Base Load Power Hub (BLPH)

PROJECT CODES AND STANDARDS REPORT

Document Number: 123A90-PML-PM-RE-00038

Document Class: 2

02	31/10/2025	Approved for Construction (AFC)	C. Giunchi	R. Degli Esposti	M. Brunelli
01	21/12/2023	Approved for Construction (AFC)	C. Giunchi	D. Lo Sterzo	M. Brunelli
00	08/09/2023	Issue for Review (IFR)	C. Giunchi	M. Dossena	M. Brunelli
Rev.	Date	Description	Prepared	Reviewed	Approved

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

Revision / Change Log

Rev.	Description
00	Issue for Review
01	Approved for Construction
02	Approved for Construction

HOLDS LIST

No.	Description
1	
2	
3	
4	

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

Table of contents

1 INTRODUCTION 4
1.1.1 PROJECT OVERVIEW 4
1.1.2 Project Location 4
1.1.3 Project Concept 5
2 DOCUMENT SCOPE 7
1.2 REFERENCES 7
1.3 ABBREVIATIONS 7
3 TECHNICAL STANDARDS STRATEGY 7
4 ORDER OF PRECEDENCE 8
5 Compliance to shell standards 8
6 SELECTION OF ENGINEERING STANDARDS 9
6.1 Shell Standards 9
6.1.1 DEM-2 Process Safety Basic Requirements 9
6.1.2 DEM-1 10
6.1.3 DEPS 47
6.2 External, Industry and/or Vendor Standards 49
6.2.1 ADDITIONAL REQUIREMENTS 55
6.3 Local Laws & RegulationS 55
6.3.1 ADDITIONAL REQUIREMENTS 56

1 INTRODUCTION

1.1.1 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.

1.1.2 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.

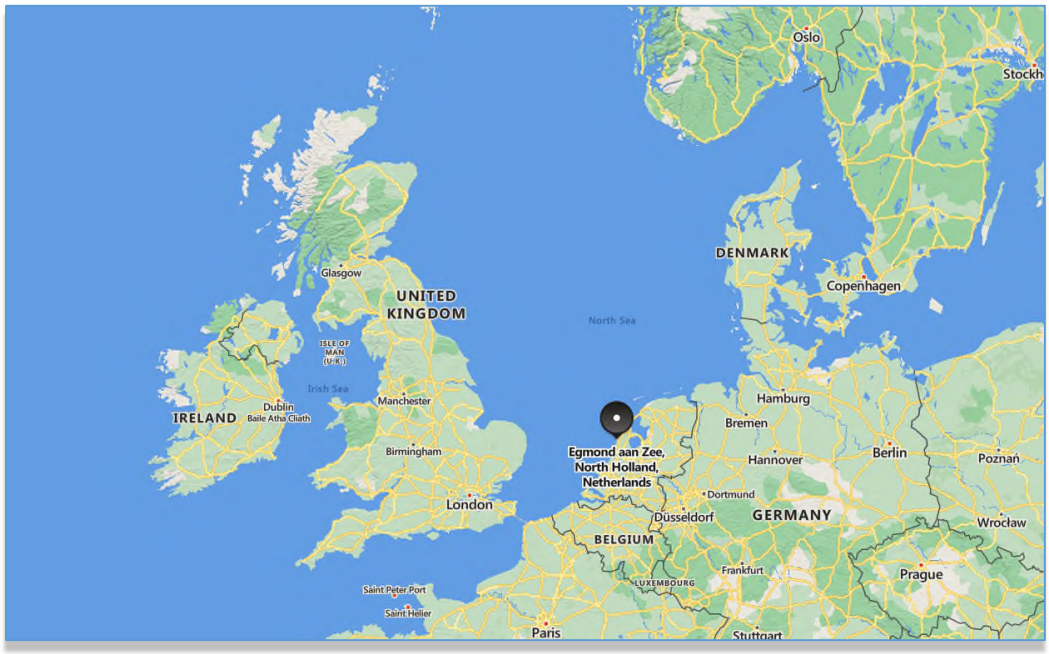


Figure 1 - HOLLANDSE KUST NOORD WIND PARK Location Map

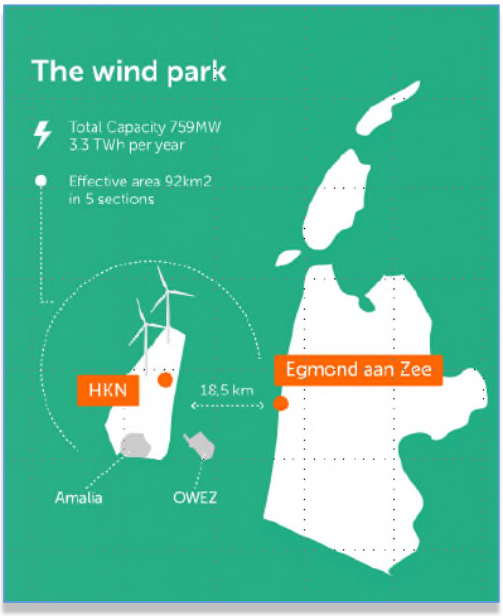


Figure 2 - Wind Park Details

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 is located on coordinates E 590719.1, N 5841602.3 and 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.

1.1.3 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.

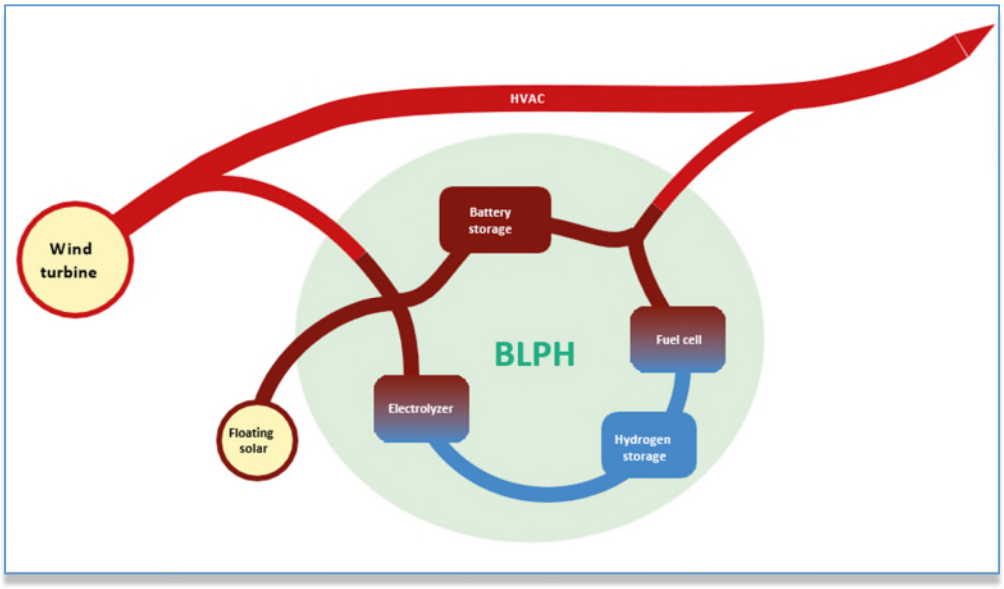


Figure 3 – BLPH Concept

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

2 DOCUMENT SCOPE

The purpose of this document is to enlist all Codes and Standards applicable to the Project.

1.2 REFERENCES

Doc. No.	Description
CONTRACT - SECTION V	Scope Description
K559-2254-PM-PLN-003	Basic Design Engineering Package

Table 1 - Reference Documents

1.3 ABBREVIATIONS

Term	Description
DEM	Design and Engineering Manual
DEP	Design and Engineering Practice

Table 2 - Definitions and Abbreviations

3 TECHNICAL STANDARDS STRATEGY

The section outlines the identified Codes and Standards applicable to the BLPH. In the EPCI phase further optimization of the Codes and Standards will be required.

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

4 ORDER OF PRECEDENCE

The project will apply relevant Standards and Codes as detailed in this Part. Following order of precedence will be adhered to:

- Dutch Standards and Regulatory Requirements.
- DEM-2 requirements described in ch. 5;
- DEM-1 requirements described in ch.5;
- Selected Shell DEPs;
- Industry or International Codes and Standards and European Directives.

During project life, situations where the project standards and specifications listed in this section result in a solution that is more than is required to be fit for purpose will be identified and discussed with the Company.

5 COMPLIANCE TO SHELL STANDARDS

With reference to Shell Standards, Contractor will:

1) Demonstrate design compliance without exception with all COMPANY's Design and Engineering Manual mandatory requirements (DEM-2) applicable to any system and equipment package.
2) Conduct a verification analysis, including impact on functionality and safety, of COMPANY's list of, in order of priority:
    a. DEM-1 statements;
    b. Design Engineering Practices (DEP) Standards listed in this document.

With reference to point 3, Contractor will use reasonable endeavours and in good faith implement the DEP Standards and DEM-1 statements. A track record of Shell Standards, indicating compliance / non-compliance with each listed requirement will be created. For the cases the project seek derogation from the appropriate requirement, clear supporting justification will be provided.

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

6 SELECTION OF ENGINEERING STANDARDS

6.1 SHELL STANDARDS

6.1.1 DEM-2 Process Safety Basic Requirements

#	Title	Applicable to	Applicable to BLPH
PSBR-1	Safe siting of occupied portable buildings	Onshore Assets that have process Hazards with RAM red Risks or yellow 5B Risks.	No. This is an Offshore project
PSBR 2	Emergency Shutdown (ESD) valves on platform risers	Offshore pipelines or production installations that have process Hazards with RAM red Risks or yellow 5B Risks.	No. There is no production riser
PSBR 3	Offshore occupied buildings	Offshore installations that have process Hazards with RAM red Risks or yellow 5B Risks.	Yes, BLPH will require a shelter, which was raised as an action in the HAZID. This is a NUI with twice a year maintenance.
PSBR 4	Retired	Not Applicable	Not Applicable
PSBR 5	Retired	Not Applicable	Not Applicable
PSBR 6	Liquid release relief to atmosphere	Assets that have process Hazards with RAM red Risks and yellow 5B Risks and that are used for producing, processing, transporting, or storing hydrocarbon liquid above its flash point	No. There is no storage of hydrocarbon (hazardous) liquid above its flash point
PSBR 7	Tank overfill followed by vapour cloud release	Assets that have process Hazards with RAM red Risks or yellow 5B Risks and that are used for producing, processing, transporting, or storing fluids that have the potential to form a vapour cloud	No. There is no storage of fluids that have the potential to form a vapour cloud
PSBR 8	Brittle fracture of metallic materials	Assets that have process Hazards with RAM red Risks or yellow 5B Risks and that are used for producing, processing, transporting, or storing LPG, Liquefied Natural Gas (LNG) or compressed flammable low molecular weight hydrocarbon gas.	No. There is no storage of LPG, Liquefied Natural Gas (LNG) or compressed flammable low molecular weight hydrocarbon gas
PSBR 9	Alarm management	Assets that have process Hazards with RAM red Risks or yellow 5B Risks and that are used for exploring, drilling, producing, processing, transporting or storing Hazardous Substances or energy	Yes, alarm management is crucial for the proper operation of this facility. This is seen as standard practice.
PSBR 10	Hydrogen Sulphide (H_2S)	Facilities and activities where Sour Gas may be present.	No. Sour gas is not present
PSBR 11	Deepwater Well Design and Construction	Well design; and Well construction	No. There is no wells scope
PSBR 12	Reactive Hazards	Runaway chemical reactions leading to explosions, fire, or toxic release.	Yes. List of reactive hazards to be created for OPERATE phase.
PSBR 13	High temperature hydrogen attack of metallic materials	Release and ignition of flammable hydrogen / hydrocarbons	Yes, determine the likelihood for high temperature hydrogen attack for all pressure vessels, piping and piping components that may be susceptible to HTHA.

6.1.2 DEM-1

The specific safety critical DEM-1 requirements (SHALL [PS] only) shall be applied as per the BLPH DEM-1 Statements List as shown below.

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 32.01.20.1 2-Gen.	IACS SECURITY	February 2021	DEP_32012012-Gen > 2. PROCESS SAFETY REQUIREMENTS	1. All communications between the IACS zone and all other zones located outside the IACS zone SHALL [PS] be routed through a DMZ or a unidirectional security gateway that restricts communications to authorized protocols and only between authorized devices. a. Refer to zone model in (APPENDIX A). Authorized protocols and devices are determined during project specific detailed design and informed by the project specific cyber security risk assessment.	PACO
DEP 32.01.20.1 2-Gen.	IACS SECURITY	February 2021	DEP_32012012-Gen > 2. PROCESS SAFETY REQUIREMENTS	2. A firewall SHALL [PS] be used to control communications between the Control and Safety Zone and any other zone located inside the IACS Zone by restricting communications to authorized protocols and only between authorized devices. a. Refer to zone model in (APPENDIX A). Authorized protocols and devices are determined during project specific detailed design and informed by the project specific cyber security risk assessment.	PACO
DEP 32.01.20.1 2-Gen.	IACS SECURITY	February 2021	DEP_32012012-Gen > 2. PROCESS SAFETY REQUIREMENTS	3. A cyber security risk assessment of the IACS, including the SIS, SHALL [PS] be carried out by the service provider to determine the necessary security controls and countermeasures required to reduce the cyber security risk to a level acceptable by the asset owner. Guidance related to SIS security is provided in ISA TR84.00.09, NAMUR NA 163 and IEC 62443 Part 2-4. General guidance on risk assessments can be found in IEC/ISA 62443 Parts 2- 1 and 3-2, ISA TR84.00.09 and NAMUR NA 163. This DEP specifies minimum requirements. The risk assessment is used to determine if any additional requirements are necessary to reduce the cyber security risk to a level acceptable by the asset owner or justify any deviations or derogations from the minimum requirements.	PACO
DEP 32.30.20.1 1-Gen.	FIRE, GAS AND SMOKE DETECTION SYSTEMS	February 2021	DEP_32302011-Gen > 2. THE FIRE, GAS AND SMOKE DETECTION SYSTEM > 2.3 ALERT PEOPLE	1. The Fire, Gas and Smoke detection system SHALL [PS] perform the following: a. Alert the operator at a continuously manned control centre to any detected hazards, their approximate location and type of event; b. Alert personnel in the vicinity of the hazard to the detected hazard so that they are able to take appropriate and timely action and evacuate to a safe location; c. Provide data about the Fire, Gas and Smoke event at the emergency control points to facilitate management of the incident. There could be the additional requirement to provide notification of emergency situations to local community services, e.g., fire brigades.	PACO

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 32.30.20.1 1-Gen.	FIRE, GAS AND SMOKE DETECTION SYSTEMS	February 2021	DEP_32302011-Gen > 4. DETECTOR TYPE SELECTION, DEPLOYMENT AND LOCATION > 4.1 ALL TYPES OF DETECTORS GENERAL > 4.1.1 Detector selection	2. All field mounted flammable gas, toxic gas and fire detectors (i.e., excluding smoke detectors inside unclassified buildings) SHALL [PS] be certified for use in a hazardous area Zone1 (Class 1, Div 1), even where they are installed in areas that are normally classified as non-hazardous.	PACO
DEP 32.30.20.1 1-Gen.	FIRE, GAS AND SMOKE DETECTION SYSTEMS	February 2021	DEP_32302011-Gen > 4. DETECTOR TYPE SELECTION, DEPLOYMENT AND LOCATION > 4.2 FIRE DETECTORS > 4.2.1 General	1. Detection equipment SHALL [PS] be capable of detecting fires of the fuel- types that could be present in the coverage area.	PACO
DEP 32.30.20.1 1-Gen.	FIRE, GAS AND SMOKE DETECTION SYSTEMS	February 2021	DEP_32302011-Gen > 4. DETECTOR TYPE SELECTION, DEPLOYMENT AND LOCATION > 4.3 FIRE DETECTORS > 4.2.4 Smoke detectors > 4.2.4.2 Smoke detection on intake ducts	1. Smoke detection SHALL [PS] be installed in HVAC air intakes to areas that need to remain manned during an emergency.	PACO
DEP 32.30.20.1 1-Gen.	FIRE, GAS AND SMOKE DETECTION SYSTEMS	February 2021	DEP_32302011-Gen > 4. DETECTOR TYPE SELECTION, DEPLOYMENT AND LOCATION > 4.3 FLAMMABLE GAS DETECTORS > 4.3.1 General	1. Detection equipment SHALL [PS] be capable of detecting the gases or vapours that could be present in the area it covers.	PACO
DEP 32.30.20.1 1-Gen.	FIRE, GAS AND SMOKE DETECTION SYSTEMS	February 2021	DEP_32302011-Gen > 4. DETECTOR TYPE SELECTION, DEPLOYMENT AND LOCATION > 4.6 TOXIC GAS DETECTOR TYPE SELECTION > 4.6.1 General	1. Toxic gas detection equipment SHALL [PS] be capable of detecting the specific toxic gases or vapours that could be present in the area covered by the detectors.	PACO
DEP 32.30.20.1 1-Gen.	FIRE, GAS AND SMOKE DETECTION SYSTEMS	February 2021	DEP_32302011-Gen > 4. DETECTOR TYPE SELECTION, DEPLOYMENT AND LOCATION > 4.7 SPECIAL AREA DETECTION REQUIREMENTS > 4.7.2 Ventilation air intakes	1. Ventilation air intake for normally occupied buildings located within the gas dispersion area SHALL [PS] have gas detectors (flammable and/or toxic), and smoke detectors if smoke ingress is an identified hazard.	PACO

