**EXHIBIT VIII**

**DIRECTIVES FOR COMMISSIONING PROCESS**

**FPSO PETROBRAS XX (P-XX)**

**SUMMARY**

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# OBJECTIVES

* 1. To define the scope of commissioning for the object of this AGREEMENT.
  2. To define the requirements to be followed and the results to be achieved by the SELLER and its SUBCONTRACTORs in the execution of commissioning.

## General

* + 1. The target of the commissioning process, as described in this exhibit, shall consider that the systems of the UNIT shall reach its full operational condition prior to sail away, as much as technically possible, and reach full operation condition at OFFSHORE phase.
    2. SELLER shall transmit convey to its suppliers, SUBCONTRACTORs and engineering partners, all requirements stablished in these Directives, as well as enforce full compliance with it, being responsible for its accomplishment.
    3. The UNIT shall be commissioned, tested, started-up and transferred to BUYER partially and sequentially. For this purpose, SELLER shall consolidate the operational system list and to elaborate subsystem list and the Precedence Network, indicating the startup sequence that shall be followed and incorporated at the overall schedule. In order to have all complete information prior to system/subsystem transfer, all design documents, lists, spread sheets, controls shall contain subsystem number.
    4. BUYER, at its discretion, will witness tests on the sites, inspect materials and equipment and follow up any other phase of SELLER scope of supply.
    5. SELLER shall perform the commissioning considering the stages of Planning, Preparation, Execution and Transfer of the Operating Systems. These activities shall be fully integrated with Procurement, Engineering Design, Construction and Assembly, of the unit.
    6. All system performance tests shall consider the situation as close to the operating condition as possible, regarding to the fluids and design parameters. The performance tests, plant simulations included, shall be planned and prepared by the SELLER, who shall provide all the facilities, Vendor’s support and temporary supplies necessary for its full execution. SELLER shall submit these procedures for BUYER approval.
    7. Regarding the commissioning documents delivered as mark-up P&ID (ex: I-DE-3010.2D-1210-970-P4X-001) it is important to highlight that the SELLER shall always use the process information in the SPPID database as the commissioning pdf documents might be outdated. The Commissioning P&ID has the sole function to outline the boundaries between Subsystems.

# COMMISSIONING PROCESS TERMS AND DEFINITIONS

Linha do tempo

Descrição gerada automaticamente

Figure 1 – Commissioning Process flow per System

**Area/Compartment Completion:** Check list with items related to design documents and field inspection that defines the area readiness which complies with, but not limited to:

* Painting.
* Insulation.
* Fire protection materials (Passive protection, MCT’s-Multi Cable Transit, etc.).
* Furnishings.
* Maintenance and operations facilities.
* Outfitting installations.
* Arrangement of lighting fixtures.
* Ventilation and Air Conditioning systems.
* Clashes.
* Drainage system.
* Safety plan devices and arrangements.
* Equipment preservation.
* Fire & Gas detection system.
* Fire & Gas fighting system.
* **Cause and Effects Matrix:** List of all interlock tests, divided by Subsystem.

**Certification Test:** Any test applied to a commissionable item or control loop during the mechanical completion phase to assure the assembly quality.

**Commissionable Item:** Any tagged instrument, equipment, accessory, piping test pack, area, control loop and automation function that can change any process or that will be subjected to a governmental or Classification society inspection/requirement.

**Commissioning (Process):** Structured set of knowledge, practices, procedures and skills applicable in an integrated way to an UNIT, aiming to make it operational within the desired performance requirements, with the main objective of certify the system operability according the design conditions, its trustworthiness and the traceability of the information and to permit the transference of the UNIT (systems) in an organized and safe way, the commissioning Process shall take into account at least the following events:

* FAT (Factory Acceptance Test)
* Preservation Plan and Activities
* Mechanical Completion Phase
* Area/Compartment Completion
* Mechanical Completion Certificate (MCC)
* Pre-commissioning
* Performance Test Certificate 1 (TAP-1)
* Subsystem Acceptance and Transfer Term 1 (TTAS-1)
* Operation Specialized Support Phase
* Performance Test Certificate 2 (TAP-2)
* Subsystem Acceptance and Transfer Term 2 (TTAS-2)

**Commissioning Manual:** Set of documents establishing how the commissioning process should be planned, organized, coordinated, executed and controlled in a project. Once prepared by the SELLER and accepted, these documents will be the main rule for the commissioning process and should be kept up to date regarding the conditions of the job to be performed.

