

	TECHNICAL SPECIFICATION					Nº: I-ET-3000.00-0000-940-P4X-003				
	CLIENT:							SHEET: 1 of 24		
	JOB:							-		
	AREA:									
SRGE	DESIGN REVIEW REQUIREMENTS					INTERNAL				
ESUP										
Microsoft Office Word - Microsoft 365 MSO (16.0.13801.20288) 64 bits / I-ET-3000.00-0000-940-P4X-003_G.docx										
REVISION INDEX										
REV.	DESCRIPTION AND/OR CHANGED SHEETS									
0	ORIGINAL ISSUE									
A	ITEM 1.2 (REFERENCE DOCUMENTS) UPDATED ACCORDING TO CLARIFICATION NOTICE DUE TO BIDDER QUESTION									
B	"STRUCTURE EXPLOSION CALCULATION REPORT" MOVED FROM ITEM 2.4.2 TO 2.5.2, AND THE "EXPLOSION ANALYSIS" AND THE "DROPPED OBJECT ANALYSIS" MOVED FROM ITEM 2.6.2 TO 2.5.2, ACCORDING TO THE CLARIFICATION NOTICE DUE TO BIDDER QUESTION AND ITEM 1.2 UPDATED WITH LAST REVISIONS.									
C	GENERAL REVISION									
D	ITEMS 2.2.3, 2.4.2, 2.4.4, 2.5.2, 2.5.3, 2.6.2 WERE REVISED									
E	ITEMS 2.1.5, 2.3.1, 2.4.4, 2.5.3, 2.6.3 WERE REVISED AND ITEM 2.1.7 WAS INCLUDED									
F	ITEM 2.2.7 WAS INCLUDED									
G	DIGITAL ENGINEERING TECHNICAL SPECIFICATION CODE WAS UPDATED									
	REV. 0	REV. A	REV. B	REV. C	REV. D	REV. E	REV. F	REV. G	REV. H	
DATA	17/JUL/20	15/SET/20	23/NOV/20	APR/20/21	DEC/29/21	AUG/30/22	DEC/06/22	DEC/16/22		
DESIGN	APS	APS	APS	APS	APS	APS	APS	APS		
EXECUTION	ESVK	ESVK	ESVK	ESVK	ESVK	ESVK	ESVK	ESVK		
CHECK	CSU3	CSU3	CSU3	CSU3	HR8P	U4KZ	CJR4	CJR4		
APPROVAL	UQ2J	UQ2J	UQ2J	UQ2J	CJR4	UQ2J	UQ2J	UQ2J		
INFORMATION IN THIS DOCUMENT IS PROPERTY OF PETROBRAS, BEING PROHIBITED OUTSIDE OF THEIR PURPOSE.										
FORM OWNED TO PETROBRAS N-0381 REV. L										

 PETROBRAS	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 2 of 24	
	TITLE:	INTERNAL	
	DESIGN REVIEW REQUIREMENTS		ESUP

INDEX

1	INTRODUCTION.....	3
1.1	Objectives.....	3
1.2	Reference Documents.....	3
2	DESIGN REVIEW SESSIONS.....	3
2.1	Introduction	3
2.2	Conditions to Promote the Design Review Sessions.....	3
2.3	Design Review Team	4
2.4	30% Design Review Session.....	4
2.5	60% Design Review Session.....	8
2.6	90% Design Review Session.....	13
	APPENDIX A – Design Review Check List.....	17

	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 3 of 24	
	TITLE:	DESIGN REVIEW REQUIREMENTS	
			INTERNAL
			ESUP

1 INTRODUCTION

1.1 Objectives

1.1.1 Establish the 3D model evaluation systematic to be used in Design Review Sessions, ensuring compliance with project objectives.

1.2 Reference Documents

I-ET-3000.00-1350-94P-P4X-002

DIGITAL ENGINEERING TECHNICAL REQUIREMENTS FOR DETAILED DESIGN DIRECTIVES FOR CONSTRUCTABILITY REQUIREMENTS

I-MD-3010.00-1200-940-P4X-033

2 DESIGN REVIEW SESSIONS

2.1 Introduction

2.1.1 SELLER shall prepare Design Review Sessions with active participation of key project personnel responsible for the design, construction and assembly, commissioning, operation and PETROBRAS. The Design Review Sessions shall be prepared for 30%, 60% and 90% phases of the detailed engineering design and the main tool to use is 3D model.

2.1.2 These events will be a detailed review of the project, including, but not limited to, ergonomics and operational issues, accessibility, constructability, maintainability and other checks requested by PETROBRAS.

2.1.3 SELLER shall apply the checklists contained in APPENDIX A, before Design Review Sessions 30%, 60% and 90%, showing to PETROBRAS that the minimum requirements are met.

2.1.4 SELLER shall do internally events or preliminary assessments to develop and define the layout and the mechanical handling philosophy before the 30% Design Review Session.


2.1.5 The Design Review Sessions shall be accomplished in a special room equipped with 3D capabilities and allow transmit the event by videoconference. These events shall be done in a place prepared by SELLER.

2.1.6 SELLER shall be responsible for Design Review Sessions, inviting the correct team members and ensure that all supporting documentation is ready and necessary facilities arrangements are available.

2.1.7 Due to the large number of valves and instruments, the ergonomic review of those items can occur in a separate event, always respecting the general rules of the regular Design Reviews. This event is expected to happen in 60% and 90% phases.

2.2 Conditions to Promote the Design Review Sessions

2.2.1 SELLER shall accomplish Design Review Sessions only in groups of two to four modules, always with the same progress percentage. For example, a 30% Design Review Session of two modules or 60% Design Review Session of four modules.

	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 4 of 24	
	TITLE:	DESIGN REVIEW REQUIREMENTS	
		INTERNAL	
		ESUP	

2.2.2 SELLER can accomplish Design Review Sessions of less than two modules only if all other modules have already overcome this phase.

2.2.3 To accomplish any Design Review Session, SELLER shall notify PETROBRAS with a minimum of 30 days in advance. Among events, the minimum interval shall be 15 days.

2.2.3.1 SELLER shall provide all engineering database backup with a minimum of 30 days in advance, previously to each Design Review Session. These engineering databases shall have all attributes defined for each Design Review Session, according to the Annex C - Petrobras Class Library for Upstream of the technical specification I-ET-3000.00-1350-94P-P4X-002.

2.2.4 SELLER shall issue a complete Design Review Report after completion of each event to all disciplines and participants affected to clearly define the actions to be taken and responsibilities assigned with estimated completion dates. SELLER shall implement all comments 30 days prior to next Design Review Session and submit for PETROBRAS approval.

2.2.5 SELLER shall comply with all comments generated at Design Review Session to do the next event. For example, 60% Design Review Session only can be done if all the comments generated in 30% Design Review Session are implemented in 3D model and detailed engineering documents.

2.2.6 SELLER shall tag all objects modelled, scope of Design Review, previously to each Design Review Session.

2.2.7 In each Design Review Session, there shall be made one specific meeting to evaluate the flow metering system (FMS) and all its metering points. At least the following items shall be verified: sampling points location, straight runs lengths, accessibility, maintenance, cargo handling and compliance to legal requirements.