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 32.30.20.1 1-Gen.	FIRE, GAS AND SMOKE DETECTION SYSTEMS	February 2021	DEP_32302011-Gen > 8. ALARMS, EXECUTIVE ACTIONS, ANNUNCIATION > 8.1 GENERAL	1. A warning system SHALL [PS] be installed at all facilities, onshore and offshore, providing the following: a. alarms audible at every part of the facility where people could be present; b. beacons to supplement audible alarms (GA, PAGA) and emergency speech announcements in areas where ambient noise exceeds 85 dB (A).	PACO
DEP 32.30.20.1 1-Gen.	FIRE, GAS AND SMOKE DETECTION SYSTEMS	February 2021	DEP_32302011-Gen > 8. ALARMS, EXECUTIVE ACTIONS, ANNUNCIATION > 8.1 GENERAL	3. Confirmed fire, gas, or smoke event, or manual call point activation SHALL [PS] initiate automatic visual and audible alarms to alert personal to evacuate the affected area, and to alert the entire facility of an event.	PACO
DEP 32.30.20.1 1-Gen.	FIRE, GAS AND SMOKE DETECTION SYSTEMS	February 2021	DEP_32302011-Gen > 8. ALARMS, EXECUTIVE ACTIONS, ANNUNCIATION > 8.2 ACTIONS > 8.2.1 Fire or gas detection	6. For confirmed gas in a generator room, all electrical equipment and generators not suitable for Zone1/Div. 1 hazardous area location housed within the room SHALL [PS] trip. See IEC 61832.	PACO
DEP 32.30.20.1 1-Gen.	FIRE, GAS AND SMOKE DETECTION SYSTEMS	February 2021	DEP_32302011-Gen > 9 FIRE, GAS AND SMOKE DETECTION SYSTEMS DESIGN > 9.1 GENERAL	1. Where there is executive action associated with the detection of either fire, gas, or smoke, the FGS system SHALL [PS] be independent of the Basic Process Control System (BPCS). Executive action includes the starting or stopping of equipment or process. It does not include local horns and beacons or driving alarm panels	PACO
DEP 32.30.20.1 1-Gen.	FIRE, GAS AND SMOKE DETECTION SYSTEMS	February 2021	DEP_32302011-Gen > 9 FIRE, GAS AND SMOKE DETECTION SYSTEMS DESIGN > 9.5 HMI INTERFACE > 9.5.4 Overrides	2. Local override devices SHALL [PS] not be installed on Fire, Gas and Smoke systems.	PACO
DEP 32.30.20.1 1-Gen.	FIRE, GAS AND SMOKE DETECTION SYSTEMS	February 2021	DEP_32302011-Gen > 9 FIRE, GAS AND SMOKE DETECTION SYSTEMS DESIGN > 9.7 AUDIBLE AND VISUAL ALARM AND PUBLIC ADDRESS > 9.7.3 Audible coverage	1. The sound level of all audible alarms and broadcast messages SHALL [PS] meet the applicable minimum sound levels in Table 9.2.	PACO
DEP 32.31.50.1 3-Gen.	ANALYSER HOUSING	February 2021	DEP_32315013-Gen > 6. HEATING, VENTILATION AND AIR CONDITIONING OF CLOSED AND PRESSURISED ANALYSER SHELTERS > 6.2 ARTIFICIAL VENTILATION FOR CLOSED AND PRESSURISED ANALYSER SHELTERS > 6.2.1 General	1. For shelters classified as Zone 2 (Div. 2), ventilation SHALL [PS] be provided to prevent the LEL concentration from exceeding 20 % LEL, based on the worst single leak case.	PACO

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 32.31.50.1 3-Gen.	ANALYSER HOUSING	February 2021	DEP_32315013-Gen > 7. ANALYSER CLOSED AND PRESSURISED SHELTER PROTECTION > 7.1 GENERAL	1. Analyser shelters SHALL [PS] be provided with appropriate gas detectors when handling fluids that are any of the following: a. very toxic-acute; b. very toxic-chronic; c. flammable; d. using hydrogen as a carrier gas or burner fuel	PACO
DEP 32.36.01.1 8-Gen	SELECTION AND PROCUREMENT OF ACTUATORS FOR ON-OFF VALVES	February 2021	DEP_32360118-Gen > 2. REQUIREMENTS > 2.1 ACTUATOR DESIGNATION AND CLASSIFICATION > 2.1.1 Protective applications	1. For Protective Applications, the actuator and valve assembly, including the position control accessory (e.g., solenoid), SHALL [PS] meet the integrity requirement of the SIF or SIFs of which it forms a part, as defined in accordance with IEC 61511 (refer to DEP 32.80.10.10-Gen.). Where used by more than one SIF, the most onerous integrity requirement applies.	PACO
DEP 32.36.01.1 8-Gen	SELECTION AND PROCUREMENT OF ACTUATORS FOR ON-OFF VALVES	February 2021	DEP_32360118-Gen > 3. ACTUATOR ACCESSORIES > 3.2 ACCESSORIES INTEGRAL TO THE ACTUATOR > 3.2.3 Hand wheel	1. For Protective Applications, hand wheels SHALL [PS] not be fitted.	PACO
DEP 32.36.01.1 8-Gen	SELECTION AND PROCUREMENT OF ACTUATORS FOR ON-OFF VALVES	February 2021	DEP_32360118-Gen > 3. ACTUATOR ACCESSORIES > 3.2 ACCESSORIES INTEGRAL TO THE ACTUATOR > 3.2.4 Locking devices	1. Actuators on valves used in Protective Applications SHALL [PS] not be fitted with locking devices.	PACO
DEP 32.36.01.1 8-Gen	SELECTION AND PROCUREMENT OF ACTUATORS FOR ON-OFF VALVES	February 2021	DEP_32360118-Gen > 3. ACTUATOR ACCESSORIES > 3.3 POSITION CONTROL AND FEEDBACK ACCESSORIES > 3.3.1 Position control > 3.3.1.1 Solenoid-operated valve	2. For Protective Applications, only Type 1 or Type 2 solenoid-operated valves SHALL [PS] be applied. a. Type 1. A direct-operated solenoid valve that contains a magnetically actuated plunger that switches a port through which flows the medium used to switch and control; b. Type 2. A combination of a Type 1 direct-operated solenoid valve and a separate pneumatically operated (3-or 5-port) valve. The moving parts of these two components are not mechanically connected. These two functions may be combined in the same product.	PACO
DEP 32.45.10.1 0-Gen.	INSTRUMENTATION OF DEPRESSURING SYSTEMS	February 2021	DEP_32451010-Gen > 3. SPECIFIC DESIGN AND CONSTRUCTION REQUIREMENTS > 3.2 SECURED INSTRUMENT AIR SYSTEM > 3.2.1 Application	1. A Secured Instrument Air (SIA) buffer vessel SHALL [PS] assure instrument air supply to the following services: a. automatically initiated air fail close valves (i.e., fail-safe condition is closed); b. air-fail open valves if the flare system cannot handle the full depressuring rate of all depressuring loads simultaneously.	PACO

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 32.45.10.1 0-Gen.	INSTRUMENTATION OF DEPRESSURING SYSTEMS	February 2021	DEP_32451010-Gen > 3. SPECIFIC DESIGN AND CONSTRUCTION REQUIREMENTS > 3.4 DEPRESSURING SYSTEM POWER SUPPLY	2. Failure of a single UPS SHALL [PS] not lead to a hazardous situation (e.g., that would exceed the vent/flare system capacity).	PACO
DEP 32.45.10.1 0-Gen.	INSTRUMENTATION OF DEPRESSURING SYSTEMS	February 2021	DEP_32451010-Gen > 3. SPECIFIC DESIGN AND CONSTRUCTION REQUIREMENTS > 3.8 TEST FACILITIES	3. Where block valves are provided on the upstream or downstream side of the depressuring valve, they SHALL [PS] be locked open.	PACO
DEP 32.80.10.1 0-Gen.	SAFETY INSTRUMENTED SYSTEMS	February 2021	DEP_32801010-Gen > 3. MANAGEMENT OF FUNCTIONAL SAFETY > 3.1 GENERAL	3. A Functional Safety Assessment (FSA), per IEC 61511-1 clause 5.2.6.1.5 SHALL [PS] be conducted before the hazards that the SIS or SIF are designed to prevent or mitigate are present. To ensure that potential issues are discovered as early as possible, it is recommended that FSA stages 1 and 2 are completed per the timings indicated in IEC 61511-1 figure 7.	PACO
DEP 32.80.10.1 0-Gen.	SAFETY INSTRUMENTED SYSTEMS	February 2021	DEP_32801010-Gen > 4. RISK ANALYSIS AND ALLOCATION OF PROTECTION LAYERS > 4.2 ALLOCATION OF SAFETY FUNCTIONS TO PROTECTION LAYERS > 4.2.1 General	1. A safety integrity targeting (SIL) review SHALL [PS] establish integrity targets for SIFs (excluding those covered under 4.2.1 item 7) identified during the main HAZOP and that prevent or mitigate a potential RAM Red orYellow 5A/5B risk. Refer to DEP 80.00.00.15-Gen clause 3.1.3 for requirements pertaining to the main HAZOP.	PACO
DEP 32.80.10.1 4-Gen.	ALARM MANAGEMENT (AMENDMENTS/SUPPLEMENTS TO IEC 62682)	February 2021	DEP_32801014-Gen > PART III. AMENDMENTS/SUPPLEMENTS TO IEC 62682 > 6. Alarm philosophy > 6.2 Alarm philosophy contents > 6.2.6 Alarm design principles > Add the following:	2. To be a valid barrier, the alarm limit SHALL [PS] be set within the associated Design, SIF or Integrity limit.	PACO
DEP 32.80.10.1 4-Gen.	ALARM MANAGEMENT (AMENDMENTS/SUPPLEMENTS TO IEC 62682)	February 2021	DEP_32801014-Gen > PART III. AMENDMENTS/SUPPLEMENTS TO IEC 62682 > 6. Alarm philosophy > 6.2 Alarm philosophy contents > 6.2.16 Approved enhanced and advanced alarming techniques > Add the following:	1. The alarm philosophy SHALL [PS] address methods and tools that the project/asset can use to minimise the amount of alarms that have no operational significance during the abnormal situation (e.g., standing alarms, repeating alarms, alarm floods).	PACO

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 32.80.10.1 4-Gen.	ALARM MANAGEMENT (AMENDMENTS/SUPPLEMENTS TO IEC 62682)	February 2021	DEP_32801014-Gen > PART III. AMENDMENTS/SUPPLEMENTS TO IEC 62682 > 6. Alarm philosophy > 6.2 Alarm philosophy contents > 6.2.17 Alarm documentation > Add the following:	1. A Master Alarm Database SHALL [PS] be created and used to document the Critical and Standard limits and their notifications.	PACO
DEP 32.80.10.1 4-Gen.	ALARM MANAGEMENT (AMENDMENTS/SUPPLEMENTS TO IEC 62682)	February 2021	DEP_32801014-Gen > PART III. AMENDMENTS/SUPPLEMENTS TO IEC 62682 > 6. Alarm philosophy > 6.2 Alarm philosophy contents > 6.2.23 Specific alarm design considerations > Add the following new sections: > 6.2.23.4 Fire and Gas Alarms	3. Fire and gas alarms that are confirmed or unconfirmed SHALL [PS] be assigned Critical priority.	PACO
DEP 32.80.10.1 4-Gen.	ALARM MANAGEMENT (AMENDMENTS/SUPPLEMENTS TO IEC 62682)	February 2021	DEP_32801014-Gen > PART III. AMENDMENTS/SUPPLEMENTS TO IEC 62682 > 14. Operation > 14.2 Alarm response procedures > 14.2.1 Alarm response procedures requirements > Add the following:	1. The operator actions for each alarm as listed in the Master Alarm Database SHALL [PS] be available to the operator at all times.	PACO
DEP 62.10.08.1 1-Gen.	INSPECTION AND FUNCTIONAL TESTING OF INSTRUMENTS	February 2021	DEP_62100811-Gen > 5. SITE ACCEPTANCE TESTING	1. Site Acceptance Testing (SAT) SHALL [PS] be conducted for Safety Instrumented Systems (SIS) and for Fire and Gas Systems (FGS).	PACO
DEP 62.10.08.1 1-Gen.	INSPECTION AND FUNCTIONAL TESTING OF INSTRUMENTS	February 2021	DEP_62100811-Gen > 10 LOOP CHECK	5. The loop check SHALL [PS] functionally verify all components of the SIF against the purchase specification and the Safety Requirements Specification (SRS). This includes specific travel/stroke times as shown on the requisition/datasheet or SRS. The SRS is required by IEC 61511-1, see also section 5 of DEP 32.80.10.10-Gen. Loop components include all field instruments, control and actuated valves, plus any other components necessary to achieve the loop function.	PACO

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 62.10.08.1 1-Gen.	INSPECTION AND FUNCTIONAL TESTING OF INSTRUMENTS	February 2021	DEP_62100811-Gen > 11 FULL FUNCTION TESTING	1. All SIFs SHALL [PS] be subject to full function testing, including the following: a. simulate the process input at the sensors; b. all potential combinations of voted sensors; c. all final elements.	PACO
DEP 62.10.08.1 1-Gen.	INSPECTION AND FUNCTIONAL TESTING OF INSTRUMENTS	February 2021	DEP_62100811-Gen	4. The correct operation of each of the following SHALL [PS] be verified, via simulating (e.g. with test gas or IR source) at the sensors, and verifying full operation of all final elements: a. confirmed fire or gas event, per fire zone and overall; b. plant shutdown and depressuring functions, per fire zone and overall.	PACO
DEP 62.10.08.1 1-Gen.	INSPECTION AND FUNCTIONAL TESTING OF INSTRUMENTS	February 2021	> 11 FULL FUNCTION TESTING	5. All input/output forces (including jumpers) and logic overrides SHALL [PS] be removed at the end of the full function testing before handover to operations.	PACO
DEP 32.71.00.1 0-Gen.	TELECOMMUNICATIONS FOR FACILITIES	February 2021	DEP_32710010-Gen > 2. GENERAL REQUIREMENTS > 2.1 SYSTEM CLASSIFICATION > 2.1.2 Mandatory/safety Critical Systems	1. Mandatory/safety critical telecommunications equipment SHALL [PS] be provided in accordance with the facility safety case or documented demonstration of ALARP and meet the minimum functional requirements defined in Principal's safety Performance Standards (ER004) or equivalent barrier.	Telecommunications
DEP 32.71.00.1 0-Gen.	TELECOMMUNICATIONS FOR FACILITIES	February 2021	DEP_32710010-Gen > 2. GENERAL REQUIREMENTS > 2.3 HAZARDOUS AREA CONSIDERATIONS	4. Telecommunications equipment that is required to operate during emergency scenarios, such as hydrocarbon release, SHALL [PS] be identified and provided with the level of protection appropriate to the credible exposure during the emergency scenarios. The default protection is typically approved to use in Zone 1 (Division 1, or equivalent) operation. This requirement includes associated infrastructure such as cable, fibre, and junction boxes.	Telecommunications
DEP 32.71.00.1 0-Gen.	TELECOMMUNICATIONS FOR FACILITIES	February 2021	DEP_32710010-Gen > 2. GENERAL REQUIREMENTS > 2.3 HAZARDOUS AREA CONSIDERATIONS	6. Portable telecommunication equipment, (e.g., hand portable radios, cellular phones, industrial mobility devices, wireless IP telephones, and associated headsets) SHALL [PS] be certified for the most stringent area classification to which staff carrying the portable equipment may be exposed.	Telecommunications