**Commissioning and Integration Tool (FIC – Ferramenta de Integração e Comissionamento):** BUYER Management Software for the Commissioning activities comprising a Database able to generate management and control reports and issuing of Item Check List (ICS or FVI) and Control Loop Check List (FVM). BUYER is able to provide both software licenses and training to the SELLER. FIC will also schedule and record all preservation activities performed by SELLER and the actual preservation status of all equipment.

**Commissioning Spare parts:** List of parts that will be required for the pre-commissioning, commissioning, start-up and endurance of this system/subsystem.

**FAT – Factory Acceptance Test:** Set of functional and performance tests to be executed in any equipment, electrical, instrumentation and telecom panels or any other commissionable item carried out on the vendor factory or in specialized test facilities, in order to demonstrate its compliance with the project specifications and allow its release to shipyard.

**Flare out:** Term used in reference to the moment during normal operation that gas production is being injected in the wells and one Vapor Recovery Unit is operating continuously.

**Functional Test (replaces “hot test”):** Set of tests in a SSOP or SOP to be executed during the Pre-operation & Start-up phase, beginning after the issue of Mechanical Completion Certificate and required to start applicable TAPs.

**Hibernation:** Activities to be executed in a commissioning item or UNIT due the decision of delay or interruption of its operation for a long term, with the goals of maintain the preservation conditions by means of use of preservation and corrosion control methods, avoid of contaminations, hazard reactions and damages.

**Item Check Sheet (ICS or FVI – Folha de Verificação de Item):** A form applicable for all Unit commissionable items where all commissioning activities are recorded.

**Instrumentation Loop:** All of the hardware and software necessary to work together for the measurement, communication, and/or control of a process variable.

**Loop Check Sheet (LCS or FVM – Folha de Verificação de Malha):** A form applicable for all commissionable loops used to manager mechanical completion and functional tests, where commissioning activities are recorded.

**Mechanical Completion Phase:** Set of construction activities and **Certification Tests** necessary to approve system/subsystem completion in accordance with drawings, specifications, instructions, applicable codes and regulations.

**Mechanical Completion Certificate (MCC):** Document issued when Subsystem Mechanical Completion phase is completed.

**Operation Specialized Support:** Period required to ensure the continuous operation of the UNIT, when SELLER and system/equipment vendors shall support for troubleshooting, clarifications, adjustments and/or correction of any problems arising from the beginning of the equipment operation and subsequent to:

* System/subsystem TTAS-1 signature and before TTAS-2 signature;
* UNIT handover;
* Continuous offshore operation with process fluid and achievement of performance test parameters according to approved procedure.

**Operational System (SOP):** Integrated set of equipment, control loops, instruments, valves, piping, supports and other properly associated facilities, capable to perform a function or support to process whose operation produces or maintains a situation, process, utility and operational facility in a safe condition.

**Operational Subsystem (SSOP):** Part of an operating system capable of performing a productive or process support function, the operation of which produces or maintains a specific operating condition, process, utility, or facility in a safe condition.

**Preservation Plan:** Consists of a document that lists all preservation activities and related periodicity per commissionable item and presents all resources (material and workforce) that will be provided by SELLER to execute the plan.

**Pre-Commissioning*:*** Set of activities performed on all commissionable items of the system in order to prepare it to **Performance Tests**.

**Preservation:** Set of activities executed on commissionable items of an operational system in order to keep them at same condition that were received at field until the handover of the operational system.

**Precedence Network of Systems and Subsystems:** Logic diagram that represents the start-up sequence of operational systems / subsystems of the Unit, according to its physical and functional dependencies network.

**Performance Acceptance Test (TAP):** Test in an Operational System/Subsystem in which its functionalities are tested and its performance is measured and compared to the design parameters as closest as possible to real operational conditions. All performance tests shall follow the procedures previously issued by the SELLER and approved by BUYER.

* **Performance Acceptance Test - Phase 1 (TAP 1):** Performance Acceptance Test executed at shipyard. TAP-1 offshore will only be accepted if it is technically not possible to be carried out at the shipyard and has to be agreed with BUYER. If it is not technically feasible to perform the tests under project conditions, it shall be performed with safe fluids and with parameters as close as possible to the operational condition.
* **Performance Acceptance Test – Phase 2 (TAP 2):** Long-term performance acceptance test (Endurance Test) to ensure that the system is reliable and performs as specified in the design. This test shall be executed in actual design conditions and shall monitor the main parameters and long-term reliability of such systems during a known interval of time.

