHF
20	AERONAUTICAL & MARINE
24	SOLAS (EPIRB/SART/MF/HF)
25	Marine VHF
70	SECURITY & SAFETY
73	Access Control

Table 30 - Telecom System Code

14.2 TELECOM EQUIPMENT FUNCTION CODE

The Telecoms function shall be represented by a two-character code prefixed with a T in accordance with Table 31:

Function Code	Description
TBC	Battery Charger
TCP	Control/Access Panel
TDC	Door Contact
TEP	EPIRB
THG	GMDSS Hand portable Radio VHF
THP	Handheld Radio
THS	Headset
THU	Hand portable Radio UHF
TIR	Intruder Detection Sensor
TRB	Radio Beacon
TSA	SART
TSR	Sensor

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TUP	Power Supply

Table 31 - Telecom Equipment Function Code

15. SAFETY EQUIPMENT

A tag number shall uniquely identify all safety equipment such as fire extinguisher stations and lifeboats.

Safety equipment shall be tagged in line with the following table 32 (N stands for Number, L for Letter; () are for optional digits).

	Safety Equipment Function Code				Process Unit		Sequence Number			Identical Equipment Code
Character Type	Y	L	L	-	N	N	N	N	N	(L)
Example	Y	B	S	-	7	0	0	0	1	A

Table 32 - Safety Equipment Function Codes

15.1 SAFETY EQUIPMENT FUNCTION CODE

The safety equipment function codes shall be in accordance with Table 33.

Letter	Safety Equipment Function Code
YBA	Breathing Apparatus
YBS	Eyebath /Safety Shower
YDF	Defibrillator
YEE	Escape Equipment
YFA	First Aid Equipment
YLB	Lifeboat / Life buoy/ Life Raft
YSE	General Safety Equipment
YXC	Extinguisher Cabinet
YXP	Packaged Bottled Extinguisher System
YXT	Extinguisher

Table 33 - Safety Equipment function codes

15.2 SAFETY EQUIPMENT NUMBER

The sequence number shall consist of a three-digit number, running consecutively from 001 for each equipment function code in accordance with the Table 33, unless flexibility for the addition of future equipment within the same sequence is required.

15.3 EXAMPLES OF SAFETY EQUIPMENT NUMBERS

An example of HVAC Equipment tag is: YBS – 70 001,

Where:

- YBS is the Safety equipment function code of a Eyebath/Safety Shower
- 70 is the Process Unit
- 001 is the Equipment sequence number of fire damper 1.

Firefighting equipment cabinets or stations shall be given a unique tag number.

However, individual extinguishers should not be tagged.

16. HEATING, VENTILATION AND AIR CONDITIONING (HVAC) EQUIPMENT

All HVAC equipment shall be uniquely identified by a tag number of the format defined in Table 34 (N stands for Number, L for Letter; () are for optional digits).

	HVAC Equipment Function Code				Process Unit		Sequence Number			Identical Equipment Code
Character Type	H	L	L	-	N	(N)	N	N	N	(L)
Example	H	D	F	-	7	7	0	0	1	A

Table 34 - HVAC tag format

16.1 HVAC EQUIPMENT FUNCTION CODE

The HVAC Equipment function code shall be in accordance with Table 35.

Letter	HVAC Equipment Function Code
HCF	Filters
HCP	Control Panel
HDB	Balancing Damper
HDN	Non-Return Damper
HDR	Pressure Relief Damper
HDS	Shut-off Damper
HEU	Air Conditioning External Unit
HFA	Fan
HFD	Fire Damper
HHD	Duct Heater

HHS	Space Heater
HIU	Air Conditioning Internal Unit
HJB	Junction Box
HLV	Louvre
HSA	Sound Attenuator (Silencer)
HSB	Switchboard
HSG	Supply Grille
HTU	Terminal Unit

Table 35 - HVAC Equipment Function Code

16.2 HVAC SEQUENCE NUMBER

The sequence number shall be a three-digit number, running consecutively from 001 for each equipment function code in accordance with the Table 35, unless flexibility for the addition of future equipment within the same sequence is required.

16.3 EXAMPLES OF HVAC EQUIPMENT NUMBERS

An example of HVAC Equipment tag is: HDN – 77001A,

Where:

- HDN is the HVAC equipment function code of a non-return damper
- 77 is the Process Unit 7700
- 001 is the Equipment sequence number of non-return damper 1
- A is the letter indicating first or at least two identical fire dampers (either working in parallel or in series or equipment with single spare).

16.4 EXAMPLES OF HVAC CABINET

	Sector Code	Cabinet/ Machine Type	Sequence Number
Character Type	LNLNLN(AN)	LLL(L)	NNN
Example	B400	HSB	001
Cabinet group number	B400	HSB	

Table 36 - HVAC Cabinet tag format

Example: B400-HSB-001 shall be the tag for HVAC cabinet 001 in B-400 container.