2.3 Design Review Team

2.3.1 SELLER shall mobilize for Design Review Sessions, at least the professionals described below:


- Engineering job leaders – piping, mechanical, process, safety, electrical, instrumentation, telecom, structures, marine, naval, architecture and ergonomics;
- Construction specialists;
- Commissioning and Procurement specialists;
- Safety specialists;
- Engineering project manager.

2.4 30% Design Review Session

2.4.1 SELLER shall present at 30% Design Review Session main emergency access/escape routes, safety requirements, special construction methods and mechanical handling requirements. Safety, Operation, Maintenance, Construction and legislation requirements must be presented in this event.

2.4.2 To carry out this event, SELLER shall issue 30 days prior to 30% Design Review Session the following documents:

- At least 80% of process and instrumentation diagram (P&ID's);
- D&ID's and PFD's;

	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 5 of 24	
	TITLE:	INTERNAL	
DESIGN REVIEW REQUIREMENTS		ESUP	


- Hydrants location study;
- Fire Monitors location study;
- Escape Route Plan;
- Modules arrangement and general arrangement with the location of major equipment (compressors, heat exchangers, pressure vessels, electrical equipment, etc.);
- Mechanical handling philosophy/plan/specification;
- Piping specification used for 3D CAE catalogue;
- Piping system stress analysis philosophy;
- Project line list;
- Critical line list (for piping system stress analysis);
- Piping system stress analysis reports for the critical modelled lines;
- Supports standard;
- General arrangement with:
 - Location of automation and control panels from automation and electrical panel room and central control room – equipment ambience;
 - Main safety areas and equipment location with muster stations areas, lifeboats embarkation areas, emergency power generation units, firefighting pumps, emergency UPS power units and other similar.
- Major electrical equipment specifications/data sheets and electrical equipment list;
- Power and grounding plant (cable trays);
- Telecoms and radio room arrangement:
 - Location of telecom racks from telecom panel room and telecom CCR room and all consoles in radio room.
- Structure slamming calculation report.

2.4.3 SELLER shall submit 3D model hierarchy at least 30 days prior to 30% Design Review Session, following the requirements defined in the document I-ET-3000.00-1350-94P-P4X-002.

2.4.4 In 3D Model, the following items shall be modelled as a pre-requisite of 30% Design Review Session:

General

- Buildings – examples: local equipment room, laboratory or storage containers to overall dimensions. Associated emergency access and escape requirements;
- Modules outline, primary steel location and Top of Steel (TOS) clearly defined;
- Volumes – The following volumes shall be modelled using volumes objects or primitive geometries and define its purposes using one of the code list options below. When defining the purpose attribute for equipment operation/maintenance volumes, SELLER shall take into account the space required for use of special devices and tools.
 - a) Equipment operation;
 - b) Escape route;
 - c) Handling route;
 - d) Hazardous area;
 - e) Closed room;
 - f) Door opening;
 - g) Helideck operation free span;
 - h) Draught;
 - i) Lay down area;
 - j) Ship supplies;
 - k) Waste removal via crane (typically on main deck);
 - l) Vendor or third-party module limits and access.

	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 6 of 24	
	TITLE:	INTERNAL	
DESIGN REVIEW REQUIREMENTS		ESUP	

- Rack layout and size as determined from module layout and line route study.

Architecture


- All compartments including staircases, for all decks, including the following items:
 - a) Coamings;
 - b) Thermo-acoustic insulation;
 - c) Passive protection on bulkheads, decks and roofs;
 - d) Lining and partitions panels;
 - e) Subfloor;
 - f) Floor covering;
 - g) Ceiling lining;
 - h) Framed internal and external doors;
 - i) Windows and boxes.

Safety

- Emergency access/escape routes including stairs and ladders for all areas and modules, muster station location/space/equipment, embarkation station location/space/equipment;
- Fire monitors, hydrants or water/foam equipment, deluge valve (ADV) and its local panels, firefighting lockers, fireman's outfit lockers, emergency showers and eye wash, breathing apparatus housing and others;
- Safety davits, lifeboats, life rafts, rescue boats, stretcher locations and proposed travel routes and other lifesaving equipment;
- Special safety requirements, examples such as escape tunnels, water curtains for escape routes, firewalls, blast walls and others;
- Firewater pump locations, foam pumps locations, fire water and foam main headers/ring main location, fire water and foam main rings block valve arrangement;
- Fire water and foam distribution to consumers (branches and block valves);
- Hazardous area classification volumes;
- Equipment and instruments installed at hazardous area.

Mechanical Equipment

- All major process equipment described below with primary nozzles, orientations, access requirements and auxiliary systems volumes:
 - a) Pumps;
 - b) Compression units;
 - c) Filters;
 - d) Heat exchangers;
 - e) Tanks;
 - f) Flares;
 - g) Package units;
 - h) Pressure vessels;
 - i) Cranes;
 - j) Offloading system;
 - k) Pull in winch;
 - l) Cylinder battery;
 - m) Turbo generators;
 - n) Motor generators;
 - o) Hydraulic Power Units (HPU);
 - p) Electrostatic dehydrators;
 - q) Waste Heat Recovery Units (WHRU);
 - r) Mooring system;

	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 7 of 24	
	TITLE:	DESIGN REVIEW REQUIREMENTS INTERNAL ESUP	

s) Vacuum deaerator units.

- Tube and plate removal spaces and handling obstructions for coolers/heaters;
- Packaged units volumes;
- Saddles and skirts for major pressure vessels positioned;
- Crane locations, radius and limit of crane capabilities;
- Mechanical handling obstructions including crane and monorail requirements and accessibility. Items with 3 Tons or above or any special size or restricted equipment modelled;
- Obstruction volumes required for safety, operations, maintenance and construction;
- Laydown areas, chemical injection laydown;
- Equipment's access platforms for maintenance;
- Major equipment of hydraulic power unit, chemical injection, auxiliary winch and bottle rack volumes;
- Diving equipment and access to cages, if applicable;
- Drain tank and pumps.

HVAC


- All HVAC systems primary equipment (with dimensions based on cooling/heating calculated capacities) with the following attributes: tag, electrical power, weight and capacity;
- Primary duct network (initial sections);
- Equipment bases (dimensions and location);
- Spaces for handling, operation and equipment maintenance;
- Air intakes and outlets position;
- Basic utilities like water and drain location.

Piping

- 3D piping catalogue according to issued piping spec. The 3D piping catalogue shall contain all pipelines, pipe components, accessories, blinds and blanks, spacers, inline instruments, manual valves (including operators) and instrumented valves (including actuators) that will be used in the project, including their area for handling handwheels and levers;
- At least 30% of topside and hull piping modelled on engineering diagram of process, marine systems, safety and HVAC, giving priority to:
 - a) Lines NPS 6 or larger;
 - b) Lines that require piping system stress analysis;
 - c) Routed lines that define equipment arrangement, nozzle position and tie-in points.
- I-Tubes and riser designations clearly defined.