**Pre-Operation & Start-Up:** Set of field activities executed on Commissionable item, subsystems and systems with the objective to take them from the Mechanical Completion to full operation. After the pre-commissioning phase activities and before full operation, some test shall be performed with the equipment under real condition such as fluids and power. The main event in this phase is the TAP (Performance Acceptance Tests) of the systems/subsystems. Pre-Operation & Start-up phase is subdivided in pre-commissioning, TAP-1 and TAP-2.

**Process start up:** Start-Up is the activities carried out to commence the flow of hydrocarbons when all commissioning is complete. Start-up is complete when the facilities have been proven and operate in accordance with the design.

**Punch Item Impeditive (Type A)**: Nonconformity that impact the safe, compliance with Legal or standards regulations and reasonable sequence of commissioning activities, acceptance test and system start-up or interferes with operability and environment. Every Punch Item Impeditive shall be classified as impeditive for MCC, TAP-1, or TTAS-1.

**Punch Item Non-impeditive (Type B):** Nonconformity that does not impact the safe and reasonable sequence of commissioning activities, acceptance test and system start-up or does not interfere with operability and environment. Every Punch Item Impeditive shall be classified as impeditive for MCC, TAP-1, or TTAS-1.

**Ready to Operate:** Milestone which indicates that an equipment, system or operational subsystem meets the conditions and has reached the necessary requirements to operate continuously. Prerequisites to attest this condition are TAP-1 approved, TTAS-1 signed, all pipelines shall be pressurized with process fluid, and no impeditive punch item to execute TAP-2.

**SubSystem Acceptance Transfer Term (TTAS – Termo de Transferência e Aceitação de Subsistema):** Document issued by SELLER and approved by BUYER attesting full functionality of an Operational Subsystem (SSOP). The document shall be divided into two steps, TTAS-1 and TTAS-2.

* **TTAS-1 –** Term issued upon successful accomplishment of TAP-1 and delivery of all documentation updated, including operation and maintenance manuals, vendor and Commissioning data-books, special tools, software licenses and BUYER’s operator and maintenance team training. At offshore phase, TTAS-1 formalizes the provisional transference of the operation and planned maintenance of that specific System/Subsystem from SELLER to BUYER. For TTAS-1 signed at onshore phase, it will be only transferred to BUYER after UNIT Handover. No type A punch list item shall remain for the issuance of TTAS-1.
* **TTAS-2** – It formalizes the definitive transference of the **operation and maintenance** **(planned and corrective)** of the Systems/Subsystems Term issued upon: Successful accomplishment of TAP-2, when applicable. Successful accomplishment of Regulatory Bodies requirements, when applicable. No existing punch list items are acceptable.

**System/Subsystem Folder:** Operational System/Subsystem’s collection of commissioning documents, to be used during all Commissioning Phase, includes all necessary documentation, lists, information to allow inspections, tests, checks, during Pre-Commissioning and Commissioning activities. These folders are deliverable products of the Commissioning and shall be prepared by the SELLER, approved by BUYER, and transferred together with the Subsystem (SSOP) to BUYER.