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 32.71.00.10-Gen.	TELECOMMUNICATIONS FOR FACILITIES	February 2021	DEP_32710010-Gen > 2. GENERAL REQUIREMENTS > 2.6 TELECOM FACILITIES > 2.6.6 Telecommunication Tower and Antenna > 2.6.6.1 Tower (onshore applications only)	4. Structural steelwork of telecommunication towers and masts SHALL [PS] be protected against direct lightning strikes and lightning induced currents, in accordance with DEP 33.64.10.10-Gen. (or DEP 33.64.20.10-Gen. for North America applications) and IEC 62305 (IEEE 780 for North American application).	Telecommunications
DEP 32.71.00.10-Gen.	TELECOMMUNICATIONS FOR FACILITIES	February 2021	DEP_32710010-Gen > 5. MOBILE RADIO COMMUNICATION > 5.2 MARINE RADIO SYSTEMS > 5.2.3 Life Rafts	1. If life rafts are provided, then each life raft SHALL [PS] be equipped in the same manner as TEMPSC (5.2.2).	Telecommunications
DEP 32.71.00.10-Gen.	TELECOMMUNICATIONS FOR FACILITIES	February 2021	DEP_32710010-Gen > 8. EMERGENCY FACILITIES > 8.5 MUSTER POINT FACILITIES	1. Muster point facilities defined in the facility emergency response plan SHALL [PS] be provided with specific telecommunication services as specified therein.	Telecommunications
DEP 01.00.01.30-Gen.	DEFINITION OF TEMPERATURE, PRESSURE AND TOXICITY LEVELS	February 2021	DEP_01000130-Gen > PART II. DEFINITION OF PRESSURE AND TEMPERATURE > 1. PRESSURE SYSTEM	2. The system design pressure SHALL [PS] not be higher than the pressure rating of any system component.	Process Engineering
DEP 01.00.01.30-Gen.	DEFINITION OF TEMPERATURE, PRESSURE AND TOXICITY LEVELS	February 2021	DEP_01000130-Gen > PART II. DEFINITION OF PRESSURE AND TEMPERATURE > 2. TEMPERATURE AND PRESSURE LEVELS > 2.1 TEMPERATURE > 2.1.2 Maximum operating temperature	2. The maximum operating temperature SHALL [PS] cover all intended modes of operation. This includes: start up, shut down, transient operation, drying, regeneration, steam-air decoking, heating up to maximum ambient temperature, including solar radiation, fouling of heat exchangers, heat exchanger by-passing, and control system variations (i.e., range of controllability).	Process Engineering
DEP 01.00.01.30-Gen.	DEFINITION OF TEMPERATURE, PRESSURE AND TOXICITY LEVELS	February 2021	DEP_01000130-Gen > PART II. DEFINITION OF PRESSURE AND TEMPERATURE > 2. TEMPERATURE AND PRESSURE LEVELS > 2.1 TEMPERATURE > 2.1.3 Upset temperature	2. The potential for upset temperatures exceeding the MOT due to exotherms, decompositions, or runaway reactions SHALL [PS] be mitigated by one of the following: a. increased design temperature; b. instrument safeguards; c. other barriers as determined from a risk assessment.	Process Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 01.00.01.30-Gen.	DEFINITION OF TEMPERATURE, PRESSURE AND TOXICITY LEVELS	February 2021	DEP_01000130-Gen > PART II. DEFINITION OF PRESSURE AND TEMPERATURE > 2. TEMPERATURE AND PRESSURE LEVELS > 2.1 TEMPERATURE > 2.1.4 Design temperature	1. The design temperature SHALL [PS] be equal to or greater than the MOT. The design temperature is typically at least 10 °C (18 °F) above the MOT.	Process Engineering
DEP 01.00.01.30-Gen.	DEFINITION OF TEMPERATURE, PRESSURE AND TOXICITY LEVELS	February 2021	DEP_01000130-Gen > PART II. DEFINITION OF PRESSURE AND TEMPERATURE > 2. TEMPERATURE AND PRESSURE LEVELS > 2.1 TEMPERATURE > 2.1.5 Minimum metal temperature (MMT)	2. The MMT SHALL [PS] be specified based upon the minimum of the following: a. the lowest normal operating temperature; b. the lowest temperature during startup (including initial filling of an empty system) or shutdown; c. Lowest Ambient Temperature (LAT); d. the temperature during exceptional cool down events caused by high rate depressurisation, resulting in either Joule-Thomson cooling of low molecular weight gases, or autorefrigeration of liquefied light hydrocarbons or other process upset conditions. The potential for high rate depressurisation is normally evaluated when determining the MMT for equipment and piping containing compressed low molecular weight hydrocarbon fluids (e.g., methane, ethane, propane, propylene, or ethylene), compressed CO2, or compressed N2. For boiling of liquefied gas, the MMT is usually based upon the Adiabatic Flash Temperature (AFT) or the Atmospheric Boiling Point (ABP) unless vacuum conditions or the presence of inert gas can cause boiling below these temperatures. Normal assessment of the MMT during depressurising only considers adiabatic flash of the process fluids, but the heat contained in the process equipment itself can be included in cases where a more detailed simulation is justified based on potential cost savings, if documented quantitatively. Typical upset scenarios include excessive cooling (e.g., due to control failure, valve mis-operation) and loss of heating medium to the system (e.g., due to power failure, valve closure, pump failure).	Process Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 01.00.01.30-Gen.	DEFINITION OF TEMPERATURE, PRESSURE AND TOXICITY LEVELS	February 2021	DEP_01000130-Gen > PART II. DEFINITION OF PRESSURE AND TEMPERATURE > 2. TEMPERATURE AND PRESSURE LEVELS > 2.1 TEMPERATURE > 2.1.6 Lower design temperature (LDT)	1. To prevent brittle fracture, the selected LDT SHALL [PS] be based on one of the following criteria, in order of preference: a. Option 1. The LDT is equal to or colder than the MMT; b. Option 2. The LDT is equal to or colder than the MMT but the LDT is determined on the basis of reduced design stress, relative to the maximum code allowable stress, in accordance with the rules in the applicable design code: i. the maximum temperature credit allowed is 50 °C (90 °F); ii. temperature credits greater than 50 °C (90 °F) are justified on the basis of a analysis using internationally recognised standards, and approved by the ME Technical Authority of the Principal. c. Option 3. The LDT is warmer than the MMT, but only when the General Membrane Stress is less than 50 N/mm2 (7,250 psi) for the operating scenarios where the fluid temperature is colder than the LDT; Selecting this option would need to be justified by significant cost savings to balance the cost of process control, instrumented safeguarding and production restraints required to prevent operation at a stress level above 50 N/mm2 (7,250 psi). d. Option 4. When the controlling MMT is associated with a depressuring scenario, the selected materials are qualified on the basis of a comparison of the MAT and CET curves. Option 4 is only selected if justified by significant cost savings, including the cost of process control and production restraints required to prevent operation on the unsafe side of the MAT curve.	Process Engineering
DEP 01.00.01.30-Gen.	DEFINITION OF TEMPERATURE, PRESSURE AND TOXICITY LEVELS	February 2021	DEP_01000130-Gen > PART II. DEFINITION OF PRESSURE AND TEMPERATURE > 2. TEMPERATURE AND PRESSURE LEVELS > 2.1 TEMPERATURE > 2.1.6 Lower design temperature (LDT)	2. Where the selected LDT is based on Option 2, Option 3 or Option 4 in (Part II, 2.1.6, Item 1), the following activities SHALL [PS] be completed: a. Identify scenarios that could lead to re-pressurisation, or pressurization from connected systems, while the equipment is colder than the LDT; b. Assess the Risk of each scenario and define the Risk mitigation in accordance with the Managing Risk manual of the HSSE & SP Control Framework; c. The resulting ALARP documentation has been reviewed and approved by the designated Technical Safety Technical Authority of the Principal.	Process Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 01.00.01.3 0-Gen.	DEFINITION OF TEMPERATURE, PRESSURE AND TOXICITY LEVELS	February 2021	DEP_01000130-Gen > PART II. DEFINITION OF PRESSURE AND TEMPERATURE > 2. TEMPERATURE AND PRESSURE LEVELS > 2.2 PRESSURE > 2.2.3 Design pressure (DP) > 2.2.3.2 Vapour and vapour-liquid systems protected by relief valves	1. Equipment that is part of a pressure system protected by a relief valve discharging into a flare system or combined vent system SHALL [PS] have a minimum design pressure of at least 3.5 barg (50 psig) to protect against flare burn-back. This requirement does not apply to systems comprising tanks and other atmospheric systems with dedicated vapour collection systems and flare systems. When using sonic flare tips, the minimum design pressure might need to be considerably higher than 3.5 barg (50 psig).	Process Engineering
DEP 01.00.02.11 1-Gen.	PREPARATION OF PROCESS FLOW SCHEMES AND PROCESS ENGINEERING FLOW SCHEMES	February 2021	DEP_01000211-Gen > 3. PROCESS ENGINEERING FLOW SCHEMES (PEFS) > 3.1 GENERAL	1. PEFS SHALL [PS] include all process and utilities equipment including installed spares, and associated piping, piping components, instrumentation, heat tracing, insulation and fire protection.	Process Engineering
DEP 01.00.02.11 1-Gen.	PREPARATION OF PROCESS FLOW SCHEMES AND PROCESS ENGINEERING FLOW SCHEMES	February 2021	DEP_01000211-Gen > 3. PROCESS ENGINEERING FLOW SCHEMES (PEFS) > 3.1 GENERAL	3. PEFS SHALL [PS] be kept updated to represent the actual installation throughout the life of the project.	Process Engineering
DEP 30.05.10.3 0-Gen.	NITROGEN SUPPLY AND DISTRIBUTION SYSTEMS	February 2021	DEP_30051030-Gen > 5. NITROGEN DISTRIBUTION NETWORK > 5.2 BACKFLOW PROTECTION	2. Independent of the pressure level during normal operation and during upsets, all users of nitrogen SHALL [PS] have backflow protection included in the design of their connections	Process Engineering
DEP 30.73.10.3 0-Gen	SAFE VAPOUR CONTROL FOR WASTEWATER COLLECTION AND TREATMENT SYSTEMS	February 2021	DEP_30731030-Gen > 2. GENERAL DESIGN REQUIREMENTS > 2.7 OXYGEN CONTROL	1. Active purge of vapour space with inert gas SHALL [PS] be used to maintain the oxygen content below the Maximum Safe Oxygen Concentration (MSOC). The MSOC can be used to establish inert gas purge rates which can be monitored and controlled. For mixtures, the molar composition of the vapour (fuel) along with an estimate of its LFL is provided by the Principal. The MSOC is determined by locating the intersection of the LFL concentration with the stoichiometric line for the vapour	Process Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 30.73.10.3 0-Gen	SAFE VAPOUR CONTROL FOR WASTEWATER COLLECTION AND TREATMENT SYSTEMS	February 2021	DEP_30731030-Gen > 3. ELEMENTS OF A VAPOUR COLLECTION AND CONTROL SYSTEM > 3.2 GAS BLANKETING	1. Gas blanketing SHALL [PS] meet the requirements of (2.7).	Process Engineering
DEP 30.73.10.3 0-Gen	SAFE VAPOUR CONTROL FOR WASTEWATER COLLECTION AND TREATMENT SYSTEMS	February 2021	DEP_30731030-Gen > 3. ELEMENTS OF A VAPOUR COLLECTION AND CONTROL SYSTEM > 3.3 BARRIERS TO SAFEGUARD AGAINST FLAME OR EXPLOSION PROPAGATION (FIREWALL) SAFEGUARDING MEASURES	1. As a defence against potential ignition and flame propagation hazards, firewall safeguarding measures SHALL [PS] be provided wherever gas mixtures can pass into the flammability envelope.	Process Engineering
DEP 30.73.10.3 0-Gen	SAFE VAPOUR CONTROL FOR WASTEWATER COLLECTION AND TREATMENT SYSTEMS	February 2021	DEP_30731030-Gen > 5. VAPOUR CONTROL > 5.3 TECHNOLOGY SPECIFIC REQUIREMENTS > 5.3.3 Carbon adsorption > 5.3.3.1 Carbon beds for continuous service	1. Carbon beds for continuous service SHALL [PS] be equipped with flame arrestors or detonation arrestors.	Process Engineering
DEP 30.73.10.3 0-Gen	SAFE VAPOUR CONTROL FOR WASTEWATER COLLECTION AND TREATMENT SYSTEMS	February 2021	DEP_30731030-Gen > 6. WASTEWATER TREATMENT EQUIPMENT DESIGN > 6.2 WASTEWATER STORAGE TANKS	2. Covered tanks with potential for vapour space SHALL [PS] follow the provisions of (2.7).	Process Engineering
DEP 31.21.01.38-Gen.	CHILLING SYSTEMS	February 2021	DEP_31210138-Gen > 2. DESIGN AND ENGINEERING > 2.4 VAPOUR COMPRESSION CHILLERS > 2.4.3 Health and safety considerations > 2.4.3.1 General	1. Safety classification of the selected refrigerants SHALL [PS] be made in accordance with the ANSI/ASHRAE Standard 34.	Process Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 31.21.01.3 8-Gen.	CHILLING SYSTEMS	February 2021	DEP_31210138-Gen > 2. DESIGN AND ENGINEERING > 2.4 VAPOUR COMPRESSION CHILLERS > 2.4.3 Health and safety considerations > 2.4.3.1 General	2. The refrigerants concentration exposure limits SHALL [PS] apply as per occupational exposure limit (OEL) in refrigerant data and safety classifications table of ANSI/ASHRAE Standard 15-2010. a. These limits shall be used as alarm set points for toxic gas detection.	Process Engineering
DEP 31.21.01.3 8-Gen.	CHILLING SYSTEMS	February 2021	DEP_31210138-Gen > 2. DESIGN AND ENGINEERING > 2.4 VAPOUR COMPRESSION CHILLERS > 2.4.3 Health and safety considerations > 2.4.3.2 Ammonia refrigerant	1. Vapour compression chillers which use ammonia as a refrigerant SHALL [PS] meet the requirements of ANSI / IIAR 2-2008. The effective control to the principle hazard of ammonia vapour is to provide adequate ventilation.	Process Engineering
DEP 31.21.01.3 8-Gen.	CHILLING SYSTEMS	February 2021	DEP_31210138-Gen > 2. DESIGN AND ENGINEERING > 2.4 VAPOUR COMPRESSION CHILLERS > 2.4.3 Health and safety considerations > 2.4.3.2 Ammonia refrigerant	2. If the compression chiller is located inside a machinery room, the machinery room SHALL [PS] have mechanical ventilation and detector suitable for detection of refrigerant leak to actuate an alarm.	Process Engineering
DEP 31.21.01.3 8-Gen.	CHILLING SYSTEMS	February 2021	DEP_31210138-Gen > 2. DESIGN AND ENGINEERING > 2.4 VAPOUR COMPRESSION CHILLERS > 2.4.3 Health and safety considerations > 2.4.3.2 Ammonia refrigerant	3. The design, construction, test and installation of refrigeration systems SHALL [PS] comply with the safeguards specified in ANSI/ASHRAE Standard 15.	Process Engineering
DEP 31.21.01.3 8-Gen.	CHILLING SYSTEMS	February 2021	DEP_31210138-Gen > 2. DESIGN AND ENGINEERING > 2.4 VAPOUR COMPRESSION CHILLERS > 2.4.6 Evaporator > 2.4.6.2 Materials of construction	4. The recommendations stipulated in Appendix J of ANSI / IIAR 2-2008 to inhibit stress corrosion cracking in ammonia refrigeration systems SHALL [PS] be followed.	Process Engineering
DEP 31.21.01.3 8-Gen.	CHILLING SYSTEMS	February 2021	DEP_31210138-Gen > 2. DESIGN AND ENGINEERING > 2.4 VAPOUR COMPRESSION CHILLERS > 2.4.6 Evaporator > 2.4.6.3 Mechanical design	4. The evaporator shell SHALL [PS] come equipped with overpressure protection as specified in ASHRAE 15.	Process Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 31.21.01.3 8-Gen.	CHILLING SYSTEMS	February 2021	DEP_31210138-Gen > 2. DESIGN AND ENGINEERING > 2.5 INSTALLATION	1. Installation SHALL [PS] meet the requirements of Section 8 in ASHRAE 15.	Process Engineering
DEP 31.21.20.3 3-Gen	CLOSED CIRCUIT COOLING SYSTEMS	February 2021	DEP_31212033-Gen > 2. REQUIREMENTS FOR CLOSED CIRCUIT COOLING SYSTEMS > 2.2 GENERAL	1. In case of multiple consumers, the process consumers in all flammable hydrocarbon and very-toxic (acute or chronic) service SHALL [PS] be served by a separate closed circuit cooling system.	Process Engineering
DEP 31.21.70.1 0-Gen.	AIR-COOLED HEAT EXCHANGERS – SELECTION AND APPLICATION	February 2021	DEP_31217010-Gen > 2. DESIGN > 2.2 PROCESS SPECIFICATION AND GENERAL DESIGN > 2.2.2 Stream property considerations	9. All critical process temperatures SHALL [PS] be specified when they are greater than the minimum ambient temperature for the location.	Heat Transfer
DEP 31.21.70.1 0-Gen.	AIR-COOLED HEAT EXCHANGERS – SELECTION AND APPLICATION	February 2021	DEP_31217010-Gen > 2. DESIGN > 2.2 PROCESS SPECIFICATION AND GENERAL DESIGN > 2.2.3 Hydrogen and toxic service considerations	1. The Contractor SHALL [PS] specify if the exchanger is subject to hydrogen service along with the hydrogen partial pressure.	Heat Transfer
DEP 31.21.70.1 0-Gen.	AIR-COOLED HEAT EXCHANGERS – SELECTION AND APPLICATION	February 2021	DEP_31217010-Gen > 2. DESIGN > 2.2 PROCESS SPECIFICATION AND GENERAL DESIGN > 2.2.4 Alternate operating mode considerations for mechanical design	1. Alternate operating modes which could impact the mechanical design of the exchanger (e.g., low process flow at low ambient air temperature, upsets with high process inlet temperatures (≥ 150 °C [≥ 300 °F]), steam-out, loss of fans due to power failure, temperature bake-out) SHALL [PS] be specified on the data sheet. This information is needed to ensure an adequate mechanical design. In cases of low ambient temperature operation where the heat duty is allowed to vary with ambient temperature, the process temperature range can become large and the need for split header construction, to allow the thermal expansion differential between passes, may be required.	Heat Transfer
DEP 31.21.70.1 0-Gen.	AIR-COOLED HEAT EXCHANGERS – SELECTION AND APPLICATION	February 2021	DEP_31217010-Gen > 2. DESIGN > 2.4 AIR-SIDE DESIGN > 2.4.3 Winter performance considerations	4. If applied for either freeze protection or hydrate formation protection, then Type 2 air-side designs SHALL [PS] include a supplementary heating coil or other device located below each process bundle with adjustable louvres above the bundle to allow the bundle to be heated up without fans in operation.	Heat Transfer