Structure

- Hull surface geometry;
- Structural tank volumes and inner hull compartments;
- All primary structures and floor plates;
- All ladders in between floors;
- Module lifting pad eyes and obstruction for lifting (preliminary);
- Primary removal monorails and their obstruction volumes (preliminary);
- Module supports and bracings with obstruction along lift volumes;
- Main equipment supports (preliminary);
- Pipe rack frame for either integral module racks or independent rack (preliminary) - elevations set by piping;

	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 8 of 24	
	TITLE:	DESIGN REVIEW REQUIREMENTS	INTERNAL
			ESUP

- Primary escape routes stairs and ladders (preliminary).

Electrical and Instrumentation

- Local control panels;
- Automation and electrical panels located inside central control room and panel room;
- Battery banks and transformers;
- Electric motors with nominal voltage above 400V;
- Main cable tray routings, obstruction volumes only;
- Secondary cable tray routings (between local control panels and instruments/equipment), obstruction volumes only for instruments located in modelled equipment and lines;
- All piping valves, Instrumentation valves SDV's, control valve stations, meter runs or any inline instrument in modelled lines;
- All nozzles or taps for instruments installations in modelled lines and equipment;
- Hydraulic racks;
- Main junction box racks obstruction volumes only;
- Maintenance volumes for batteries, rectifiers, battery-chargers, soft-starters, inverters, control panels, AC and DC switchboards, UPSs, switchgears and MCCs, power transformers, lighting transformers and grounding resistors;
- Fiscal metering;
- Access, emergency and maintenance paths for valves, inline instruments, meter runs, (straight run requirements) junction boxes, etc.

Telecom

- Telecom racks, radio consoles located in radio room and CCR – Operator Ambiance;
- Main telecom cable tray route in EIT TRUNK;
- Secondary cable tray routings (between telecom racks and telecom devices);
- Telecom tower;
- Telecom electrical panels.

Constructability

- Location of temporary facilities, tools and equipment for construction for Structure discipline.


2.4.5 SELLER shall apply in the 3D Model the 30% Design Review Check List (APPENDIX A) and submit to PETROBRAS to promote this event.

2.5 60% Design Review Session


2.5.1 SELLER shall present at 60% Design Review Session main construction deliverables with emphasis on critical components with sufficient detail to freeze for construction secondary steel and critical large bore piping. Safety, Operation, Maintenance, Construction and legislation requirements must be presented in this event.

2.5.2 To carry out this event, SELLER shall issue and/or updated the following documents:

- 30% design review comments, solved and complete;
- APR and HAZOP studies;
- P&ID's, D&ID and PFDs with change notices if applicable;
- Equipment heat dissipation list confirmed;
- Thermal load calculation memory;
- Hazardous area classification data list;

	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 9 of 24	
	TITLE:	INTERNAL	
	DESIGN REVIEW REQUIREMENTS		ESUP

- Safety data sheet;
- Water and foam firefighting system calculation;
- CO2 firefighting system calculation;
- Hydrants location study;
- Fire Monitors location study;
- Fire Control Plan;
- Safety Plan;
- Escape Route Plan;
- Evacuation and Escape Rescue Analysis (EERA);
- Flame detectors coverage report;
- Passive fire protection specification;
- Water mist fire firefighting specification;
- Ergonomic analysis (manual valves, instruments and push buttons access);
- HVAC plans, elevation and sections (duct and equipment layout);
- Duct calculation memory;
- Equipment specifications/data sheets for all equipment, approved for design by vendors;
- Modules arrangement and general arrangement;
- Equipment location/ module plans;
- Mechanical handling philosophy/plan/specification;
- Vendor equipment general arrangement approved for design;
- Primary structural steel drawings, subject to major equipment drawing confirmation;
- Secondary structural steel drawings;
- Instrumentation typical details for process, electrical, pneumatic and hydraulic;
- Pneumatic/hydraulic lay out plan;
- Instrumentation lay out plan;
- Gas dispersion analysis report;
- Support list;
- Project line list;
- Critical line list (for piping system stress analysis);
- Piping system stress analysis reports for the critical modelled lines;
- Supports standard;
- Special supports drawings;
- Piping isometrics;
- Piping isometric list;
- All electrical equipment specifications/data sheets for all equipment, approved for design by vendors;
- Lighting posts plants;
- Power and grounding plant (cable trays);
- Telecommunications systems arrangement;
- Hull telecom systems calculation report;
- Topside telecom systems calculation report;
- Fatigue calculation reports both in the in-place condition and in-transit condition for all modelled structures. All calculation reports shall have been previously approved by Classification Society;
- Hook up (process, electrical, pneumatic and hydraulic) to be detailed for all instruments located in modelled equipment and lines;
- Explosion analysis;
- Dropped object analysis;
- Structure explosion calculation report.

	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 10 of 24	
	TITLE:	INTERNAL	
DESIGN REVIEW REQUIREMENTS		ESUP	

2.5.3 In 3D Model, the following items shall be modelled as a pre-requisite for 60% Design Review Session in addition to 30% requirements:

General


- Buildings – Examples: Local Equipment Room, Laboratory or storage containers to confirmed dimensions. Associated emergency access and escape requirements, any electrical or HVAC requirements;
- Package modules outline;
- Volumes - The following volumes shall be modelled using volumes objects or primitive geometries and define its purposes using one of the code list options below:
 - a) Gas exhaust;
 - b) Flame detection cones;
 - c) Sprinkler coverage;
 - d) Meeting points;
 - e) Vendor or third-party module limits and access (requirements confirmed and approved);
 - f) Cylinder between Tx and Rx of open path gas detectors.
- Maintenance/installation/design obstructions to approved data – all disciplines;
- All tagged equipment modelled, and General Arrangement checked and issued for construction;
- All accesses and operation sites with ergonomic evaluation;
- All attributes filled in 3D model elements required to make this event, the 60% Design Review.

Architecture

- Equipment basis (for galley, workshops, freezer room, etc.);
- Ceiling accessories (inside compartment), ceiling, lining and partitions assembly's accessories, lining and partitions accessories (hydrants, electrical panels, railing, etc.);
- General furniture of each compartment and equipment (galley, laundry, laboratory, gym, hospital, etc.).

Safety

- Emergency access/escape routes including stairs and ladders for all areas and modules, muster station location/space/equipment, embarkation station location/space/equipment;
- All topside and hull piping used for firefighting systems including sprinklers and all its components as pipelines, pipe components, accessories, blinds and blanks, spacers, inline instruments, manual valves (including operators) and instrumented valves (including actuators);
- Fire monitors, hydrants or water/foam equipment, deluge valve (ADV) and its local panels, firefighting lockers, fireman's outfit lockers, emergency showers and eye wash, breathing apparatus and others;
- Safety davits, lifeboats, life rafts, rescue boats, stretcher locations and proposed travel routes and other lifesaving equipment;
- Special safety requirements, examples such as escape tunnels, water curtains for escape routes, firewalls, blast walls and others;
- Firewater pumps;
- Equipment and instruments installed at hazardous area;
- All CO2 flooding systems, including local ones and general layout. Rooms with CO2 firefighting flooding systems and firefighting pump CO2 skids shall have at least two accesses;

	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 11 of 24	
	TITLE:	DESIGN REVIEW REQUIREMENTS	
		INTERNAL	
		ESUP	

- Water mist system location and arrangement;
- Safe location of air intakes and outlets, vents, machinery exhaust gases;
- Dropped object protection;
- Fire proofing graphically modelled.