# REFERENCE DOCUMENTS LIST

|  |  |  |
| --- | --- | --- |
| 3.1 | I-ET-3010.00-1200-200-P4X-115 | REQUIREMENTS FOR PIPING, FABRICATION AND COMMISSIONING |
| 3.2 | I-ET-3010.00-1200-200-P4X-116 | REQUIREMENTS FOR BOLTED JOINTS ASSEMBLY AND MANAGEMENT |
| 3.3 | I-ET-3010.00-5140-700-P4X-004 | POWER MANAGEMENT SYSTEM (PMS) FOR OFFSHORE UNITS |
| 3.4 | I-ET-3010.2D-1200-919-P4X-001 | REQUIREMENTS FOR VENDORS TRAINING CONTENT AND PROGRAM |
| 3.5 | I-ET-3010.00-1225-323-P4X-001 | TECHNICAL SPECIFICATION FOR VAPOR RECOVERY UNIT |
| 3.6 | I-ET-3010.00-1200-321-P4X-001 | TECHNICAL SPECIFICATION FOR CENTRIFUGAL COMPRESSOR DRIVEN BY ELECTRIC MOTOR |
| 3.7 | I-ET-3010.00-1200-970-P4X-005 | SAFETY REQUIREMENTS FOR ONSHORE COMMISSIONING |
| 3.8 | I-RL-3010.2D-1200-940-P4X-001 | GENERAL SPECIFICATION FOR AVAILABLE UTILITIES |
| 3.9 | I-ET-3010.2D-5524-941-P54-001 | INFRAESTRUCTURE FOR PRM SYSTEM ON A SPREAD MOORING FPSO |
| 3.10 | I-ET-3010.00-5147-332-P4X-001 | TECHNICAL SPECIFICATION FOR TURBOGENERATOR UNIT |
| 3.11 | I-MD-3010.2D-1200-970-P4X-001 | COMMISSIONING DESCRIPTIVE MEMORANDUM |
| 3.12 | I-LI-3010.2D-1200-970-P4X-002 | COMPRESSOR UNITS SPARE PARTS LIST MINIMUM REQUIREMENTS |
| 3.13 | I-ET-3010.00-5147-711-P4X-001 | MAIN GENERATORS FOR OFFSHORE UNITS |
| 3.14 | I-ET-3010.00-5261-700-P4X-001 | EMERGENCY GENERATOR PACKAGE FOR OFFSHORE UNITS |
| 3.15 | I-ET-3010.00-5262-700-P4X-001 | AUXILIARY GENERATOR PACKAGE FOR OFFSHORE UNITS |
| 3.16 | I-ET-3010.00-1200-310-P4X-001 | API 610 CENTRIFUGAL PUMPS SPECIFICATION |
| 3.17 | I-ET-3010.00-5134-323-P4X-001 | INSTRUMENT AND SERVICE AIR ROTARY SCREW COMPRESSION UNITS AND AIR DRYING UNITS |
| 3.18 | I-ET-3010.00-5111-310-P4X-001 | SEA WATER LIFT PUMP AND START-UP SEA WATER LIFT PUMP |
| 3.19 | I-ET-3010.2D-1233-560-P4X-001 | MOLECULAR SIEVE UNIT |
| 3.20 | I-ET-3010.2D-5412-320-P4X-001 | FLARE/SLOP VESSEL GAS RECOVERY COMPRESSION UNIT |
| 3.21 | I-ET-3010.2D-1350-320-P4X-001 | STRUCTURAL TANKS GAS RECOVERY COMPRESSION UNIT |

Table 1 – Reference documents list

* 1. Test requirements included on other contractual documents not listed on table 1 shall be followed.

# MINIMUM REQUIREMENTS FOR COMMISSIONING

## Commissioning Management Plan

* + 1. SELLER shall start the preparation of the Commissioning Management Plan after Agreement Effective Date.
    2. The scope of the Commissioning Management Plan shall consider five steps (see item 4.1.4). The plan details the methodology to analyze the project and implement actions that enhance their value. The Commissioning Management Plan is part of the Commissioning Chapter and is updated along the rolling wave planning.
    3. These steps shall be planned and executed according to Exhibit VI, Directives for Planning and Control, item 7.11.1 and 7.11.2 - rolling wave planning.
    4. The SELLER shall present the Commissioning Management Plan considering the following minimum requirements (table 2).

|  |  |  |  |
| --- | --- | --- | --- |
| ***STEP*** | ***SCOPE*** | ***MINIMUM REQUIREMENTS*** | ***TIME*** |
| 1 | Commissioning Manual | Commissioning documents (Hull, Modules, Integration and Offshore commissioning) describing main milestones, resources, documents package issuance and locations. Details see 4.1.6. | One Hundred and twenty (120) days after Agreement Effective Date. |
| 2 | Hull Commissioning Detailed Plan | Detailed executive planning of Hull commissioning, listing all resources and activities used. | According to item 4.1.7. |
| 3 | Modules Commissioning Detailed Plan | Detailed executive planning of Modules commissioning, listing all resources and activities used. | According to item 4.1.7. |
| 4 | Integration Commissioning Detailed Plan | Detailed executive planning of Integration commissioning, listing all resources and activities used. | According to item 4.1.7. |
| 5 | Offshore Commissioning Detailed Plan | Detailed executive planning of Offshore Commissioning, listing all resources and activities used. | First issuance at least ninety (90) days before sail away. Updates shall follow Exhibit VI, item 7.11.2. |