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 31.21.70.10-Gen.	AIR-COOLED HEAT EXCHANGERS – SELECTION AND APPLICATION	February 2021	DEP_31217010-Gen > APPENDIX B. TYPE 3 WINTERIZED AIR-COOLED HEAT EXCHANGER REQUIREMENTS > B.3 WINTER PERFORMANCE CONSIDERATIONS	1. 100% variable speed drive systems SHALL [PS] not be implemented in lieu of Type 3 air designs for services where an exceedance of the critical process temperature can result in tube rupture.	Heat Transfer
DEP 31.21.70.10-Gen.	AIR-COOLED HEAT EXCHANGERS – SELECTION AND APPLICATION	February 2021	DEP_31217010-Gen > APPENDIX B. TYPE 3 WINTERIZED AIR-COOLED HEAT EXCHANGER REQUIREMENTS > B.3 WINTER PERFORMANCE CONSIDERATIONS	2. For fluids with critical process temperatures which are for freeze protection or hydrate formation protection, Type 3 air-side designs SHALL [PS] be provided with a hot air recirculation winterization protection system.	Heat Transfer
DEP 31.21.70.10-Gen.	AIR-COOLED HEAT EXCHANGERS – SELECTION AND APPLICATION	February 2021	DEP_31217010-Gen > APPENDIX B. TYPE 3 WINTERIZED AIR-COOLED HEAT EXCHANGER REQUIREMENTS > B.3 WINTER PERFORMANCE CONSIDERATIONS	4. If applied for either freeze protection or hydrate formation protection, then Type 3 air-side designs SHALL [PS] include a supplementary heating coil or other device located below each process bundle.	Heat Transfer
DEP 31.21.70.10-Gen.	AIR-COOLED HEAT EXCHANGERS – SELECTION AND APPLICATION	February 2021	DEP_31217010-Gen > APPENDIX B. TYPE 3 WINTERIZED AIR-COOLED HEAT EXCHANGER REQUIREMENTS > B.3 WINTER PERFORMANCE CONSIDERATIONS	7. All actuators and instruments SHALL [PS] be suitable for operation at the minimum ambient temperature.	Heat Transfer
DEP 31.21.70.10-Gen.	AIR-COOLED HEAT EXCHANGERS – SELECTION AND APPLICATION	February 2021	DEP_31217010-Gen > APPENDIX B. TYPE 3 WINTERIZED AIR-COOLED HEAT EXCHANGER REQUIREMENTS > B.3 WINTER PERFORMANCE CONSIDERATIONS	8. The louvers for a fully Type 3 air-side design (i.e., fully winterized) SHALL [PS] be controlled based on air plenum temperature, which is completely independent of process temperature control.	Heat Transfer
DEP 31.21.70.10-Gen.	AIR-COOLED HEAT EXCHANGERS – SELECTION AND APPLICATION	February 2021	DEP_31217010-Gen > APPENDIX B. TYPE 3 WINTERIZED AIR-COOLED HEAT EXCHANGER REQUIREMENTS > B.8 LOUVERS	7. Upon the loss of motive air supply or control signal, Type 3 air-side designs SHALL [PS] have the inlet and exhaust louvres fail closed and the recirculation louvre fail open to provide full recirculation of exhaust air for the maximum winterization protection.	Heat Transfer