Mechanical Equipment


- All process equipment with its nozzles, orientations, access requirements and auxiliary systems volumes;
- Access paths to equipment for operation and maintenance including head height;
- Mechanical handling obstructions including crane and monorail requirements and accessibility. All removable material handling equipment modelled;
- Containment areas local to vessels, chemicals storage, etc. detailed model;
- Tube and plate removal volumes and handling obstructions for coolers/heaters;
- Secondary access paths for equipment, including ladders and platforms;
- Drip trays for equipment;
- Coamings whenever required by the equipment.

HVAC

- All HVAC equipment;
- All HVAC ducts and its supports with final dimensions, based on approved calculation memories, including thermal insulation;
- Air distribution elements (grills, diffusers, louvers, dampers etc.) with dimensions and capacities (based on vendor data);
- Fire and gas tight dampers and penetration pieces designed;
- Water tight valves designed;
- Basic utilities like water and drain location.

Piping

- At least 60% of topside and hull piping modelled on engineering diagram of process, marine systems, safety and HVAC, giving priority to:
 - a) Lines NPS 6 or larger;
 - b) Lines that require piping system stress analysis;
 - c) Routed lines that define equipment arrangement, nozzle position and tie-in points.
- Piping scope represented on 60% design review must be fully modelled including all supports, vents, drains and instrumentation, including all SDV's, XV's, HV's, inline valves, control valves or any inline instruments and any other valve, accessories, fittings, special items, gaskets, expansion joints, dresser couplings, spring hanger supports, spectacles, blankets, spacers and thermal insulation. Valves shall be identified according to their ergonomic classification with the use of different colors;
- Flare system layout and determination of PSV platforms/locations;
- Major/Critical pipe supports located (piping lines NPS 6 or larger or that require piping system stress analysis);
- Any under production deck drains, overboard lines or deluge systems to be modelled with supports. Typically supports need to be issued early for installation to primary steel pancake prior to painting;
- All special items to be modelled except hose connections;
- Final drain pit and box locations;
- Access/maintenance paths for valves, inline instruments, meter runs, etc.;
- Interfaces between modules, main deck, pipe rack and riser balcony.


	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 12 of 24	
	TITLE:	DESIGN REVIEW REQUIREMENTS	INTERNAL
			ESUP

Structure

- All primary and secondary module structures;
- Upper and Lower riser balcony and manifold area primary steel (fully detailed);
- Hard pipes (fully detailed);
- Pipe rack and Riser pipe rack (fully detailed);
- Pull-in (fully detailed);
- Diving station (fully detailed);
- Mooring balcony (fully detailed);
- Fairleads (fully detailed);
- Vent post (fully detailed);
- Well stimulation support (fully detailed);
- Helideck (fully detailed);
- Flare base (fully detailed);
- Rescue boats platform (fully detailed);
- Caisson (fully detailed);
- Module lifting pad eyes and obstruction for lifting;
- Primary monorails and their obstruction volumes;
- Primary escape routes stairs and ladders (fully detailed);
- Pipe rack frame for either integral module racks or independent rack (fully detailed);
- Module deck plate with penetrations (fully detailed);
- Flare tower structure and main deck levels framing (fully detailed);
- Handrails and coamings, including deck coamings not supplied with equipment within the structure discipline hierarchy;
- Module installation aids, lifting arrangements or safety protection i.e., bumper bars, guides (fully detailed);
- Firewalls or blast protection on topsides modules (fully detailed);
- All piping special supports;
- All structural supports;
- All equipment foundation;
- Structural tanks, inner hull compartments and draught;
- Identify in the 3D model, highlighting in different colors and creating viewpoints for all temporary structures, removable structures and “hook up” structures of the modules.

Electrical and Instrumentation

- All electrical and instrumentation panels with identification and their accessories, including supports and doors with obstruction volumes and according to Vendor Documentation;
- All electrical equipment and its accessories (fully detailed);
- Main cable tray paths between automation and electrical panels;
- Main ladders/trays with a minimum of 300mm free space between the top of one ladder edge to the bottom of the next ladder edge, and from top ladder edge to roof, according to IEC 61892-6 to facilitate cable pulling and cleating/strapping;
- Secondary cable tray paths between local control panels and equipment/instruments, including main passageways/penetrations between different areas and/or levels;
- All cable tray paths for vendor packages;
- All supports for the modelled electrical and instrumentation cable tray paths;
- 60% of lighting posts, including supports and accessories;
- All junction boxes including supports and accessories with obstruction volumes, and door swings modelled (fully detailed);
- Access, emergency and maintenance paths for junction boxes;
- Hydraulic racks to be detailed with supports and doors with obstruction volumes;

	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 13 of 24	
	TITLE:	INTERNAL	
DESIGN REVIEW REQUIREMENTS		ESUP	

- All air distribution manifolds shall be located in their final position detailed with supports;
- All electrical, hydraulic and pneumatic cable tray paths for all instruments located on modelled piping and equipment;
- Access, emergency and maintenance paths for valves, navigation lights, inline instruments, meter runs, junction boxes etc.;
- All inline instruments (flowmeters), pressure-safety valves, instrumented valves (SDVs, BDVs, XVs, control valves) and actuators located on modelled piping. These objects shall be modelled within the piping discipline hierarchy;
- For all offline instruments, radar level transmitters, fire and gas detectors: 3D modeling shall consider a cylinder between the bottom of the instrument to the bottom of the tank/vessel in order to avoid any interference of piping or structures in the level measurement.

Telecom

- All telecom panels with identification and their accessories, including supports and doors with obstruction and operation volumes;
- All telecom equipment of all systems and its accessories (fully detailed), except for PAGA system;
- 60% of loudspeakers from PAGA system;
- All antennas in antenna deck and in telecom tower;
- Main cable tray paths between telecom panels and antenna deck and telecom tower;
- All junction boxes including supports and accessories with obstruction volumes, and door swings modelled (fully detailed);
- Secondary cable tray paths between telecom equipment and devices like antennas and junction boxes;
- All cable tray paths for vendor packages.

Constructability

- Location of temporary facilities, tools and equipment for construction for Mechanical, Equipment, Safety and HVAC disciplines.


2.5.4 SELLER shall apply in 3D model the 60% Design Review Check List (APPENDIX A) and submit to PETROBRAS to promote this event.

2.6 90% Design Review Session

2.6.1 SELLER shall present at 90% Design Review Session, identifying if all documents are issued for construction and to prove the scope and specification of the Project has been concluded. Any changes from 60% Design Review to 90% shall be evaluated.