Table 2: Requirements and timeline for planning steps

* + 1. For each step, SELLER shall issue the documentation and schedule a meeting to present all content. All steps shall be approved by BUYER.
    2. **Commissioning Manual (Step 1)**
       1. The objective of this Manual is to define the execution strategy for Commissioning, presenting how the Commissioning Process will occur during the project, the responsibilities, engineering/construction interfaces, organization, and the macro schedule.
       2. SELLER shall present the first issue of Commissioning Manual to BUYER in a specific meeting involving all stakeholders.
       3. The Commissioning Manual shall include the following items, but not limited to:
          1. Detailed Responsibility Matrix for the Commissioning Activities.
          2. Macro Commissioning Time Schedule containing at least: Main phases, steps and packages forecast.
          3. Preliminary List of the Systems and Subsystems.
          4. Preliminary Subsystem Precedence Network.
          5. List of engineering documentation necessary for the commissioning activities, including the required delivery dates.
          6. List of planning and control documentation necessary for the commissioning activities, including the required delivery dates.
          7. Commissioning Team Organization Chart, for the various stages of the project.
          8. Commissioning Process Histogram, including the various stages of the project.
          9. Procedure of Emergency Control, as per the HSE General Plan.
          10. Communication Plan.
          11. Risk Management Plan.
          12. Procedure for Punch list Items Control and Clearance.
          13. List of procedures to be issued with the respective delivered dates such as, but not limited to:

Instrument Calibration Procedure.

Instrumentation Loop Tests Procedure.

Hydrostatic Tests Procedure.

Leakage Test Procedure.

Piping Cleaning methods and procedure.

Electrical Functional Tests Procedure.

NR-10 Inspection procedure.

Mechanical Equipment Tests Procedure.

NR-13 and SPIE Inspection Procedure.

* + 1. **Detailed Executive Plan (Steps 2, 3 and 4)**
       1. SELLER shall submit Commissioning documentation for BUYER’s approval in four PACKAGES, according to the deadlines set out below:
       2. PACKAGE 1 (Full Project Commissioning Engineering): Two hundred and forty (240) days after Agreement Effective Date, SELLER shall issue the typical documents listed below, which shall be kept up to date. All lists bellow shall include System/Subsystem information:

1. Sets of Process and Instrumentation Diagrams (P&IDs), containing the identification of all systems and subsystems with the respective limits and interfaces.
2. Operational System/Subsystem list.
3. Detailed Time Schedule for Commissioning by Operational Systems/Subsystems (SSYs) according to the Project main time schedule following and the sequence of FPSO/systems startups defined by BUYER.
4. Detailed Precedence Network, including subsystems.
5. List of Commissionable Items.
6. Lists for control loop, electrical, piping, automation, instrumentation, and telecom.
7. List of Special Tools and commissioning spare parts required to pre-commissioning and commissioning.
8. List of software, licenses of any Electrical, Automation or Telecommunication system or equipment.
9. Receiving or Arrival inspection procedure.
10. Storage procedure.
11. Preservation Procedure.
12. Hibernation Procedures.
13. List of all equipment subject to NR-10, NR-13 and SPIE (NR-13 and SPIE list shall include piping and safety devices) requirements with the respective TAGs and Categories, related to the respective systems and Subsystems.
14. NR-13 and SPIE Inspection Procedure.
15. NR-10 Inspection Procedure.
16. List of Equipment, assembled in a classified area, containing all the information necessary to comply with current regulations.
17. Vendor Technical Support Plan, with the identification of all equipment, manufacturers, contacts, qualification of manpower required for commissioning activities, resources required, supplier visits calendar, in accordance with the project's integrated schedule.
18. Instrument Loop Test Procedure.
19. Piping cleaning and testing procedures (shall be informed the method to be used in each kind of line).
20. Leakage Test Procedure. (it shall be informed the method to be used in each kind of line).
21. Hydrostatic Tests Procedure.

**Note:** This package shall be detailed for Hull commissioning, Modules and Integration Commissioning Detailed Plan according to item 4.1.4.