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 31.37.00.1 1-Gen.	INSTRUMENT AIR SUPPLY	February 2021	DEP_31370011-Gen > 2. GENERAL > 2.2 INSTRUMENT AIR QUALITY > 2.2.1 General	2. Nitrogen or carbon dioxide SHALL [PS] not be used as back-up for instrument air systems.	Heat Transfer
DEP 31.37.00.1 1-Gen.	INSTRUMENT AIR SUPPLY	February 2021	DEP_31370011-Gen > 2. GENERAL > 2.4 AIR SUPPLY FOR SAFETY EQUIPMENT	1. For new designs, the instrument air header SHALL [PS] not be used for safety equipment, such as breathing air masks.	Heat Transfer
DEP 37.05.10.1 0-Gen.	DESIGN OF SEAWATER SYSTEMS FOR OFFSHORE AND ONSHORE	February 2021	DEP_37051010-Gen > 3. SEAWATER SYSTEMS ONSHORE AND OFFSHORE > 3.1 SEGREGATION OF USERS	1. Hazardous and non-hazardous users SHALL [PS] be segregated to prevent the migration and release of hazardous substance into an unprotected non-hazardous area on the installation. A hazardous user is one where, if the equipment fails, the seawater can be contaminated with a flammable or "very toxic" (1.3.2) substance. Hazardous users typically include process heat exchangers, such as crude oil coolers and gas coolers.	Heat Transfer
DEP 37.05.10.1 0-Gen.	DESIGN OF SEAWATER SYSTEMS FOR OFFSHORE AND ONSHORE	February 2021	DEP_37051010-Gen > 3. SEAWATER SYSTEMS ONSHORE AND OFFSHORE > 3.2 ANTI-FOULING/BIOCIDE DOSING SYSTEM	13. Sodium hypochlorite holding tanks SHALL [PS] be provided with twin 100 % ventilation fans for hydrogen dilution below the explosive limit. Sodium hypochlorite generators produce hydrogen as a by-product	Heat Transfer
DEP 37.76.10.1 0-Gen.	HVAC FOR OFFSHORE INSTALLATIONS (AMENDMENTS/SUPPLEMENTS TO ISO 15138)	February 2021	DEP_37761010-Gen > PART III. AMENDMENTS/SUPPLEMENTS TO ISO 15138 > 5. Design > 5.2 Development of design basis > 5.2.2 Hazardous area classification and the role of HVAC > 5.2.2.2 Functional requirements > 5.2.2.2.1 Process safety and safety-critical requirements	3. HVAC equipment located in a hazardous area, or potentially handling a flammable air/gas mixture, SHALL [PS] be designed, constructed and certified suitable for the zone classification. Examples of potentially applicable standards include CSA, UL, FM, ATEX or IEC. Refer to installation safety philosophy to check if there is a risk of a major gas release extending outside hazardous areas and which could require HVAC equipment in a non- hazardous area to be classified suitable for a hazardous area.	Mechanical Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 37.76.10.1 0-Gen.	HVAC FOR OFFSHORE INSTALLATIONS (AMENDMENTS/SUPPLEMENTS TO ISO 15138)	February 2021	DEP_37761010-Gen > PART III. AMENDMENTS/SUPPLEMENTS TO ISO 15138 > 5. Design > 5.2 Development of design basis > 5.2.2 Hazardous area classification and the role of HVAC > 5.2.2.2 Functional requirements > 5.2.2.2.1 Process safety and safety-critical requirements	7. HVAC systems SHALL [PS] shut down (including closure of fire and gas dampers) when required to do so by Fire and Gas or Safety system design requirements.	Mechanical Engineering
DEP 82.00.10.3 0-Gen.	ENGINEERING INFORMATION SPECIFICATION (EIS)	February 2021	DEP_82001030-Gen > 3. DOCUMENTS > 3.1 GENERAL	2. The Contractor SHALL [PS] hand over all documents identified by Principal as required as "As Built" within the following time frames: a. red line versions before start up; b. electronic versions within three months of start-up.	IM/IT
DEP 82.00.10.3 0-Gen.	ENGINEERING INFORMATION SPECIFICATION (EIS)	February 2021	DEP_82001030-Gen > 4. DATA > 4.1 GENERAL	1. The Contractor SHALL [PS] handover a complete As Built Tag Register for their entire scope (including Manufacturer/Supplier Tags) in accordance with this DEP and the Principal's Tagging Specification.	IM/IT
DEP 37.01.10.1 0-Gen.	OFFSHORE PRODUCTION INSTALLATIONS BASIC SURFACE PROCESS SAFETY SYSTEMS (ENDORSEMENT OF API-RP-14C AND ISO 10418)	February 2021	DEP_37011010-Gen > 2. BASIC PROCESS SAFETY SYSTEMS > 2.1 SAFETY INSTRUMENTED SYSTEMS	1. In the context of Safety Instrumented Systems, ISO 10418 or API-RP-14C design requirements SHALL [PS] dictate the minimum initiators and final elements. See DEP 32.80.10.10-Gen. for SIS requirements.	Technical Safety Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 37.01.10.10-Gen.	OFFSHORE PRODUCTION INSTALLATIONS BASIC SURFACE PROCESS SAFETY SYSTEMS (ENDORSEMENT OF API-RP-14C AND ISO 10418)	February 2021	DEP_37011010-Gen > 2. BASIC PROCESS SAFETY SYSTEMS > 2.2 LEAK DETECTION	1. Where ISO 10418:2003 refers to 'leak' detection, low pressure detection SHALL [PS] not be used exclusively as a means of 'leak' detection unless dynamic modelling demonstrates that leaks can be detected using this method.	Technical Safety Engineering
DEP 37.01.10.10-Gen.	OFFSHORE PRODUCTION INSTALLATIONS BASIC SURFACE PROCESS SAFETY SYSTEMS (ENDORSEMENT OF API-RP-14C AND ISO 10418)	February 2021	DEP_37011010-Gen > 2. BASIC PROCESS SAFETY SYSTEMS > 2.4 SAFETY ANALYSIS CHECKLISTS	1. The selected safety device or alternative identified in the applicable Safety Analysis Checklists (SAC) in API RP 14C or ISO 10418, whichever external standard applies, SHALL [PS] be incorporated into the design.	Technical Safety Engineering
DEP 80.00.00.15-Gen.	HAZARD AND OPERABILITY (HAZOP) STUDY	February 2021	DEP_80000015-Gen > 2. HAZOP PROCESS > 2.1 OVERVIEW	1. HAZOP study SHALL [PS] be applied to all processes with hazards, including marine and utility systems. HAZOP should not be restricted to just the hydrocarbon processing systems, but should be applied to any system with process hazards.	Technical Safety Engineering
DEP 80.00.00.15-Gen.	HAZARD AND OPERABILITY (HAZOP) STUDY	February 2021	DEP_80000015-Gen > 2. HAZOP PROCESS > 2.2 HAZOP PROCESS > 2.2.2 Phase A: Definition	4. The scope of the HAZOP study SHALL [PS] include verification of the applicable Process Safety Basic Requirements (DEM2) per HSSE & SP Control Framework.	Technical Safety Engineering
DEP 80.00.00.15-Gen.	HAZARD AND OPERABILITY (HAZOP) STUDY	February 2021	DEP_80000015-Gen > 2. HAZOP PROCESS > 2.2 HAZOP PROCESS > 2.2.4 Phase C: Examination > 2.2.4.6 Operating Modes	1. The HAZOP review SHALL [PS] cover all operating modes, including normal operations (i.e., as designed), transient modes and alternative normal operating modes. Alternative normal Operating Modes include Summer / Winter operation.	Technical Safety Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 80.00.00.1 5-Gen.	HAZARD AND OPERABILITY (HAZOP) STUDY	February 2021	DEP_80000015-Gen > 3. THE ROLE OF HAZOP IN THE PROJECT LIFECYCLE > 3.1 THE TIMING OF HAZOP STUDIES WITHIN THE PROJECT LIFECYCLE > 3.1.3 Main HAZOP	13. Changes made to the PEFS/UEFS (P&ID) after the Main HAZOP review and impacting process SHALL [PS] be managed by a formal Management of Change (MOC) procedure that includes criteria to help identify changes requiring a re-HAZOP.	Technical Safety Engineering
DEP 80.00.00.1 5-Gen.	HAZARD AND OPERABILITY (HAZOP) STUDY	February 2021	DEP_80000015-Gen > 4. HAZOP ORGANISATION AND EXECUTION > 4.3 STEP 2: THE HAZOP TEAM > 4.3.2 Qualifications and requirements of core members > 4.3.2.1 Chairperson	1. The HAZOP Chairperson SHALL [PS] be independent of the project team organisation In this context, independent means a Chairperson provided by the Principal has a reporting line separate from the project organisation. A Chairperson provided by the EPC contractor is from a third party that is not a subsidiary of the EPC.	Technical Safety Engineering
DEP 80.00.00.1 5-Gen.	HAZARD AND OPERABILITY (HAZOP) STUDY	February 2021	DEP_80000015-Gen > 4. HAZOP ORGANISATION AND EXECUTION > 4.3 STEP 2: THE HAZOP TEAM > 4.3.2 Qualifications and requirements of core members > 4.3.2.1 Chairperson	2. The appointed Chairperson SHALL [PS] satisfy the following criteria, as assessed and approved by the Authorised Person (or business equivalent competent person): a. Be a qualified HAZOP facilitator as recognized by the Principal or external accredited organization (IChemE or AIChE); b. Have led multiple HAZOP studies for major projects in the petrochemical industry; c. Able to demonstrate the following skills by either producing previous HAZOP reports or via verbal interview: i. "Causes" are thoroughly listed, analysed and credible; ii. "Consequences" are clearly developed on how the causes lead to the consequence; iii. "Barriers" are clearly demonstrated to be valid barriers; iv. "Recommendations" are self- explanatory and demonstrable to fully address deficiency identified. d. Has technical competencies equivalent to those defined as "skill" or higher with 5+ years' experience in Process Safety Reviews (PSA, PHA, HAZOP). e. Demonstrate a good understanding of Shell's approach towards risk based assessment.	Technical Safety Engineering
DEP 80.00.00.1 5-Gen.	HAZARD AND OPERABILITY (HAZOP) STUDY	February 2021	DEP_80000015-Gen > 4. HAZOP ORGANISATION AND EXECUTION > 4.8 STEP 7: TRACK AND CLOSE-OUT RECOMMENDATIONS	1. All HAZOP Recommendations SHALL [PS] be addressed and closed out as part of the project deliverables. Risk ranking of the HAZOP Recommendations is not required.	Technical Safety Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 80.00.00.1 5-Gen.	HAZARD AND OPERABILITY (HAZOP) STUDY	February 2021	DEP_80000015-Gen > 4. HAZOP ORGANISATION AND EXECUTION > 4.9 STEP 8: ISSUE CLOSE-OUT REPORT AND AUDIT	2. All HAZOP recommendations and associated response documentation SHALL [PS] have a full audit trail on how each HAZOP recommendation has been addressed.	Technical Safety Engineering
DEP 80.00.00.1 5-Gen.	HAZARD AND OPERABILITY (HAZOP) STUDY	February 2021	DEP_80000015-Gen > 4. HAZOP ORGANISATION AND EXECUTION > 4.9 STEP 8: ISSUE CLOSE-OUT REPORT AND AUDIT	4. All process documents relevant for complete close-out SHALL [PS] be updated to reflect the resolution of the HAZOP recommendations. Process documents include the following: a. PEFS//UEFS (P&ID); b. Cause and Effects; c. Process Safeguarding Memorandum; d. Process Safeguarding Flow Scheme; e. SIL Study; f. Pressure Relief Valve datasheets; g. Hazardous Area Classification; h. Operations and Maintenance philosophy; i. Process Control Narrative; j. Reactive Hazard Assessment.	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 2. DESIGN PHILOSOPHY > 2.1 PRESSURE SYSTEM SAFETY STUDY (PSSS)	1. A PSSS of all potential overpressure and underpressure scenarios SHALL [PS] be performed to verify that all equipment is adequately protected against overpressure and underpressure.	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 2. DESIGN PHILOSOPHY > 2.10 ROLE OF INSTRUMENTATION IN OVERPRESSURE PROTECTION > 2.10.1 General	1. Except as described in (2.10) and (2.11), any instrumentation that could provide favourable response SHALL [PS] be assumed to be frozen (or on manual mode).	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 2. DESIGN PHILOSOPHY > 2.10.3 Safety Instrumented Systems (and other measures) to reduce or eliminate the relief load > 2.10.3.3 Application of the alternative design approach	3. Mitigation measures (barriers) SHALL [PS] be valid as defined by HEMP design criteria (i.e., independent, effective, and auditable).	Technical Safety Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 2. DESIGN PHILOSOPHY > 2.11 CHECK VALVES (NON RETURN VALVES) IN OVERPRESSURE PROTECTION > 2.11.6 Work process for backflow overpressure protection of equipment excluding low pressure and atmospheric storage tanks	5. If the pressure generating equipment is a centrifugal pump or compressor and the system pressure ratio is five or greater, then severe check valve leakage or complete check valve failure SHALL [PS] be mitigated by any one of the following options: a. Regular (i.e., not Class 1) check valve(s) in the flow path and the relief device sized for backflow assuming complete check valve failure. i. To prevent reverse overspeed of centrifugal equipment and/or motors, provide a single Class I check valve on the discharge of each pump/compressor. b. An instrumented valve plus dual Class 1 check valves in the flow path and the relief device sized for the backflow assuming severe heck valve leakage (i.e., check valve flow area is 1%): i. The instrumented valve may be a basic process control system or a SIL-1 SIF; ii. The instrumented valve is able to close before the vapour backflow reaches the instrumented valve; iii. When assessing available closure time, assume no flow restrictions through any check valves. c. Dual Class 1 check valves and multiple instrumented valves (equivalent to SIL-2) in the flow path, where the instrumented valve is able to close before the vapour backflow reaches the instrumented valve. i. When assessing available closure time, assume no flow restrictions through any check valves. d. One Class 1 check valve and multiple instrumented valves (equivalent to SIL-3) in the flow path, where the instrumented valves are able to close before the vapour backflow reaches the instrumented valves. i. When assessing available closure time, assume no flow restrictions through any check valves. Systems where there is no vapour space in the suction equipment to absorb backflow could quickly pressurize to the downstream pressure with loss of the pump. In these cases use of instrumented safeguard are unlikely to be fast enough.	Technical Safety Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 2. DESIGN PHILOSOPHY > 2.14 OPERATOR INTERVENTION	1. If credit for operator intervention is taken to reduce design requirements, then all of the following criteria SHALL [PS] be met: a. The alarm that alerts the operator is independent of the initiating event for the scenario. For example, the cause of the overpressure will not disable the alarm instrumentation. b. There is sufficient time for the operator to take action to stop the scenario, as agreed with the Principal. This time includes the time to diagnose the alarm, to take action, and for the action to take effect. The criterion will typically be 30 minutes (if operator action in the field is required) but no less than 15 minutes (if operator action from the control board is required). c. There are clear, unambiguous, and effective operator actions specified for responding to the alarm. d. All consequences (e.g., overpressure, impact of relief stream to disposal system, impact of relief to atmosphere) of no operator intervention or ineffective operator intervention areincluded in the assessment. e. If credit for operator intervention is taken for the relief device sizing, then the overpressure consequences associated with ineffective operator intervention is evaluated as a remote contingency (4.3). The equipment pressure is determined by calculating the pressure required to pass the relief load through the provided relief devices.	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 2. DESIGN PHILOSOPHY > 2.15 ADMINISTRATIVE CONTROLS > 2.15.3 Valve mechanical locking elements	6. All valves in the flow path in a relief header (e.g., a flare header battery limit isolation valve) SHALL [PS] be key locked or car-sealed open	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 3. DESIGN SCENARIOS > 3.2 POWER FAILURE > 3.2.1 General	1. The extent of a power failure for all of the following cases SHALL [PS] be based on the loss of any one component (e.g., feeder, bus, circuit, or line) even if the design employs UPS for power security. a. total power failure; b. partial power failure; c. individual power failure.	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 3. DESIGN SCENARIOS > 3.2 POWER FAILURE > 3.2.1 General	3. A total site-wide power failure SHALL [PS] be considered as a credible scenario for relief design. Other scenarios described in this DEP can be an outcome of a power failure. For example, relief loads associated with backflow (2.11) or relief loads associated with vapour breakthrough (3.7.3) can result from a power failure.	Technical Safety Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 3. DESIGN SCENARIOS > 3.2 POWER FAILURE > 3.2.2 Partial power failure	3. For pumped streams providing flow or heat into the system, relief calculations SHALL [PS] assume that heat and/or pressure input continues if these pumps have auto-start spares that are steam-driven or electrically-driven from a source not affected by the partial power failure.	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 3. DESIGN SCENARIOS > 3.2 POWER FAILURE > 3.2.2 Partial power failure	4. If a pump and its spare (e.g., reflux pumps) are electrically independent (or one is turbine driven), the resulting flare/relief load SHALL [PS] be calculated on the basis of failure of the pump that causes the largest relief.	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 3. DESIGN SCENARIOS > 3.4 COOLING WATER FAILURE	1. Total, partial and individual cooling water failure SHALL [PS] be evaluated for impact on pressure relief loads, where applicable. Total cooling water failure could be caused by for instance: Power or steam failure that causes loss of all cooling water pumps; Sudden fouling (e.g., fouling of cooling water intake screens); Loss of makeup water supply to a cooling tower. Partial cooling water failure could be caused by for instance: Power failure to cooling water tower fans; Blocked valve in cooling water header; Loss of some pumps; Loss of on-site cooling water booster pumps. Individual cooling water failure could be caused by for instance: Loss of on-site cooling water booster pump; Blocked valve in cooling water supply to the equipment.	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 3. DESIGN SCENARIOS > 3.7 VAPOUR BREAKTHROUGH > 3.7.2 Case 1 – Single valve goes open	1. The case of a single valve going open SHALL [PS] be considered as a design scenario for determining pressure relief load.	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 3. DESIGN SCENARIOS > 3.8 MANUAL VALVE OPERATION > 3.8.1 General	1. The consequences of closing normally open manual valves as well as opening normally closed manual valves SHALL PS] be evaluated. Most of these cases are already covered if there is a pump or control valve in the system as the single power failure case and instrument air/controller cases cover the same closed or open condition.	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 3. DESIGN SCENARIOS > 3.10 THERMAL RELIEF AND LIQUID THERMAL EXPANSION RELIEF > 3.10.3 Vessels	1. Overpressure protection SHALL [PS] be provided if closure of a valve would result in thermal relief overpressure.	Technical Safety Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 3. DESIGN SCENARIOS > 3.10 THERMAL RELIEF AND LIQUID THERMAL EXPANSION RELIEF > 3.10.4 Heat exchangers	1. Overpressure protection SHALL [PS] be provided for vaporizers or the cold size of heat exchangers if a blocked outlet results in a vapour pressure greater than design. Size the relief device based on the equipment duty under relieving conditions. This is not a thermal relief overpressure scenario. This scenario should already be covered under (3.8).	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 3. DESIGN SCENARIOS > 3.10 THERMAL RELIEF AND LIQUID THERMAL EXPANSION RELIEF > 3.10.4 Heat exchangers	2. Overpressure protection SHALL [PS] be provided for those portions of heat exchangers where closure of a valve would result in thermal relief overpressure.	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 4. REMOTE CONTINGENCY SCENARIOS > 4.2 HEAT EXCHANGER INTERNAL FAILURE > 4.2.1 General	1. The heat exchanger system (exchanger and attached equipment) SHALL [PS] have overpressure protection if both of the following are met: a. Exchanger high side operating pressure is greater than the corrected hydrotest pressure of the low side system Experience supports that it would be considered double jeopardy for the exchanger high pressure side to be at upset or abnormal pressures at the same time there is an exchanger tube rupture. b. The hydraulic limits of the system's relief path would cause the system pressure to exceed the corrected hydrotest pressure.	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 4. REMOTE CONTINGENCY SCENARIOS > 4.2 HEAT EXCHANGER INTERNAL FAILURE > 4.2.2 Relief loads	3. For shell and tube heat exchangers, the potential for high transient pressures on the shell side SHALL [PS] be mitigated when all of the following exists: a. the high-pressure side is on the tube side, b. the shell side is (>95 %) liquid phase, c. the ratio pressure and the low pressure side design pressure is greater than 3 to 1, d. Mitigate by one of the following two options: i. Size the relief device assuming the transient relief load is the flow of liquid at the tube rupture's volumetric flow rate and locate the relief device close to the exchanger outlet; 1). The design of the relief device inlet and outlet hydraulics shall be based on the steady state (vapour/gas) conditions. ii. Perform a surge analysis as described in API 521 and design accordingly.	Technical Safety Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 4. REMOTE CONTINGENCY SCENARIOS > 4.2 HEAT EXCHANGER INTERNAL FAILURE > 4.2.4 Pressure relief considerations	2. Pressure relief devices used to protect the shell side of a heat exchanger SHALL [PS] be placed downstream of the inlet nozzle. If the exchanger contains one or more impingement plates, they could blow off and block the exchanger inlet during a tube rupture and thereby block the relieving path.	Technical Safety Engineering
DEP 80.45.10.1 1-Gen.	OVERPRESSURE AND UNDERPRESSURE – PREVENTION AND PROTECTION	February 2021	DEP_80451011-Gen > 5. SPECIFIC PROCESS EQUIPMENT > 5.1 FRACTIONATING COLUMN RELIEF > 5.1.8 Overfill > 5.1.8.4 Other consequences of overfill	1. If relief is to atmosphere, then the designer SHALL [PS] assure sufficient safeguards to meet risk criteria and meet DEP 80.45.10.10-Gen. section 5.8.1.	Technical Safety Engineering
DEP 80.45.10.1 2-Gen.	EMERGENCY DEPRESSURING AND SECTIONALISING	February 2021	DEP_80451012-Gen > 2. EMERGENCY DEPRESSURING SYSTEMS > 2.2 DEPRESSURING DESIGN CRITERIA > 2.2.1 High-rate depressuring	1. High rate depressuring SHALL [PS] as a minimum meet one of the following criteria: a. Depressure the equipment to 7 bar (ga) (100 psig), or 50 % of design pressure, whichever is lower, within 15 minutes (or within 20 minutes for existing refining and chemical plants). b. Depressure the equipment to 7 bar (ga) (100 psig), or 50 % of design pressure, whichever is lower, within a time shorter than 15 minutes as justified by the business risk, if specified by the Principal. c. Where application-specific depressuring is used, depressure the equipment to pressure and time criteria specific to the application (end pressure and time) where these criteria are supported by analysis and it has been demonstrated that risks are tolerable and ALARP. Some applications can justify using a performance based depressuring criteria through additional analysis while complying with the objectives stated in (2.1). Examples where application-specific depressuring has been used are: thick walled high pressure equipment, large finger slug-catchers, and equipment where the default 15 minute high rate depressuring creates severe design challenges (2.6, Item 5).	Technical Safety Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 80.45.10.1 2-Gen.	EMERGENCY DEPRESSURING AND SECTIONALISING	February 2021	DEP_80451012-Gen > 2. EMERGENCY DEPRESSURING SYSTEMS > 2.3 APPLICATIONS FOR EMERGENCY DEPRESSURING > 2.3.1 High-rate depressuring	1. High rate depressuring SHALL [PS] be provided for the following applications: a. Permanently manned offshore facilities. b. Onshore process equipment systems where, under normal operating conditions, at least one vessel (excluding pipework) contains at least 20 m3 (706 ft3) of volatile liquid hydrocarbon. Volatile liquid hydrocarbon is defined as: liquid butane;a mixture lighter than butane;a mixture operating above its boiling point at atmospheric pressure and contains more than 20 m3 (706 ft3) of butane or lighter materials. Emergency depressuring is not used in pressurised storage. BLEVE prevention is covered by DEP 80.47.10.30-Gen. c. Where high rate depressuring is required to prevent loss of containment due to exothermic reaction (e.g., runaway reaction). d. Process units operating above 35 bar (ga) (500 psig) that contain very toxic – acute materials or both flammable liquids and gases. For example, refinery scale hydrotreaters, desulphurisers, residue hydroconversion units. e. Onshore process equipment that meet all of the following: i. Process contains flammable/combustible materials; ii. Normal operating pressure is above 17.2 barg (250 psig); iii. The equipment is exposed to credible escalating fire scenarios; iv. The system contents would produce a vapour volume exceeding 5000 m^3 (175,000 ft^3) when immediately flashed and expanded adiabatically from operating conditions to atmospheric pressure.	Technical Safety Engineering
DEP 80.45.10.1 2-Gen.	EMERGENCY DEPRESSURING AND SECTIONALISING	February 2021	DEP_80451012-Gen > 3. SECTIONALISING OF PROCESS SYSTEMS FOR EMERGENCY DEPRESSURING > 3.4 SECTIONALISATION VALVES	3. Where sectionalising valves are specified to mitigate fire escalation, and the valve is within the potential fire zone as identified in DEP 80.47.10.30-Gen., the following SHALL [PS] be fireproofed for at least 15 minutes of fire exposure: a. The actuator, power/air supply, and control leads of motor operated sectionalising valves; b. The actuator, power/air supply, and control leads of sectionalising valves that fail in the last position; c. The actuator, air supply, bottle and instrumentation of sectionalising valves with dual air actuators (air pressure is used to close the valve) that are designed to fail closed. For valves that are spring fail closed, no special fire protection is required for the actuator or control leads.	Technical Safety Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 80.45.10.1 2-Gen.	EMERGENCY DEPRESSURING AND SECTIONALISING	February 2021	DEP_80451012-Gen > 3. SECTIONALISING OF PROCESS SYSTEMS FOR EMERGENCY DEPRESSURING > 3.4 SECTIONALISATION VALVES	4. Where sectionalising valves are specified to mitigate fire escalation, and the valve is within the potential fire zone as identified in DEP 80.47.10.30-Gen., and the valves are designed to fail open, the actuator, air supply, and control leads SHALL [PS] be fireproofed for 90 min of fire exposure.	Technical Safety Engineering
DEP 80.47.10.1 2-Gen.	FIRE AND EXPLOSION CONTROL, PROTECTION SYSTEMS AND EMERGENCY RESPONSE FOR OFFSHORE FACILITIES	February 2021	DEP_80471012-Gen > PART II. AMENDMENTS/SUPPLEMENTS TO ISO 13702:2015 > 13. Passive fire protection > 13.2 Functional requirements > Replace 2nd paragraph ("Where PFP...) with the following:	1. Where PFP is required to provide protection following an explosion, it SHALL [PS] be designed and installed such that deformation of the substrate caused by an explosion will not adversely affect its performance as specified in the performance standard.	Technical Safety Engineering
DEP 80.47.10.1 2-Gen.	FIRE AND EXPLOSION CONTROL, PROTECTION SYSTEMS AND EMERGENCY RESPONSE FOR OFFSHORE FACILITIES	February 2021	DEP_80471012-Gen > PART III. FIRE PROTECTION SYSTEMS FOR OFFSHORE FACILITIES > 2. FIRE AND EXPLOSION STRATEGY AND FIRE HAZARD ASSESSMENT > 2.1 GENERAL	1. A Fire and Explosion Strategy (FES) SHALL [PS] be developed that identifies the following: a. the credible hazardous scenarios related to fire/explosion; b. the measures to prevent fire/explosions scenarios; c. the consequences along with the performance criteria for each of the measures. Rationale: A Fire and Explosion Strategy (FES) is the result of the process that uses information from HEMP studies covering the fire and explosion evaluation (e.g. FHA, FRA, FERA, Physical Effects Consequence Modelling) to determine the measures required to manage these hazardous events and the role and performance requirements of these measures. The FES drives the decision to use a particular type of fire protection system, rather than information provided in design codes of practice. Industry standards such as National Fire Protection Association (NFPA) codes tend to relate to specific elements and components of firewater systems. They do not normally give guidance on the overall firewater system as defined here. Such documents could, however, give useful design guidance once a particular firewater system element has been selected on the basis of the hazard assessments. Rationale: The level of detail in the Fire and Explosion Strategy (FES) varies depending on the scale and complexity of the offshore facility and the stage in the offshore facility's life-cycle when the risk management process is undertaken.	Technical Safety Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 80.47.10.1 2-Gen.	FIRE AND EXPLOSION CONTROL, PROTECTION SYSTEMS AND EMERGENCY RESPONSE FOR OFFSHORE FACILITIES	February 2021	DEP_80471012-Gen > PART III. FIRE PROTECTION SYSTEMS FOR OFFSHORE FACILITIES > 2. FIRE AND EXPLOSION STRATEGY AND FIRE HAZARD ASSESSMENT > 2.1 GENERAL	4. A Fire Hazard Assessment (FHA) SHALL [PS] be conducted to assess the fire protection system for an offshore facility.	Technical Safety Engineering
DEP 80.47.10.1 2-Gen.	FIRE AND EXPLOSION CONTROL, PROTECTION SYSTEMS AND EMERGENCY RESPONSE FOR OFFSHORE FACILITIES	February 2021	DEP_80471012-Gen > PART III. FIRE PROTECTION SYSTEMS FOR OFFSHORE FACILITIES > 2. FIRE AND EXPLOSION STRATEGY AND FIRE HAZARD ASSESSMENT > 2.3 FIRE HAZARD ASSESSMENT (FHA) FOR OFFSHORE FACILITIES > 2.3.9 Assessment of control measures > 2.3.9.3 Mitigation measures to minimise hydrocarbon leakage quantities	6. Sectionalising valves used to mitigate fire escalation by isolating flammable inventory SHALL [PS] be fire safe if they can be engulfed by flames.	Technical Safety Engineering
DEP 80.64.10.1 1-Gen.	STATIC ELECTRICITY	February 2021	DEP_80641011-Gen > 3. CONTROL OF ELECTROSTATIC CHARGE GENERATION AND ACCUMULATION > 3.1 EARTHING/GROUNDING AND BONDING > 3.1.1 Bonding resistance criteria	1. When the earthing/grounding or bonding is provided by an entirely metallic path (e.g. cable), a bonding resistance of less than 10 Ω SHALL [PS] be achieved. While a resistance to earth/ground of 1 MΩ will ensure safe dissipation of static electricity, a higher resistance than 10 Ω indicates that the intended metallic path is not properly established, possibly because of corrosion or loose connections. There is a clear distinction between the 10 Ω value, and the value of 1 MΩ, which is the upper limit for the resistance to earth/ground of a conductor in all situations. In order to obtain 10 Ω the connection will need to be reliable, permanent and not subject to deterioration.	Technical Safety Engineering
DEP 80.64.10.1 1-Gen.	STATIC ELECTRICITY	February 2021	DEP_80641011-Gen > 4. MANAGING RISK OF ELECTROSTATIC IGNITION IN LIQUIDS > 4.1 GENERAL > 4.1.2 Filling velocities	1. The filling velocity SHALL [PS] be restricted to 1 m/s (3 ft/s) for two phase flow or if water bottoms could be disturbed in the tank when filling low conductivity products.	Technical Safety Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 80.64.10.1 1-Gen.	STATIC ELECTRICITY	February 2021	DEP_80641011-Gen > 4. MANAGING RISK OF ELECTROSTATIC IGNITION IN LIQUIDS > 4.3 MEDIUM STORAGE TANKS > 4.3.2 Filling velocities > 4.3.2.2 Filling velocities for medium and high conductivity liquids in a flammable atmosphere	2. For medium conductivity liquids in medium sized tanks, the filling velocity SHALL [PS] not exceed 1 m/sec (3 ft/sec) until the highest protrusion (including the fill pipe) from the tank floor is submerged to twice the fill pipe diameter.	Technical Safety Engineering
DEP 80.64.10.1 1-Gen.	STATIC ELECTRICITY	February 2021	DEP_80641011-Gen > 4. MANAGING RISK OF ELECTROSTATIC IGNITION IN LIQUIDS > 4.3 MEDIUM STORAGE TANKS > 4.3.2 Filling velocities > 4.3.2.3 Filling velocities for low conductivity liquids in a flammable atmosphere	1. For uncontaminated low conductivity liquids, the filling velocity SHALL [PS] not exceed 1 m/sec (3 ft/sec) until the highest protrusion (including the fill pipe) from the tank floor is submerged to twice the fill pipe diameter.	Technical Safety Engineering
DEP 80.64.10.1 1-Gen.	STATIC ELECTRICITY	February 2021	DEP_80641011-Gen > 4. MANAGING RISK OF ELECTROSTATIC IGNITION IN LIQUIDS > 4.3 MEDIUM STORAGE TANKS > 4.3.2 Filling velocities > 4.3.2.3 Filling velocities for low conductivity liquids in a flammable atmosphere	2. For uncontaminated low conductivity liquids, if the atmosphere above the liquid surface is flammable then the maximum filling velocity SHALL [PS] be restricted by one of the following, whichever is applicable: a. Equation 1 when top loading or bottom loading with a central conductor; b. Equation 2 when bottom loading without a central conductor. where: v is the linear flow velocity in the pipe in metres/second (For conversion to other units (e.g., ft/sec, gal/min) refer to NFPA 77, Figure 10.1.4.(b)); d is the diameter in metres of the fill pipe or the smallest diameter pipe section upstream of the tank or compartment being filled (if the smallest section is less than 10 m (33 ft) long and has a diameter of at least 67% of the next smallest section, the diameter of the next smallest section may be taken); N is a factor describing the dependence on the length L of the compartment: For L < 2 m (6 ft), N is 1; For L between 2 m (6 ft) and 4.6 m (15 ft), N = (L/2)0.5 For L > 4.6 m (15 ft), N = 1.5. For determining the compartment length, baffles in the compartments need not to be taken into account.	Technical Safety Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 80.64.10.1 1-Gen.	STATIC ELECTRICITY	February 2021	DEP_80641011-Gen > 4. MANAGING RISK OF ELECTROSTATIC IGNITION IN LIQUIDS > 4.3 MEDIUM STORAGE TANKS > 4.3.2 Filling velocities > 4.3.2.3 Filling velocities for low conductivity liquids in a flammable atmosphere	3. In all cases for uncontaminated low conductivity liquids, the filling velocity SHALL [PS] not exceed 7 m/sec (23 ft/sec).	Technical Safety Engineering
DEP 80.64.10.1 1-Gen.	STATIC ELECTRICITY	February 2021	DEP_80641011-Gen > 4. MANAGING RISK OF ELECTROSTATIC IGNITION IN LIQUIDS > 4.3 MEDIUM STORAGE TANKS > 4.3.2 Filling velocities > 4.3.2.3 Filling velocities for low conductivity liquids in a flammable atmosphere	4. For contaminated liquids, the filling velocity SHALL [PS] not exceed 1 m/sec (3 ft/sec) during the whole filling period.	Technical Safety Engineering
DEP 80.64.10.1 1-Gen.	STATIC ELECTRICITY	February 2021	DEP_80641011-Gen > 4. MANAGING RISK OF ELECTROSTATIC IGNITION IN LIQUIDS > 4.3 MEDIUM STORAGE TANKS > 4.3.2 Filling velocities > 4.3.2.3 Filling velocities for low conductivity liquids in a flammable atmosphere	5. Where splash top filling of low conductivity liquids is essential for process reasons (e.g., to prevent interference with stirrers in chemical reaction vessels), the location of the fill pipe and design filling velocities SHALL [PS] be subject to approval by the Principal's designated Technical Authority for Technical Safety. Further guidance can be found in IEC 60079-32-1 Section 7.3.2.3.2.2.	Technical Safety Engineering
DEP 80.64.10.1 1-Gen.	STATIC ELECTRICITY	February 2021	DEP_80641011-Gen > 4. MANAGING RISK OF ELECTROSTATIC IGNITION IN LIQUIDS > 4.15 HOSES > 4.15.1 General	3. All conductive parts of a conductive hose SHALL [PS] be bonded and earthed/grounded.	Technical Safety Engineering
DEP 30.00.60.2 0-Gen.	HUMAN FACTORS ENGINEERING – PHYSICAL WORKSPACE DESIGN	February 2021	DEP_30006020-Gen > 2. GENERAL WORKSPACE DESIGN REQUIREMENTS > 2.3 HORIZONTAL ACCESS (WALKWAYS AND PLATFORMS) > 2.3.1 Walkways	1. Walkways on packaged units or on vessel access platforms (e.g., columns and pressure vessels) between the vessel piping or other obstruction and guardrail (Onshore or offshore) SHALL [PS] be 700 mm (28 in) minimum in width.	Health