2.6.2 To carry out this event, SELLER shall issue and/or updated the following documents:

- 60% design review comments, resolved and complete;
- Hydrants location study;
- Fire Monitors location study;
- Fire propagation and smoke dispersion analysis;
- Ship collision analysis;
- Preliminary risk analysis;
- Hazard and operability study;
- Noise and vibration analysis;
- Flare radiation and dispersion analysis;
- Safe use of helideck;


	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 14 of 24	
	TITLE:	DESIGN REVIEW REQUIREMENTS	
		INTERNAL	
		ESUP	

- Cryogenic effect of condensate (C3+) leaks in installation;
- Safety plan;
- Hazardous area classification;
- Fire control plan;
- Escape route plan;
- Fire propagation and smoke dispersion analysis;
- Flame detectors coverage report;
- Passive fire protection specification;
- Equipment heat dissipation list approved and consolidated;
- HVAC plans, elevation and sections (duct and equipment layout) approved and consolidated;
- Duct calculation memory;
- Plot plan revision;
- Equipment specifications/data sheets for all equipment, issued for construction by vendors;
- Mechanical handling philosophy/plan/specification;
- Vendor equipment general arrangement issued for construction;
- Primary, secondary and tertiary structural steel drawings;
- All Piping system stress analysis reports for the critical lines;
- Support list;
- Project line list;
- Critical line list (for piping system stress analysis);
- Supports standard;
- Special supports drawings;
- Piping isometrics;
- Piping isometric list;
- Instrumentation typical details for process, electrical, pneumatic and hydraulic;
- Pneumatic/Hydraulic lay out plan;
- Instrumentation lay out plan;
- Gas dispersion analysis report;
- Dimensional drawings for instruments, actuators, involucres issued by vendors;
- All electrical equipment specifications/data sheets for all equipment, approved for design by vendors;
- Lighting posts plants;
- Power and grounding plant (cable trays);
- All telecom equipment specifications/data sheets for all equipment, approved for design by vendors;
- Telecom study to define the antenna location in order to avoid interferences;
- Hook up (process, electrical, pneumatic and hydraulic) to be detailed for all instruments.

2.6.3 In 3D Model, the following items shall be modelled as a pre-requisite for 90% Design Review Session in addition to 30% and 60% requirements:

General

- Ensure that all the piping, instrumentation and equipment with status approved and meet process and ergonomics requirements;
- All voids on structural objects for piping, trays and other objects passing through;
- All platforms, stairs, operation and maintenance accesses, bases, supports and other structural objects, even if they belong to equipment skids;
- Deck penetrations for pipe, tray, tubing and cables;

	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 15 of 24	
	TITLE:	DESIGN REVIEW REQUIREMENTS	
		INTERNAL	
		ESUP	

- Final equipment access, maintenance and operation volumes. All handling routes, including hoisting with removable handling equipment, i.e., interference volumes for the removable handling equipment (chain hoists, trolleys, etc., including straps and slings), and clash analysis of the handling routes with other components of the UNIT;
- Package modules equipment;
- Interfaces between modules, main deck, pipe rack and riser balcony;
- Utility stations and welding receptacles;
- All attributes filled.

Architecture

- Miscellaneous, nautical equipment, framed plans, bulletin boards, key keeper, decorative pictures and modelled equipment through the designs of the subcontractors.

Mechanical Equipment

- All equipment inside SELLER packages modelled with its attributes;
- Final mechanical handling.

HVAC


- All HVAC instruments;
- Damper Panels / hand valves;
- Basic utilities like water and drain location.

Piping

- All topside and hull piping modelled on engineering diagram of process, marine systems, safety and HVAC;
- All pipe supports located, vent and drain support reinforcements;
- All piping modelled with supports, vents, drains and instrumentation, including all SDV's, XV's, HV's, inline valves, control valves or any inline instruments and any other valve, accessories, fittings, special items, gaskets, expansion joints, dresser couplings, spring hanger supports, spectacles, blankets, spacers and thermal insulation;
- Interfaces between modules, main deck, pipe rack and riser balcony.

Electrical and Instrumentation

- All electrical and instrumentation cable trays and its supports, penetrations and accessories, including the ones located inside SELLER package modules;
- Main and secondary cable trays modelled;
- All lighting posts, including supports and accessories;
- Local control stations with stand and local control panels;
- All offline instruments;
- All offline and inline instruments with accessibility. In particular, those instruments that require local access;
- E&I Stands, speakers, welding receptacles lights and MCT;
- Instrument stands and supports;
- PA systems;
- All ESD push-buttons, including its supports;
- Final dimensions for instruments, actuators, involucres in accordance with vendor documents;
- All Electrical Equipment modelled according to Vendor Documentation information.

	TECHNICAL SPECIFICATION	Nº I-ET-3000.00-0000-940-P4X-003	REV. G
	AREA:	SHEET: 16 of 24	
	TITLE:	DESIGN REVIEW REQUIREMENTS	
		INTERNAL	
		ESUP	

Telecom

- All telecom cable trays and its supports, penetrations and accessories, including the ones located inside SELLER package modules;
- All PAGA system;
- All antenna location in antenna deck and telecom tower.

Constructability

- Location of temporary facilities, tools and equipment for construction for Architecture, Piping, Electrical, Instrumentation and Telecom disciplines.

Safety

- Emergency access/escape routes including stairs and ladders for all areas and modules, muster station location/space/equipment, embarkation station location/space/equipment;
- All fire and gas detectors in their final locations, fire detection cones, gas detector cylinders (open path), after the gas dispersion analysis;
- Safety equipment, including safety showers, eye wash and hose reels;
- Fire monitors, hydrants or water/foam equipment, deluge valve (ADV) and its local panels, firefighting lockers, fireman's outfit lockers, emergency showers and eye wash, breathing apparatus and others;
- Passive fire protection;
- Check if safety material and lifesaving material are in compliance with 3D model;
- Final check of safety plan and fire control plan;
- Final check of legislation compliance.

2.6.4 SELLER shall apply 90% Design Review Check List (APPENDIX A) in 3D model and submit it to PETROBRAS before this event. A complete final report of Design Review Sessions shall be issued after the event.