17. PIPING SYSTEMS

All plant piping systems with piping classes in P&IDs, Utility Engineering Flow Schemes and piping drawings shall be identified by a line number consisting of the components listed in Table 37 (N stands for Number, L for Letter; () are for optional digits).

	Size - Nominal Pipe Size (NPS)				Service Code (Fluid)			Line Number				Piping Spec.			Coating Class
												Class	Material		
Character Type	N	(N)	"	-	L	L	-	N	N	N	-	NN	LL	-	L
Example	4		"	-	D	M	-	0	0	1	-	01	SS	-	H

Table 37 - Line number in US Customary units tag format

17.1 PIPING SIZE

The size of the piping system shall be designated as NPS for US customary units.

17.2 SERVICE CODES (FLUIDS)

The following table provides the fluid codes project shall use:

Letter	*Fluid*
AV	Atmospheric Vent
CB	Concentrated Brine
CI	Chemical Injection
DI	Deionised Water
DM	Demineralized Water
HY	Hydrogen
IA	Instrument Air
N	Nitrogen Gas
SWR	Water Return
SWS	Water Supply
VL	LP Vent
WW	Waste Water

Table 38 - Line number in US Customary units tag format

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17.3 LINE NUMBER

The line number shall be a combination of the fluid code and sequence number.

17.4 SEQUENCE NUMBER

The sequence number shall be a three-digit number, running consecutively from 001 to 999.

17.5 PIPE CLASS RATING

The following Pipe Class Rating shall be used for Piping Lines:

Code	*Class*
00	Below 150# (miscellaneous)
01	150# (according to ASME B31.3)
03	300# (according to ASME B31.3)
06	600# (according to ASME B31.3)
01H	150# (according to ASME B31.12)
03H	300# (according to ASME B31.12)

Table 39 - Pipe Class Rating Codes

17.6 MATERIAL

The following Materials shall be used for Piping Lines:

Code	*Material*
CS	Carbon Steel
SS	Stainless Steel
SD	Super Duplex Stainless Steel
GRP	Glass Reinforced Plastic
CP	CPVC
PU	PVC-U
PE	Polyethylene
PP	Polypropylene

Table 40 - Material Codes for Piping Lines

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17.7 COATING CLASS

The following Coating Classes shall be used for Piping Lines:

Code	*Coating Class*
H	Heat Conservation
P	Personnel Protection
E	Electrically Heat Traced
N	Not Insulated (Painted)

Table 41 - Coating Classes for Piping Lines

18. MANUAL VALVES AND CHECK VALVES

Manual vales shall be uniquely identified by a tag number of the format below (N stands for Number, L for Letter):

	Plant Code		Valve Type		Sequence Number		
Character Type	BLPH	-	L	-	N	N	N
Example	BLPH	-	NRV	-	0	0	1

Table 42 - Manual and Check Valves tag format

18.1 VALVE TYPE

A two- or three-character code shall be used to identify the valve type as per the table 43:

Valve Type	Description
MV	Manual Valve
NRV	Check Valve (also known as a Non-Return Valve)

Table 43 - Valve type codes

19. SPECIAL PIPING ITEMS

Special piping items include all in-line piping components not typically specified in piping classes, for example:

- certain types of blowdown valves;
- non-slam check valves;
- non-standard thermowell;
- branch devices;

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- hose;
- hose reel;
- hose coupling;
- special piping pieces;
- balanced pressure proportioner;
- mechanical regulator;
- vent.

Special piping items shall be uniquely identified by a tag number of the format shown in Table 44.

	Plant Code		Special Piping Item			Sequence Number			
Character Type	BLPH	-	S	P	-	N	N	N	(N)
Example	BLPH	-	S	P	-	0	0	0	6

Table 44 - Special Piping Items tag format

20. MULTIDISCIPLINARY SUPPORTS

All supports (piping, cable way, HVAC) must be identified with a progressive number, with reference to the platform deck plan and the installation phase, as indicated below:

	Support indication			Installation Code	Deck Plan Code	Progressive number		
Reference	-			Table 46	Table 47			
Character Type	P	S	-	N	N	N	N	N
Example	P	S	-	0	0	0	1	8

Table 45 - Multidisciplinary Supports tag format

Installation code indicates in which construction phase the support must be installed:

Installation Code	Phase
0	Fabrication Phase
7	Hook-Up Phase
8	Future (not installed)
9	Temporary support

Table 46 - Supports Installation codes

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Deck Plan code represents the identification code inside the deck, to identify the fixing position on the platform:

Deck Plan Code	Phase
1	Lower Deck
2	Upper Deck
3	PAU

Table 47 - Deck Identification codes

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