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 30.00.60.2 0-Gen.	HUMAN FACTORS ENGINEERING – PHYSICAL WORKSPACE DESIGN	February 2021	DEP_30006020-Gen > 2. GENERAL WORKSPACE DESIGN REQUIREMENTS > 2.3 HORIZONTAL ACCESS (WALKWAYS AND PLATFORMS) > 2.3.1 Walkways	2. Walkways other than on packaged units or vessel access platforms SHALL [PS] be 900 mm (36 in) minimum in width with additional width required for operating aisles or stretcher accessible routes from any location in or on a structure or building (Onshore or Offshore).	Health
DEP 33.64.10.1 0-Gen.	ELECTRICAL ENGINEERING DESIGN	February 2021	DEP_33641010-Gen > 2. DESIGN AND ENGINEERING PRINCIPLES > 2.2 PROTECTION AGAINST EXPLOSION AND FIRE HAZARDS > 2.2.1 General	1. Area classification drawing(s) SHALL [PS] be prepared, to permit the proper selection of apparatus for areas where flammable gas or vapour or where combustible dust risks might arise.	Electrical Engineering
DEP 33.64.10.1 0-Gen.	ELECTRICAL ENGINEERING DESIGN	February 2021	DEP_33641010-Gen > 2. DESIGN AND ENGINEERING PRINCIPLES > 2.2 PROTECTION AGAINST EXPLOSION AND FIRE HAZARDS > 2.2.1 General	4. Equipment that is installed or used in hazardous areas SHALL [PS] have a type of protection suitable for the applicable zone.	Electrical Engineering
DEP 33.64.10.1 0-Gen.	ELECTRICAL ENGINEERING DESIGN	February 2021	DEP_33641010-Gen > 2. DESIGN AND ENGINEERING PRINCIPLES > 2.2 PROTECTION AGAINST EXPLOSION AND FIRE HAZARDS > 2.2.2 Flammable gas/vapour hazards > 2.2.2.1 Equipment in Zone 1 areas	5. Where motors in accordance with IEC 60079-7 are used in Zone 1 areas, the motor SHALL [PS] have successfully passed the tests in accordance with clause 6.2.3.2 of IEC 60079-7.	Electrical Engineering
DEP 33.64.10.1 0-Gen.	ELECTRICAL ENGINEERING DESIGN	February 2021	DEP_33641010-Gen > 2. DESIGN AND ENGINEERING PRINCIPLES > 2.2 PROTECTION AGAINST EXPLOSION AND FIRE HAZARDS > 2.2.2 Equipment in Zone 2 areas	4. Where motors in accordance with IEC 60079-7, with a rated output in excess of 100kW, are used in Zone 2 areas for duties other than S1, S2, S6 or S9, the motor SHALL [PS] have successfully passed the tests in accordance with clause 6.2.3.2 of IEC 60079-7.	Electrical Engineering
DEP 33.64.10.1 0-Gen.	ELECTRICAL ENGINEERING DESIGN	February 2021	DEP_33641010-Gen > 3. ELECTRICAL SYSTEM DESIGN > 3.7 ELECTRICAL PROTECTION	1. The electrical system SHALL [PS] be equipped with automatic protection to provide safeguards in the event of electrical equipment failures or system maloperation.	Electrical Engineering
DEP 33.64.10.1 0-Gen.	ELECTRICAL ENGINEERING DESIGN	February 2021	DEP_33641010-Gen > 3. ELECTRICAL SYSTEM DESIGN > 3.9 ELECTRICITY SUPPLY FOR VITAL SERVICES > 3.9.1 General	3. Vital services SHALL [PS] be provided with two separate and independent supplies from duplicate energy sources, lines of supply and equipment.	Electrical Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 33.64.10.10-Gen.	ELECTRICAL ENGINEERING DESIGN	February 2021	DEP_33641010-Gen > 3. ELECTRICAL SYSTEM DESIGN > 3.9 ELECTRICITY SUPPLY FOR VITAL SERVICES > 3.9.1 General	4. Supplies to 'vital' services SHALL [PS] be uninterrupted by failure of one energy source, unless the 'vital' service has been designated in the safety case (documented demonstration of ALARP) to be tolerant to a disturbance of the supply for up to 60 s.	Electrical Engineering
DEP 33.64.10.10-Gen.	ELECTRICAL ENGINEERING DESIGN	February 2021	DEP_33641010-Gen > 3. ELECTRICAL SYSTEM DESIGN > 3.9 ELECTRICITY SUPPLY FOR VITAL SERVICES > 3.9.4 Battery autonomy times	3. Batteries of UPS units SHALL [PS] be rated to energise the relevant loads per the battery autonomy time requirements of the safety case (documented demonstration of ALARP) for the installation.	Electrical Engineering
DEP 33.64.10.10-Gen.	ELECTRICAL ENGINEERING DESIGN	February 2021	DEP_33641010-Gen > 3. ELECTRICAL SYSTEM DESIGN > 3.9 ELECTRICITY SUPPLY FOR VITAL SERVICES > 3.9.4 Battery autonomy times	4. In the absence of a stipulation in the safety case, batteries of UPS units SHALL [PS] be rated to energise the relevant loads for at least the time specified as follows: a. For onshore i. the longer of 30 minutes or until the facility has depressured to a safe state (to meet survivability or sequenced depressuring requirements) for process plant shutdown, monitoring and control systems; ii. 1 hour for emergency lighting; iii. 8 hours for fire-fighting and fire alarmand gas detection systems; iv. 8 hours for telecommunication and radio systems. b. For offshore i. 30 minutes for emergency shutdown and depressurising systems, process monitoring and control systems; ii. 90 minutes for helideck and obstruction lighting; iii. 3 hours for public address, platform audible alarms and status lights; iv. 3 hours for fire and gas detection and alarm systems; v. 3 hours for emergency and escape lighting (the latter with 1 h internal battery back-up); vi. 24 hours for Safety of Life at Sea (SOLAS) communications equipment; vii. 96 hours for navigational aid systems. Refer to DEP 32.45.10.10-Gen. for further details about instrumentation for depressuring systems. See (5.4.2) for emergency lighting, (6.2.4.3) for helideck lighting, (5.4.2) and (6.2.4) for emergency and escape lighting.	Electrical Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 33.64.10.1 0-Gen.	ELECTRICAL ENGINEERING DESIGN	February 2021	DEP_33641010-Gen > 4. DESIGN AND SELECTION REQUIREMENTS FOR EQUIPMENT AND CABLES > 4.10 LIGHTING AND SMALL POWER EQUIPMENT > 4.10.4 Special lighting	1. Lighting used for navigation aids, obstruction warning lights, and aviation lights SHALL [PS] be provided with a power supply from an uninterruptible source.	Electrical Engineering
DEP 33.64.10.1 0-Gen.	ELECTRICAL ENGINEERING DESIGN	February 2021	DEP_33641010-Gen > 5. ENGINEERING AND INSTALLATION REQUIREMENTS > 5.5 EARTHING AND BONDING > 5.5.3 Earthing of plant equipment and structures	1. The metallic enclosures of electrical equipment and non-electrical equipment SHALL [PS] be earthed	Electrical Engineering
DEP 33.64.10.1 0-Gen.	ELECTRICAL ENGINEERING DESIGN	February 2021	DEP_33641010-Gen > 6. DESIGN AND ENGINEERING REQUIREMENTS FOR PARTICULAR INSTALLATIONS > 6.6 JETTIES	1. Ship/Shore electrical isolation and earthing/bonding of jetties SHALL [PS] comply with the requirements of sections 17.5 and 17.6 of the International Safety Guide for Oil Tankers and Terminals (ISGOTT). These rules specify electrical isolation between ship and jetty installations, regardless of whether or not the jetties are cathodically protected.	Electrical Engineering
DEP 33.65.50.3 1-Gen.	STATIC UNINTERRUPTIBLE POWER SUPPLY UNIT (STATIC UPS UNIT)	February 2021	DEP_33655031-Gen > 2. GENERAL REQUIREMENTS > 2.1 BASIC STANDARDS > 2.1.1 General	3. UPS supply units and distribution systems having overall availability greater than 99.95% SHALL [PS] be used to supply HSSE critical equipment. HSSE critical equipment is an item of equipment or structure, or a system (including software logic), that acts as a barrier to prevent the uncontrolled release of a Hazardous Substance or release of energy leading to worst case credible scenario with RAM red, yellow 5A or yellow 5B Risk, or acts as a barrier to control or mitigate the effects of such a release. UPS systems are considered to be robust if they have an overall availability of greater than 99.95 %, an overall Mean Time Between Failures (MTBF) in excess of 200,000 hours and a Mean Time to Repair (MTTR) of eight (8) hours. These figures exclude outage time for battery discharge testing and assume spare parts are available at site. UPS systems, which are designed and manufactured in accordance with this DEP, are deemed to be robust.	Electrical Engineering
DEP 33.65.50.3 1-Gen.	STATIC UNINTERRUPTIBLE POWER SUPPLY UNIT (STATIC UPS UNIT)	February 2021	DEP_33655031-Gen > 3. PERFORMANCE REQUIREMENTS > 3.2 BATTERY AND DC CIRCUIT > 3.2.1 General	1. The battery voltage and capacity SHALL [PS] fulfil the inverter input power requirements when the inverter is delivering the UPS rated kVA output while maintaining an output voltage within the permissible tolerances, for the autonomy time of the UPS specified on the Requisition.	Electrical Engineering