APPENDIX A – DESIGN REVIEW CHECK LIST

APPENDIX A: DESIGN REVIEW CHECK LIST					
Design Review 30%					
Item	Discipline	Description	Yes	No	Remarks
1	General	Buildings – examples: local equipment room, laboratory or storage containers to overall dimensions. Associated emergency access and escape requirements.			
2	General	Modules outline, primary steel location and Top of Steel (TOS) clearly defined.			
3	General	Volumes – The following volumes shall be modelled using volumes objects or primitive geometries and define its purposes using one of the code list options below. When defining the purpose attribute for equipment operation/maintenance volumes, SELLER shall take into account the space required for use of special devices and tools. a) Equipment operation; b) Escape route; c) Handling route; d) Hazardous area; e) Closed room; f) Door opening; g) Helideck operation free span; h) Draught; i) Lay down area; j) Ship supplies; k) Waste removal via crane (typically on main deck); l) Vendor or third-party module limits and access.			
4	General	Rack layout and size as determined from module layout and line route study.			
5	Architecture	All compartments including staircases, for all decks, including the following items: a) Coamings; b) Thermo-acoustic insulation; c) Passive protection on bulkheads, decks and roofs; d) Lining and partitions panels; e) Subfloor; f) Floor covering; g) Ceiling lining; h) Framed internal and external doors; i) Windows and boxes.			
6	Safety	Emergency access/escape routes including stairs and ladders for all areas and modules, muster station location/space/equipment, embarkation station location/space/equipment.			
7	Safety	Fire monitors, hydrants or water/foam equipment, deluge valve (ADV) and its local panels, firefighting lockers, fireman's outfit lockers, emergency showers and eye wash, breathing apparatus housing and others.			
8	Safety	Safety davits, lifeboats, life rafts, rescue boats, stretcher locations and proposed travel routes and other lifesaving equipment.			
9	Safety	Special safety requirements, examples such as escape tunnels, water curtains for escape routes, firewalls, blast walls and others.			
10	Safety	Firewater pump locations, foam pumps locations, fire water and foam main headers/ring main location, fire water and foam main rings block valve arrangement.			
11	Safety	Fire water and foam distribution to consumers (branches and block valves).			
12	Safety	Hazardous area classification volumes.			
13	Safety	Equipment and instruments installed at hazardous area.			
14	Mechanical Equipment	All major process equipment described below with primary nozzles, orientations, access requirements and auxiliary systems volumes: a) Pumps; b) Compression units; c) Filters; d) Heat exchangers; e) Tanks; f) Flares; g) Package units; h) Pressure vessels; i) Cranes; j) Offloading system;			

DESIGN REVIEW REQUIREMENTS

		k) Pull in winch; l) Cylinder battery; m) Turbo generators; n) Motor generators; o) Hydraulic Power Units (HPU); p) Electrostatic dehydrators; q) Waste Heat Recovery Units (WHRU); r) Mooring system; s) Vacuum deaerator units.			
15	Mechanical Equipment	Tube and plate removal spaces and handling obstructions for coolers/heaters.			
16	Mechanical Equipment	Packaged units volumes.			
17	Mechanical Equipment	Saddles and skirts for major pressure vessels positioned.			
18	Mechanical Equipment	Crane locations, radius and limit of crane capabilities.			
19	Mechanical Equipment	Mechanical handling obstructions including crane and monorail requirements and accessibility. Items with 3 Tons or above or any special size or restricted equipment modelled.			
20	Mechanical Equipment	Obstruction volumes required for safety, operations, maintenance and construction.			
21	Mechanical Equipment	Laydown areas, chemical injection laydown.			
22	Mechanical Equipment	Equipment's access platforms for maintenance.			
23	Mechanical Equipment	Major equipment of hydraulic power unit, chemical injection, auxiliary winch and bottle rack volumes.			
24	Mechanical Equipment	Diving equipment and access to cages, if applicable.			
25	Mechanical Equipment	Drain tank and pumps.			
26	HVAC	All HVAC systems primary equipment (with dimensions based on cooling/heating calculated capacities) with the following: attributes: tag, electrical power, weight and capacity.			
27	HVAC	Primary duct network (Initial sections).			
28	HVAC	Equipment bases (dimensions and location).			
29	HVAC	Spaces for handling, operation and equipment maintenance.			
30	HVAC	Air intakes and outlets position.			
31	HVAC	Basic utilities like water and drain location.			
32	Piping	3D piping catalogue according to issued piping spec. the 3D piping catalogue shall contain all pipelines, pipe components, accessories, blinds and blanks, spacers, inline instruments, manual valves (including operators) and instrumented valves (including actuators) that will be used in the project, including their area for handling handwheels and levers.			
33	Piping	At least 30% of topside and hull piping modelled on engineering diagram of process, marine systems, safety and HVAC, giving priority to: a) Lines NPS 6 or larger; b) Lines that require piping system stress analysis; c) Routed lines that define equipment arrangement, nozzle position and tie-in points.			
34	Piping	I-Tubes and riser designations clearly defined.			
35	Structure	Hull surface geometry.			
36	Structure	Structural tank volumes and inner hull compartments.			
37	Structure	All primary structures and floor plates.			
38	Structure	All ladders in between floors.			
39	Structure	Module lifting pad eyes and obstruction for lifting (preliminary).			
40	Structure	Primary removal monorails and their obstruction volumes (preliminary).			
41	Structure	Module supports and bracings with obstruction along lift volumes.			
42	Structure	Main equipment supports (preliminary).			
43	Structure	Pipe rack frame for either integral module racks or independent rack (preliminary) - elevations set by piping.			
44	Structure	Primary escape routes stairs and ladders (preliminary).			
45	Electrical and Instrumentation	Local control panels.			
46	Electrical and Instrumentation	Automation and electrical panels located inside central control room and panel room.			
47	Electrical and Instrumentation	Battery banks and transformers.			

AREA:

SHEET: 19 of 24

TITLE:

DESIGN REVIEW REQUIREMENTS

INTERNAL

ESUP

48	Electrical and Instrumentation	Electric motors with nominal voltage above 400V.			
49	Electrical and Instrumentation	Main cable tray routings, obstruction volumes only.			
50	Electrical and Instrumentation	Secondary cable tray routings (between local control panels and instruments/equipment), obstruction volumes only for instruments located in modelled equipment and lines.			
51	Electrical and Instrumentation	All piping valves, instrumentation valves SDV's, control valve stations, meter runs or any inline instrument in modelled lines.			
52	Electrical and Instrumentation	All nozzles or taps for instruments installations in modelled lines and equipment.			
53	Electrical and Instrumentation	Hydraulic racks.			
54	Electrical and Instrumentation	Main junction box racks obstruction volumes only.			
55	Electrical and Instrumentation	Maintenance volumes for batteries, rectifiers, battery-chargers, soft-starters, inverters, control panels, AC and DC switchboards, UPSs, switchgears and MCCs, power transformers, lighting transformers and grounding resistors.			
56	Electrical and Instrumentation	Fiscal metering.			
57	Electrical and Instrumentation	Access, emergency and maintenance paths for valves, inline instruments, meter runs, (straight run requirements) junction boxes, etc.			
58	Telecom	Telecom racks, radio consoles located in radio room and CCR – Operator Ambiance.			
59	Telecom	Main telecom cable tray route in EIT TRUNK.			
60	Telecom	Secondary cable tray routings (between telecom racks and telecom devices).			
61	Telecom	Telecom tower.			
62	Telecom	Telecom electrical panels.			
63	Constructability	Location of temporary facilities, tools and equipment for construction for Structure discipline.			