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 33.80.00.30-Gen.	NAVIGATIONAL AIDS FOR OFFSHORE STRUCTURES FOR GLOBAL APPLICATION	February 2021	DEP_33800030-Gen > 3. MARITIME NAVIGATIONAL AIDS SYSTEM > 3.1 DESCRIPTION > 3.1.1 General	2. Each Aids to Navigation (AtoN) SHALL [PS] have a minimum availability of 0.998 with availability calculated in accordance with IALA Recommendation O-130 on Categorisation and Availability Objectives for Short Range AtoN and IALA Guideline 1035 on Availability and Reliability of AtoN.	Electrical Engineering
DEP 34.19.20.11-Gen."	PASSIVE FIRE PROTECTION AND COLD SPILL PROTECTION	February 2021	DEP_34192011-Gen > 2. SELECTION AND PHILOSOPHY > 2.2 PFP	3. For equipment and steel structures, the physical extent and safety performance requirements of PFP for pool fires and jet fires SHALL [PS] be established on the basis of a Fire Safety Assessment (FSA) executed for the particular plant or unit. The zones where PFP is required are called Fireproofing Zones (FPZs). For designs inside the USA, the concept of Potential Fire Source is used. The need for protection times is provided in the FSA, which considers fire size, duration, extent of flame impingement and availability of fixed/mobile firefighting systems. The FSA uses HCM methods which are mathematical models to estimate the effect of explosions, fires and dispersion. The FSA can include the output of studies such as FHA, FRA, FERA. Jet fire requirements for onshore are specifically through HCM/PEM or FERA analysis of the fire exposure envelope.	Civil, Offshore, and Pipelines
DEP 34.19.20.11-Gen."	PASSIVE FIRE PROTECTION AND COLD SPILL PROTECTION	February 2021	DEP_34192011-Gen > 3. MATERIAL PROPERTIES AND APPLICATION > 3.1 GENERAL MINIMUM REQUIREMENTS	2. PFP and CSP systems made from proprietary cementitious, epoxy intumescent, epoxy syntactic or other adhered insulation materials SHALL [PS] be certified by a third party certifying authority as being suitable for the maximum allowable surface temperature values and duration in the specified fire protection scenario.	Civil, Offshore, and Pipelines
DEP 34.19.20.11-Gen."	PASSIVE FIRE PROTECTION AND COLD SPILL PROTECTION	February 2021	DEP_34192011-Gen > 3. DETAILS FOR PIPING, EQUIPMENT AND STRUCTURES > 4.6 PIPE AND VESSEL PRESSURE RETAINING PARTS	1. The PFP system for pressure containing parts of piping and equipment SHALL [PS] maintain the metal at a temperature less than the specified maximum metal temperature for the fire exposed piping/equipment for the specified fire duration.	Civil, Offshore, and Pipelines

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 37.01.10.1 1-Gen.	DESIGN OF OFFSHORE TOPSIDES FACILITIES AGAINST FIRE AND BLAST LOADING (AMENDMENTS/SUPPLEMENTS TO API RP 2FB)	February 2021	DEP_37011011-Gen > PART III. AMENDMENTS/SUPPLEMENTS TO API RP-2FB > 2. Risk Assessment > 2.7 PERFORMANCE CRITERIA > Add the following sections to this clause: > 2.7.3 Performance Criteria for a Ductility Level Blast (DLB) event at a Medium to Higher Risk facility	1. A structure at a Medium to Higher Risk facility that is exposed to DLB SHALL [PS] not collapse or lead to escalation through progressive collapse.	Civil, Offshore, and Pipelines
DEP 37.01.10.1 1-Gen.	DESIGN OF OFFSHORE TOPSIDES FACILITIES AGAINST FIRE AND BLAST LOADING (AMENDMENTS/SUPPLEMENTS TO API RP 2FB)	February 2021	DEP_37011011-Gen > PART III. AMENDMENTS/SUPPLEMENTS TO API RP-2FB > 2. Risk Assessment > 2.7 PERFORMANCE CRITERIA > Add the following sections to this clause: > 2.7.3 Performance Criteria for a Ductility Level Blast (DLB) event at a Medium to Higher Risk facility	2. The extent of damage to a structure at a Medium to Higher Risk facility that is exposed to DLB SHALL [PS] not impair the functionality of SCEs required to mitigate the consequence of a blast. Safety Critical Elements (SCE) are defined and described further in API RP 2FB.	Civil, Offshore, and Pipelines
DEP 37.01.10.1 1-Gen.	DESIGN OF OFFSHORE TOPSIDES FACILITIES AGAINST FIRE AND BLAST LOADING (AMENDMENTS/SUPPLEMENTS TO API RP 2FB)	February 2021	DEP_37011011-Gen > PART III. AMENDMENTS/SUPPLEMENTS TO API RP-2FB > 2. Risk Assessment > 2.7 PERFORMANCE CRITERIA > Add the following sections to this clause: > 2.7.3 Performance Criteria for a Ductility Level Blast (DLB) event at a Medium to Higher Risk facility	4. The Temporary Refuge (TR) and essential command and communication support functions SHALL [PS] remain intact and serviceable during and after the event for the specified endurance period.	Civil, Offshore, and Pipelines

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 37.01.10.1 1-Gen.	DESIGN OF OFFSHORE TOPSIDES FACILITIES AGAINST FIRE AND BLAST LOADING (AMENDMENTS/SUPPLEMENTS TO API RP 2FB)	February 2021	DEP_37011011-Gen > PART III. AMENDMENTS/SUPPLEMENTS TO API RP-2FB > 2. Risk Assessment > 2.7 PERFORMANCE CRITERIA > Add the following sections to this clause: > 2.7.4 Performance Criteria for a Fire event at a Medium to Higher Risk facility	2. A structure at a Medium to Higher Risk facility that is exposed to fire SHALL [PS] continue to support the TR and escape routes for the specified endurance period.	Civil, Offshore, and Pipelines
DEP 37.01.10.1 1-Gen.	DESIGN OF OFFSHORE TOPSIDES FACILITIES AGAINST FIRE AND BLAST LOADING (AMENDMENTS/SUPPLEMENTS TO API RP 2FB)	February 2021	DEP_37011011-Gen > PART III. AMENDMENTS/SUPPLEMENTS TO API RP-2FB > 5. Fire Mitigation > 5.2 FIREWALLS > Add the following to this clause:	2. Where penetrations (e.g., doors, windows, pipe penetrations) are required, they SHALL [PS] not compromise the overall fire rating and integrity of the firewall.	Civil, Offshore, and Pipelines
DEP 37.17.10.1 1-Gen.	DESIGN OF OFFSHORE TEMPORARY REFUGES	February 2021	DEP_37171011-Gen > 2. GENERAL REQUIREMENTS > 2.1 PRIMARY OBJECTIVE	3. The TR SHALL [PS] maintain the safety of personnel during the period required for the evacuation process to be completed including the following times and activities: a. time to complete the full muster at the TR; b. time to account for personnel not reporting to their assigned muster stations; c. time to evaluate the situation and make decisions; d. time to initiate responses to minimise the consequences and control the emergency, if possible; e. time to complete the evacuation (if required). i. This may be done in a phased manner, initially evacuating non-essential personnel; f. contingency time to allow for the unforeseen.	Civil, Offshore, and Pipelines
DEP 37.17.10.1 1-Gen.	DESIGN OF OFFSHORE TEMPORARY REFUGES	February 2021	DEP_37171011-Gen > 3.TR CONFIGURATION CONCEPTS > 3.3 CAPACITY	1. The primary TR SHALL [PS] have capacity for the maximum permitted POB.	Civil, Offshore, and Pipelines

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 37.17.10.1 1-Gen.	DESIGN OF OFFSHORE TEMPORARY REFUGES	February 2021	DEP_37171011-Gen > 4. SYSTEMS > 4.3 STRUCTURAL SUPPORT SYSTEM	7. Adjacent structures that can collapse onto and damage (e.g. rupture) the TR or its systems, or whose failure could obstruct escape and evacuation routes SHALL [PS] be identified and be subject to preventative measures. These adjacent structures might include derricks, cranes, helidecks, flares, vents, masts, and smaller structures such as walkways, stairways and platforms. Preventative measures might be repositioning, application of passive fire protection, addition of protective structural support systems.	Civil, Offshore, and Pipelines
DEP 37.17.10.1 1-Gen.	DESIGN OF OFFSHORE TEMPORARY REFUGES	February 2021	DEP_37171011-Gen > 4. SYSTEMS > 4.4 COMMAND SUPPORT SYSTEM	1. The integrity of the essential Command Support arrangements SHALL [PS] ensure availability of the communication and monitoring information to allow decisions to be taken, particularly those concerning escape and evacuation; This enables the installation to maintain an effective installation command structure (organisation). Essential command support functions are those whose loss or impairment are deemed to constitute direct loss of integrity of the TR, escape routes, evacuation routes, or points of embarkation. Further guidance on essential command support can be found in (5.2.4.1)	Civil, Offshore, and Pipelines
DEP 37.17.10.1 1-Gen.	DESIGN OF OFFSHORE TEMPORARY REFUGES	February 2021	DEP_37171011-Gen > 5. ACCEPTANCE CRITERIA > 5.2 CONDITIONS REQUIRED FOR INTEGRITY > 5.2.5 Escape and evacuation > 5.2.5.2 Fire	1. Escape and evacuation routes and points of embarkation SHALL [PS] be arranged so that personnel will not be directly affected by flame. In practice this means demonstrating at least one escape route being available to people who can survive the initial fire events and having embarkation points located away from or protected from fire effects.	Civil, Offshore, and Pipelines
DEP 37.17.10.1 1-Gen.	DESIGN OF OFFSHORE TEMPORARY REFUGES	February 2021	DEP_37171011-Gen > 5. ACCEPTANCE CRITERIA > 5.2 CONDITIONS REQUIRED FOR INTEGRITY > 5.2.5 Escape and evacuation > 5.2.5.6 Explosion	1. At least one evacuation route and the designated survival craft embarkation areas SHALL [PS] be designed and constructed to remain passable and free of obstructive debris when the effects of potential explosions are evaluated.	Civil, Offshore, and Pipelines
DEP 37.17.10.1 1-Gen.	DESIGN OF OFFSHORE TEMPORARY REFUGES	February 2021	DEP_37171011-Gen > 5. ACCEPTANCE CRITERIA > 5.3 ENDURANCE PERIOD > 5.3.1 General	1. The endurance period of the TR SHALL [PS] exceed the shorter of the following: a. duration of the maximum major incident; b. time required to complete evacuation.	Civil, Offshore, and Pipelines
DEP 37.17.10.1 1-Gen.	DESIGN OF OFFSHORE TEMPORARY REFUGES	February 2021	DEP_37171011-Gen > 5. ACCEPTANCE CRITERIA > 5.3 ENDURANCE PERIOD > 5.3.2 Maximum major incident duration	1. A potential threat to the TR is an ignited hydrocarbon release. The inventory of hydrocarbons available to feed or sustain an event and the reliability of shutdown systems and emergency depressurisation facilities SHALL [PS] be used to evaluate the endurance period. This does not eliminate the requirement to provide a means of evacuation from the installation.	Civil, Offshore, and Pipelines

DEP Number	DEP Title	DEP Revision Date	Heading Hierarchy	SHALL [PS] Statement	Discipline
DEP 80.00.10.1 2-Gen.	LAYOUT OF OFFSHORE FACILITIES	February 2021	DEP_80001012-Gen > 2. LAYOUT STRATEGY	4. The Project HSSE & SP Philosophies SHALL [PS] be incorporated into the layout development at each stage of the project.	Civil, Offshore, and Pipelines
DEP 80.00.10.1 2-Gen.	LAYOUT OF OFFSHORE FACILITIES	February 2021	DEP_80001012-Gen > 4. GENERAL LAYOUT CONSIDERATIONS AND ORIENTATION > 4.1 LAYOUT DESIGN CRITERIA > 4.1.3 Dropped Objects	1. A dropped object study SHALL [PS] be undertaken to evaluate the impact energy and potential damage caused by dropped objects, based on crane usage and objects lifted during construction and operational activities.	Civil, Offshore, and Pipelines

6.1.3 DEPS

The following is the list of relevant Shell DEPs that shall be applied to the project.