APPENDIX A: DESIGN REVIEW CHECK LIST
Design Review 60%

Item	Discipline	Description	Yes	No	Remarks
1	General	Review 30% Design Review comment resolutions.			
2	General	Buildings – examples: local equipment room, laboratory or storage containers to confirmed dimensions. Associated emergency access and escape requirements, any electrical or HVAC requirements.			
3	General	Package modules outline.			
4	General	Volumes - The following volumes shall be modelled using volumes objects or primitive geometries and define its purposes using one of the code list options below: a) Gas exhaust; b) Flame detection cones; c) Sprinkler coverage; d) Meeting points; e) Vendor or third-party module limits and access (requirements confirmed and approved). f) Cylinder between Tx and Rx of open path gas detectors.			
5	General	Maintenance/installation/design obstructions to approved data – all disciplines.			
6	General	All tagged equipment modelled, and General Arrangement checked and issued for construction.			
7	General	All accesses and operation sites with ergonomic evaluation.			
8	General	All attributes filled in 3D model elements required to make this event, the 60% Design Review.			
9	Architecture	Equipment basis (for galley, workshops, freezer room, etc.).			
10	Architecture	Ceiling accessories (inside compartment), ceiling, lining and partitions assembly's accessories, lining and partitions accessories (hydrants, electrical panels, railing, etc.).			
11	Architecture	General furniture of each compartment and equipment (galley, laundry, laboratory, gym, hospital, etc.).			
12	Safety	Emergency access/escape routes including stairs and ladders for all areas and modules, muster station location/space/equipment, embarkation station location/space/equipment.			
13	Safety	All topside and hull piping used for firefighting systems including sprinklers and all its components as pipelines, pipe components, accessories, blinds and blanks, spacers, inline instruments, manual valves (including operators) and instrumented valves (including actuators).			
14	Safety	Fire monitors, hydrants or water/foam equipment, deluge valve (ADV) and its local panels, firefighting lockers, fireman's outfit lockers, emergency showers and eye wash, breathing apparatus and others.			
15	Safety	Safety davits, lifeboats, life rafts, rescue boats, stretcher locations and proposed travel routes and other lifesaving equipment.			
16	Safety	Special safety requirements, examples such as escape tunnels, water curtains for escape routes, firewalls, blast walls and others.			
17	Safety	Firewater pumps.			
18	Safety	Equipment and instruments installed at hazardous area.			
19	Safety	All CO2 flooding systems, including local ones and general layout. Rooms with CO2 firefighting flooding systems and firefighting pump CO2 skids shall have at least two accesses.			
20	Safety	Water mist system location and arrangement.			
21	Safety	Safe location of air intakes and outlets, vents, machinery exhaust gases.			
22	Safety	Dropped object protection.			
23	Safety	Fire proofing graphically modelled.			
24	Mechanical Equipment	All process equipment with its nozzles, orientations, access requirements and auxiliary systems volumes.			
25	Mechanical Equipment	Access paths to equipment for operation and maintenance including head height.			
26	Mechanical Equipment	Mechanical handling obstructions including crane and monorail requirements and accessibility. All removable material handling equipment modelled.			
27	Mechanical Equipment	Containment areas local to vessels, chemicals storage, etc. detailed model.			
28	Mechanical Equipment	Tube and plate removal volumes and handling obstructions for coolers/heaters.			
29	Mechanical Equipment	Secondary access paths for equipment, including ladders and platforms.			
30	Mechanical Equipment	Drip trays for equipment.			

AREA:

SHEET: 21 of 24

TITLE:

DESIGN REVIEW REQUIREMENTS

INTERNAL

ESUP

31	Mechanical Equipment	Coamings whenever required by the equipment.			
32	HVAC	All HVAC equipment.			
33	HVAC	All HVAC ducts and its supports with final dimensions, based on approved calculation memories, including thermal insulation.			
34	HVAC	Air distribution elements (grills, diffusers, louvers, dampers etc.) with dimensions and capacities (based on Vendor Data).			
35	HVAC	Fire and gas tight dampers and penetration pieces designed.			
36	HVAC	Water tight valves designed.			
37	HVAC	Basic utilities like water and drain location.			
38	Piping	At least 60% of topside and hull piping modelled on engineering diagram of process, marine systems, safety and HVAC, giving priority to: a) Lines NPS 6 or larger; b) Lines that require piping system stress analysis; c) Routed lines that define equipment arrangement, nozzle position and tie-in points.			
39	Piping	Piping scope represented on 60% design review must be fully modelled including all supports, vents, drains and instrumentation, including all SDV's, XV's, HV's, inline valves, control valves or any inline instruments and any other valve, accessories, fittings, special items, gaskets, expansion joints, dresser couplings, spring hanger supports, spectacles, blankets, spacers and thermal insulation. Valves shall be identified according to their ergonomic classification with the use of different colors.			
40	Piping	Flare system layout and determination of PSV platforms/locations.			
41	Piping	Major/critical pipe supports located (piping lines NPS 6 or larger or that require piping system stress analysis).			
42	Piping	Any under production deck drains, overboard lines or deluge systems to be modelled with supports. Typically, supports need to be issued early for installation to primary steel pancake prior to painting.			
43	Piping	All special items to be modelled except hose connections.			
44	Piping	Final drain pit and box locations.			
45	Piping	Access/maintenance paths for valves, inline instruments, meter runs, etc.			
46	Piping	Interfaces between modules, main deck, pipe rack and riser balcony.			
47	Structure	All primary and secondary module structures.			
48	Structure	Upper and Lower riser balcony and manifold area primary steel (fully detailed).			
49	Structure	Hard pipes (fully detailed).			
50	Structure	Pipe rack and Riser pipe rack (fully detailed).			
51	Structure	Pull-in (fully detailed).			
52	Structure	Diving station (fully detailed).			
53	Structure	Mooring balcony (fully detailed).			
54	Structure	Fairleads (fully detailed).			
55	Structure	Vent post (fully detailed).			
56	Structure	Well stimulation support (fully detailed).			
57	Structure	Helideck (fully detailed).			
58	Structure	Flare base (fully detailed).			
59	Structure	Rescue boats platform (fully detailed).			
60	Structure	Caisson (fully detailed).			
61	Structure	Module lifting pad eyes and obstruction for lifting.			
62	Structure	Primary monorails and their obstruction volumes.			
63	Structure	Primary escape routes stairs and ladders (fully detailed).			
64	Structure	Pipe rack frame for either integral module racks or independent rack (fully detailed).			
65	Structure	Module deck plate with penetrations (fully detailed).			
66	Structure	Flare tower structure and main deck levels framing (fully detailed).			
67	Structure	Handrails and coamings, including deck coamings not supplied with equipment within the structure discipline hierarchy.			
68	Structure	Module installation aids, lifting arrangements or safety protection i.e., bumper bars, guides (fully detailed).			
69	Structure	Firewalls or blast protection on topsides modules (fully detailed).			
70	Structure	All piping special supports.			
71	Structure	All structural supports.			
72	Structure	All equipment foundation.			
73	Structure	Structural tanks, inner hull compartments and draught.			

AREA:

SHEET: 22 of 24

TITLE:

DESIGN REVIEW REQUIREMENTS

INTERNAL

ESUP

74	Structure	Identify in the 3D model, highlighting in different colors and creating viewpoints for all temporary structures, removable structures and "hook up" structures of the modules.			
75	Electrical and Instrumentation	All electrical and instrumentation panels with identification and their accessories, including supports and doors with obstruction volumes and according to Vendor Documentation.			
76	Electrical and Instrumentation	All electrical equipment and its accessories (fully detailed).			
77	Electrical and Instrumentation	Main cable tray paths between automation and electrical panels.			
78	Electrical and Instrumentation	Main ladders/trays with a minimum of 300mm free space between the top of one ladder edge to the bottom of the next ladder edge, and from top ladder edge to roof, according to IEC 61892-6 to facilitate cable pulling and cleating/strapping.			
79	Electrical and Instrumentation	Secondary cable tray paths between local control panels and equipment/instruments, including main passageways/penetrations between different areas and/or levels.			
80	Electrical and Instrumentation	All cable tray paths for vendor packages.			
81	Electrical and Instrumentation	All supports for the modelled electrical and instrumentation cable tray paths.			
82	Electrical and Instrumentation	60% of lighting posts, including supports and accessories.			
83	Electrical and Instrumentation	All junction boxes including supports and accessories with obstruction volumes, and door swings modelled (fully detailed).			
84	Electrical and Instrumentation	Access, emergency and maintenance paths for junction boxes.			
85	Electrical and Instrumentation	Hydraulic racks to be detailed with supports and doors with obstruction volumes.			
86	Electrical and Instrumentation	All air distribution manifolds shall be located in their final position detailed with supports.			
87	Electrical and Instrumentation	All electrical, hydraulic and pneumatic cable tray paths for all instruments located on modelled piping and equipment.			
88	Electrical and Instrumentation	Access, emergency and maintenance paths for valves, navigation lights, inline instruments, meter runs, junction boxes etc.			
89	Electrical and Instrumentation	All inline instruments (flowmeters), pressure-safety valves, instrumented valves (SDVs, BDVs, XVs, control valves) and actuators located on modelled piping. These objects shall be modelled within the piping discipline hierarchy.			
90	Electrical and Instrumentation	For all offline instruments, radar level transmitters, fire and gas detectors: 3D modeling shall consider a cylinder between the bottom of the instrument to the bottom of the tank/vessel in order to avoid any interference of piping or structures in the level measurement.			
91	Telecom	All telecom panels with identification and their accessories, including supports and doors with obstruction and operation volumes.			
92	Telecom	All telecom equipment of all systems and its accessories (fully detailed), except for PAGA system.			
93	Telecom	60% of loudspeakers from PAGA system.			
94	Telecom	All antennas in antenna deck and in telecom tower.			
95	Telecom	Main cable tray paths between telecom panels and antenna deck and telecom tower.			
96	Telecom	All junction boxes including supports and accessories with obstruction volumes, and door swings modelled (fully detailed).			
97	Telecom	Secondary cable tray paths between telecom equipment and devices like antennas and junction boxes.			
98	Telecom	All cable tray paths for vendor packages.			
99	Constructability	Location of temporary facilities, tools and equipment for construction for Mechanical, Equipment, Safety and HVAC disciplines.			

APPENDIX A: DESIGN REVIEW CHECK LIST
Design Review 90%

Item	Discipline	Description	Yes	No	Remarks
1	General	Ensure that all the piping, instrumentation and equipment with status approved and meet process and ergonomics requirements.			
2	General	All voids on structural objects for piping, trays and other objects passing through.			
3	General	All platforms, stairs, operation and maintenance accesses, bases, supports and other structural objects, even if they belong to equipment skids.			
4	General	Deck penetrations for pipe, tray, tubing and cables.			
5	General	Final equipment access, maintenance and operation volumes. All handling routes, including hoisting with removable handling equipment, i.e., interference volumes for the removable handling equipment (chain hoists, trolleys, etc., including straps and slings), and clash analysis of the handling routes with other components of the UNIT.			
6	General	Package modules equipment.			
7	General	Interfaces between modules, main deck, pipe rack and riser balcony.			
8	General	Utility stations and welding receptacles.			
9	General	All attributes filled.			
10	Architecture	Miscellaneous, nautical equipment, framed plans, bulletin boards, key keeper, decorative pictures and modelled equipment through the designs of the subcontractors.			
11	Mechanical Equipment	All equipment inside SELLER packages modelled with its attributes.			
12	Mechanical Equipment	Final mechanical handling.			
13	HVAC	All HVAC instruments.			
14	HVAC	Damper panels / hand valves.			
15	HVAC	Basic utilities like water and drain location.			
16	Piping	All topside and hull piping modelled on engineering diagram of process, marine systems, safety and HVAC.			
17	Piping	All pipe supports located, vent and drain support reinforcements.			
18	Piping	All piping modelled with supports, vents, drains and instrumentation, including all SDV's, XV's, HV's, inline valves, control valves or any inline instruments and any other valve, accessories, fittings, special items, gaskets, expansion joints, dresser couplings, spring hanger supports, spectacles, blankets, spacers and thermal insulation.			
19	Piping	Interfaces between modules, main deck, pipe rack and riser balcony.			
20	Electrical and Instrumentation	All electrical and instrumentation cable trays and its supports, penetrations and accessories, including the ones located inside SELLER package modules.			
21	Electrical and Instrumentation	Main and secondary cable trays modelled.			
22	Electrical and Instrumentation	All lighting posts, including supports and accessories.			
23	Electrical and Instrumentation	Local control stations with stand and local control panels.			
24	Electrical and Instrumentation	All offline instruments.			
25	Electrical and Instrumentation	All offline and inline instruments with accessibility. In particular, those instruments that require local access.			
26	Electrical and Instrumentation	E&I Stands, speakers, welding receptacles lights and MCT.			
27	Electrical and Instrumentation	Instrument stands and supports.			
28	Electrical and Instrumentation	PA systems.			
29	Electrical and Instrumentation	All ESD push-buttons, including its supports.			
30	Electrical and Instrumentation	Final dimensions for instruments, actuators, involucre in accordance with vendor documents.			
31	Electrical and Instrumentation	All Electrical Equipment modelled according to Vendor Documentation information.			

**TECHNICAL SPECIFICATION**

Nº I-ET-3000.00-0000-940-P4X-003

REV. G

AREA:

SHEET: 24 of 24

TITLE:

DESIGN REVIEW REQUIREMENTS

INTERNAL

ESUP

32	Telecom	All telecom cable trays and its supports, penetrations and accessories, including the ones located inside SELLER package modules.			
33	Telecom	All PAGA system.			
34	Telecom	All antenna location in antenna deck and telecom tower.			
35	Constructability	Location of temporary facilities, tools and equipment for construction for Architecture, Piping, Electrical, Instrumentation and Telecom disciplines.			
36	Safety	Emergency access/escape routes including stairs and ladders for all areas and modules, muster station location/space/equipment, embarkation station location/space/equipment.			
37	Safety	All fire and gas detectors in their final locations, fire detection cones, gas detector cylinders (open path), after the gas dispersion analysis.			
38	Safety	Safety equipment, including safety showers, eye wash and hose reels.			
39	Safety	Fire monitors, hydrants or water/foam equipment, deluge valve (ADV) and its local panels, firefighting lockers, fireman's outfit lockers, emergency showers and eye wash, breathing apparatus and others.			
40	Safety	Passive fire protection.			
41	Safety	Check if safety material and lifesaving material are in compliance with 3D model.			
42	Safety	Final check of safety plan and fire control plan.			
43	Safety	Final check of legislation compliance.			