Document Number	Revision or Date	Document Title
DEP 01.00.01.30-Gen.	2021	Definition of Temperature, Pressure and Toxicity Levels
DEP 01.00.02.11-Gen.	2021	Preparation of Process Flow Schemes and Process Engineering Flow Schemes
DEP 01.00.02.14-Gen	2021	Layers of Protection Analysis (LOPA)
DEP 01.00.09.10-Gen	2021	Tagging specification and symbols
DEP 30.00.60.20-Gen	2021	Human Factors Engineering – Physical Workspace Design
DEP 30.05.10.30-Gen	2021	Nitrogen Supply and Distribution Systems
DEP 30.73.10.30-Gen.	2021	Safe Vapour Control for Wastewater Collection and Treatment Systems
DEP 31.22.00.30-Gen.	2021	Equipment criticality in pressure vessel design
DEP 31.22.00.31-Gen.	2023	Unfired pressure vessels including adoption of IOGP S-619
DEP 31.37.00.11-Gen	2021	Instrument Air Supply
DEP 31.38.01.11-Gen.	2018	Piping General Requirements
DEP 32.01.20.12-Gen	2021	IACS Security
DEP 33.64.10.10-Gen	2021	Electrical Engineering Design
DEP 33.65.50.31-Gen.	2021	Static Uninterruptable Power Supply Unit (Static UPS Unit)
DEP 33.80.00.30-Gen.	2021	Navigational Aids for Offshore Structures for Global Application
DEP 34.19.20.11-Gen.	2021	Passive fire protection and cold spill protection

Document Number	Revision or Date	Document Title
DEP 35.00.00.11-Gen	2021	Wet Towing of Mobile Offshore (Drilling) Units, Feb 2021
DEP 37.01.10.10-Gen.	2021	Offshore Production Installations Basic Surface Process Safety Systems (Endorsement of API-RP-14C and ISO 10418)
DEP 37.01.10.11-Gen	2021	Design of Offshore Topsides Facilities against Fire and Blast Loading (Amendments/Supplements to API RP 2FB)
DEP 37.05.10.10-Gen.	2021	Design of Seawater Systems for Offshore and Onshore
DEP 37.17.10.11-Gen.	2021	Design of Offshore Temporary Refuges
DEP 37.76.10.10-Gen	2021	HVAC for Offshore Installations (Amendments/Supplements to ISO 15138)
DEP 37.90.10.32-Gen	2021	Selection and operation of dynamically positioned (DP) vessels, Feb 2021
DEP 37.91.10.11-Gen	2021	Mobile Moorings (AMENDMENTS/SUPPLEMENTS TO API RP 2SK, API RP 2SM AND API RP 2I), Feb 2021
DEP 80.00.00.15-Gen.	2021	Hazard and Operability (HAZOP) Study
DEP 80.00.10.12-Gen	2021	Layout of offshore facilities
DEP 80.45.10.10-Gen.	2021	Design of Pressure Relief, Flare and Vent Systems
DEP 80.45.10.11-Gen.	2022	Overpressure and underpressure – prevention and protection
DEP 80.45.10.12-Gen.	2022	Emergency depressuring and sectionalizing
DEP 80.47.10.12-Gen.	2021	Fire and explosion control, protection systems and emergency response for offshore facilities
DEP 80.64.10.11-Gen.	2021	Static Electricity

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

6.2 EXTERNAL, INDUSTRY AND/OR VENDOR STANDARDS

Document Number	Revision or Date	Document Title
2014/30/EU	2014	Electromagnetic Compatibility (EMC) Directive
1999/92/EC	1999	ATEX 153 Workplace Directive
2011/65/EU	2011	Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment
2014/30/EU	2014	Electromagnetic Compatibility (EMC) Directive
2014/34/EU	2014	ATEX Directive
2014/35/EU	2014	Low Voltage Directive
94/9/EC	1994	Equipment intended for use in Potentially Explosive Atmospheres
99/92/EC	1999	Minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres
2006/42/EC	2006	Machinery Directive MD)
2004/22/EC	2004	Measuring Instruments (MID)
2014/68/EU (previously 97/23/EC)	2014	Pressure Equipment (PED)
2014/29/EU (previously 87/404/EEC)	2014	Simple Pressure Vessels (SPV)
98/24/EC	1998	Chemical Agents Directive
API 520	2020	Sizing, Selection, and Installation of Pressure-relieving Devices - Part 1 - Sizing and Selection
API 521	2020	Pressure-relieving and Depressuring Systems
API 526	2017	Flanged Steel Pressure-relief Valves
API 594	Latest	Check Valves: Flanged, Lug, Wafer and Butt Welding
API 599	Latest	Metal Plug Valves-Flanged, Threaded and Welding Ends
API 6D	2021	Specification for Valves
API600/ISO 10434	Latest	Bolted bonnet Steel Gate Valves for Petroleum and Natural Gas Industries
API 602/ISO 15761	Latest	Steel Gate, Globe and Check Valves, DN 100 and Smaller for Petroleum and Natural Gas Industries
API 607	Latest	Fire Test for Soft Seated Quarter Turn Valves
API 608	Latest	Metal Ball Valves-Flanged, Threaded and Welding Ends
API 609	Latest	Butterfly Valves Double Flanged, Lug and Wafer Type

Document Number	Revision or Date	Document Title
ASHRAE	2021	Handbook of Fundamentals
ASME B1.1	Latest	Unified Inch Screw Threads UN and UNR Thread Form
ASME B16.5	Latest	Pipe Flanges and Flanged Fittings
ASME B16.9	Latest	Factory Made Wrought Buttwelding Fittings
ASME B16.10	Latest	Face to Face and End to End Dimensions of Valves
ASME B16.11	Latest	Forged Fittings, Socket Welding and Threaded
ASME B16.20	Latest	Metallic Gaskets for Pipe Flanges Ring Joint, Spiral Wound and Jacketed
ASME B16.21	Latest	Non-metallic Gaskets for Pipe Flanges
ASME B16.25	Latest	Butt-Welding Ends
ASME B16.34	Latest	Valves – Flanged, Threaded and Welding Ends
ASME B16.48	Latest	Line Blanks
ASME B31.3	Latest	Process Piping
ASME B31.12	Latest	Hydrogen Piping and Pipelines
ASME B36.10M	Latest	Welded and Seamless Wrought Steel Pipe
ASME B36.19M	Latest	Stainless Steel Pipe
ASME VIII	Latest	
ASME IX	Latest	
ASTM A182	Latest	Standard Specification for Forged or Rolled Alloy and Stainless-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
ASTM A193	Latest	Standard Specification For Alloy-Steel And Stainless Steel Bolting For High Temperature Or High Pressure Service And Other Special Purpose Applications
ASTM A194	Latest	Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
ASTM A240	Latest	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A276	Latest	Standard Specification for Stainless Steel Bars and Shapes
ASTM A312	Latest	Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless-Steel Pipes
ASTM A320	Latest	Standard Specification for Alloy-Steel and Stainless-Steel Bolting Materials for Low-Temperature Service

Document Number	Revision or Date	Document Title
ASTM A333	Latest	Standard Specification for Seamless and Welded Steel Pipe for Low-Temperature Service
ASTM A350	Latest	Standard Specification for Carbon and Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping Components
ASTM A351	Latest	Standard Specification for Castings, Austenitic, for Pressure-Containing Parts
ASTM A352	Latest	Standard Specification for Steel Castings, Ferritic and Martensitic, for Pressure-Containing Parts, Suitable for Low-Temperature Service
ASTM A358	Latest	Standard Specification for Electric-Fusion-Welded Austenitic Chromium-Nickel Stainless Steel Pipe for High-Temperature Service and General Applications
ASTM A403	Latest	Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings
ASTM A420	Latest	Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service
ASTM A479	Latest	Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels
ASTM A671	Latest	Standard Specification for Electric-Fusion-Welded Steel Pipe for Atmospheric and Lower Temperatures
ASTM A790	Latest	Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless-Steel Pipe
ASTM A815	Latest	Standard Specification for Wrought Ferritic, Ferritic/Austenitic, and Martensitic Stainless Steel Piping Fittings
ASTM A928	Latest	Standard Specification for Ferritic/Austenitic (Duplex) Stainless Steel Pipe Electric Fusion Welded with Addition of Filler Metal
ASTM A995	Latest	Standard Specification for Castings, Austenitic-Ferritic (Duplex) Stainless Steel, for Pressure-Containing Parts
ASTM B363	Latest	Standard Specification for Seamless and Welded Unalloyed Titanium and Titanium Alloy Welding Fittings
ASTM G93	Latest	Standard Guide for Cleanliness Levels and Cleaning Methods for Materials and Equipment Used in Oxygen-Enriched Environments
BS 1873	Latest	Steel Globe and Globe Stop and Check Valves Flanged and Butt-Welding Ends for the Petroleum, Petrochemical and Allied Industries
BS EN ISO 17292	Latest	Metal Ball Valves for Petroleum, Petrochemical and Allied Industries
DNVGL-ST-0145	2020	Offshore Substations
EIGA Doc 13/20	2020	Oxygen Pipeline and Piping Systems (2020)
EN 1127	Latest	Explosive Atmospheres, Explosion Prevention and Protection, Basic Concepts and Methodology
EN 10028-2	2017	Flat products made of steels for pressure purposes-Non-alloy and alloy steels with specified elevated temperature properties
EN 13121	Latest	GRP Tanks and Vessels for Use Above Ground
EN 13445	Latest	Unfired Pressure Vessels
EN 61131	Latest	Programmable Controllers

Document Number	Revision or Date	Document Title
EN 62271	Latest	High Voltage Switchgear and Control Gear - Common Specifications for Alternating Current Switchgear and Control Gear
IEC 60092	Latest	Electrical Installations in Ships
IEC 60529	Latest	Degrees of Protection Provided by Enclosures (IP Code)
IEC 60076-1	Latest	Power Transformers – Part 1: General
IEC 60076-11	Latest	Power Transformers - Part 11: Dry-type Transformers
IEC 60076-14	Latest	Power transformers - Part 14: Liquid-immersed Power Transformers Using High-temperature Insulation Materials
IEC/TS 60479-1	2018	Effects of current on human beings and livestock - Part 1: General aspects
IEC 60079	2017	Installation & Maintenance of Electrical apparatus for use in Potential explosive atmosphere
IEC 60364	Latest	Low-voltage Electrical Installations
IEC 60502	Latest	Standard Series Power Cables with Extruded Insulation and Their Accessories for Rated Voltages from 1 kV (Um = 1.2 kV) up to 30 kV (Um = 36 kV)
IEC 60529	Latest	Degrees of protection provided by enclosures (IP Code)
IEC 60534	2005	Industrial-Process Control Valves
IEC 62682	2022	Management of Alarm Systems for the Process Industries
IEC 61892	2023	Mobile and Fixed Offshore Units. Electrical installations. Part 1: General requirements and conditions
IEC 60751	2008	Industrial Platinum Resistance Thermometers and Platinum Temperature Sensors
IEC 60947 Part 1	Latest	Low Voltage Switch gear and Control Gear Part 1 General Rules
IEC 60947-5-2/3	2021	Control Circuit Devices and Switching Elements – Proximity Switches
IEC 61000-6-2	2016	Immunity standards for industrial environments
IEC 61000-6-4	2018	Emission standards for industrial environments
IEC 61340-5-1	2016	Protection of Electronic Devices from Electrostatic Phenomena
IEC 61427-2	2015	Secondary cells and batteries for renewable energy storage – General requirements and methods of test –Part 2: On-grid applications
IEC 61439 Part 1	Latest	Low Voltage Switch gear and Control Gear Assemblies Part 1 General Rules
IEC 61439 Part 2	Latest	Low Voltage Switch gear and Control Gear Assemblies Part 2 Power Switch gear and Control gear Assemblies
IEC 61508	2010	Functional safety of electrical/electronic/programmable electronic safety-related systems

Document Number	Revision or Date	Document Title
IEC 61511	2017	Functional Safety – Safety Instrumented Systems for the Process Industry Sector – Framework, Definitions, System, Hardware and Application Programming Requirements
IEC 61508	Latest	Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems
IEC 61850	2020	Communication Networks and Systems for Power Utility Automation
IEC 62282-2-100	Latest	Fuel cell modules - Safety
IEC 62282-3-100	Latest	Stationary Fuel Cell Power Systems - Safety
IEC 62282-3-200	Latest	Stationary Fuel Cell Power Systems - Performance test methods
IEC 62282-3-300	Latest	Stationary Fuel Cell Power Systems - Installation
IEC 62933-5-2	Latest	Electrical energy storage (EES) systems Part 5-2: Safety requirements for grid integrated EES systems -electrochemical based systems
IEC 62061	2021	Safety of Machinery – Functional Safety of Safety-related Control Systems
IEC 62271-202	Latest	High Voltage / Low Voltage Prefabricated Substation
IEC 62305	Latest	Protection against lightning
IEC 62477	Latest	Safety requirements for power electronic converter systems and equipment
IEC 62443	2020	Cyber Security for Industrial Automation and Control Systems
IEC 62485	Latest	Safety requirements for secondary batteries and battery installations
IEC 62619	Latest	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications
IEC 62933	Latest	Electrical energy storage (EES) systems
IEC 63056	Latest	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries for use in electrical energy storage systems
IEEE-802	2021	Network Standards
IOGP Report 454	2nd edition 2020	Human Factors Engineering in Projects
ISO 15138	2018	Petroleum and Natural Gas Industries – Offshore Production installations – Heating, Ventilation and Air Conditioning
ISO 19901-5	2021	Petroleum and Natural Gas Industries – Specific requirements for offshore structures – Part 5 – Weight Control During Engineering and Construction
ISO 22734	2019	Hydrogen generators using water electrolysis process
ISO/TR 15916	2015	Basic considerations for the safety of hydrogen systems

Document Number	Revision or Date	Document Title
ISO 22734-1:2008	2008	Hydrogen generators using water electrolysis process – Part 1: Industrial and commercial applications
ISO 7010	2019	Safety Signage
ISO 19901-3	2014	Petroleum and Natural Gas Industries – Specific requirements for offshore structures – Part 3: Topsides Structures
ISO 19902	2020	Petroleum and Natural Gas Industries – Fixed Steel Offshore Structures
NEN 1010	Latest	Laagspanningsinstallaties (Dé norm voor het aanleggen van veilige laagspanningsinstallaties)
NFPA HAZ10	14th editions	Hazardous Materials
NFPA 2	2020	Hydrogen Technologies Code
NFPA 10	2022	Portable Fire Extinguishers
NFPA 53	2020	Materials, Equipment, and Systems Used in Oxygen-Enriched Atmospheres
NFPA 850	2020	Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations
NFPA 855	2020	Standard for the Installation of Stationary Energy Storage Systems
TRGS 2152	Latest	Explosion Protection/Hazardous Area Classification
UL 1642	2020	Standard for Safety, Lithium Batteries
UL 1741	2021	Standard for Power Conversion Systems
UL 1973	2018	Standard for Safety, Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications
UL 9540	2021	Standard for Safety, Energy Storage Systems and Equipment
UL 9540A	2021	Standard for Safety, Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems

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

6.2.1 ADDITIONAL REQUIREMENTS

Following standards are added in this Revision 01 as required by Company. The standards included in this paragraph are considered by Contractor for information only: any mandatory application of any part of the below standards will be required by Company and discussed within the parties.

Document Number	Document Title
UN38.3	Certification for Lithium Batteries
UN3090	Certification for lithium metal batteries special
UN3480	*Certification for* Lithium ion batteries
UN3091	*Certification for* Lithium *methal* batteries
UN3481	*Certification for* Lithium ion batteries
IEC 62281	Safety of primary and secondary lithium cells and batteries during transport

6.3 LOCAL LAWS & REGULATIONS

Document Number	Document Title
94/9/EC	Equipment intended for use in Potentially Explosive Atmospheres
2014/29/EU	Simple Pressure Vessels Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/34/EU	ATEX Directive
2014/35/EU	Low Voltage Directive
2006/42/EC	Machine Directive
2011/65/EU	PB Free Directive
2014/68/EU	EU Pressure Equipment Directive
1999/92/EC	ATEX 153 Workplace Directive
99/92/EC	Minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres
305/2011/EU	Regulation (EU) for marketing of construction products

6.3.1 ADDITIONAL REQUIREMENTS

Following standards are added in this Revision 01 as required by Company. The standards included in this paragraph are considered by Contractor for information only: any mandatory application of any part of the below standards will be required by Company and discussed within the parties.

Document Number	Document Title
NEN 3140	Operation of Electrical Installations
NEN 3840	Operation of Electrical installations - High voltage
NEN 1010	Electrical installations for low-voltage - Dutch implementation of the HD-IEC 60364 series
TenneT TSO GmbH	Grid Connection Requirements - High and Extra-High Voltage -
Arbeidsomstandighedenregeling	Working conditions regulation