* + - 1. PACKAGE 2 (Subsystem Mechanical Completion): Up to 90 (ninety) calendar days prior to the date set forth in the Commissioning Schedule for the commencement of the respective Subsystem Mechanical Completion phase, the following typical documents shall be released. All lists shall include System/Subsystem number:

1. Instrument and safety devices calibration certificates. (this item can be delivered 30 days before MC).
2. Brazilian Regulatory Standards equipment inspection procedure.
3. Electrical equipment testing certification procedures.
4. Procedures for cabling certification tests (power and control).
5. Procedure for Subsystem Mechanical Completion Inspection.
6. Training Plan, including programs and schedules, according to I-ET-3010.2D-1200-919-P4X-001 - REQUIREMENTS FOR VENDORS TRAINING CONTENT AND PROGRAM)
7. Operation and maintenance manuals.

**Note:** This package shall be detailed for Hull commissioning, Modules and Integration Commissioning Detailed Planning according to item 4.1.4

* + - 1. PACKAGE 3 (Pre-operation & start-up): Up to 180 (one hundred and eighty) calendar days prior to the date set forth in the Commissioning Schedule for the start of the respective Pre-operation & start-up phase activities, the documents below shall be released. All lists shall include System/Subsystem number:

1. Procedures for systems startup.
2. Special operations plan (loading of catalysts and returns in vessels and towers, transportation of chemicals, etc.).
3. Functional testing procedures (with power and operating fluids).
4. Procedures for cause and effect matrix simulation.
5. Performance acceptance tests (TAP) procedures.
6. Reliability testing procedures.
7. Commissioning spare parts list containing all supplier-defined information, including Part Number per item.
8. Procedures for control loops tests (electrical and instrumentation).
9. Physical test folders are to be delivered within the period of 180 (one hundred and eighty) calendar days prior to the date set forth in the Commissioning Schedule for the start of the respective Pre-operation & start-up commissioning phase activities.
10. Energy Control Management Plan.
11. Maintenance plans.

**Note:** This package shall be detailed for Hull commissioning, modules and Integration Commissioning and Offshore Commissioning Detailed Planning according to item 4.1.4.

* + - 1. PACKAGE 4: SELLER shall elaborate and submit to BUYER a Monthly Commissioning Report starting from first commissioning manual issuance date until 30 (thirty) calendar days prior to the date set forth in the Commissioning Schedule for the start of the respective Pre-commissioning phase activities, after that it shall be sent weekly until offshore phase starts, with the following information:
         1. Relevant documents issued.
         2. Relevant commissioning works performed.
         3. Documents to be issued in the next months.
         4. Work program for the next weeks / months, according to the Commissioning Schedule.
         5. Commissioning Punch list updated, indicating the date for the corrective actions and the responsible for the actions.
         6. Physical Advance Curve (planned x performed).
    1. **Offshore Commissioning Detailed (Step 5)** 
       1. SELLER shall present the planning for commissioning, pre-operation and integrated start-up activities for offshore phase, containing at least:
          1. Work scope (mooring, pull-in, remaining scope, others).
          2. Manpower plan by specialist per activity.
          3. Organization Chart, Histogram by specialist.
          4. Mobilization plan including all necessary documentation (for vendors, direct and indirect manpower).
          5. Subcontractors plan (including workshops and warehouse for support).
          6. Procurement procedure, Overseas Procurement and Transport Procedure.
          7. Training plan for employees (CBSP – Basic Platform Safety Course, T-HUET – Tropical Helicopter Underwater Escape Training, BUYER’s Safety Manual Training, BUYER’s Offshore Work Permit Software Training (APLAT) and others).
          8. Onboard material control and materials logistic procedure.
          9. Preservation plan.
          10. Planning considering registration at BUYER’s Offshore Work Permit Software (APLAT) with a minimum look ahead of 2 months.
       2. SELLER shall elaborate and submit to BUYER a Weekly Commissioning Report, during whole offshore phase until UNIT final completion signature, with the following information:
          1. Relevant commissioning works performed.
          2. Work program for the next weeks/months, according to the Commissioning Schedule.
          3. Commissioning Punch and remaining onshore scope list updated, indicating the date for the corrective actions and the responsible for the actions.
          4. Physical Advance Curve (planned x performed) Ex: TAP-1, TTAS-1, TAP-2, TTAS-2, remaining manhour, others.

## Receiving or Arrival Inspection

* + 1. SELLER shall inform BUYER about the arrival of any commissionable item received at the shipyard.
    2. SELLER shall execute a receiving inspection on all commissionable items and it register on FIC.
    3. SELLER is the only responsible for guarantee the meeting requirements for all received items, even in case of BUYER’s team participation on the receiving inspection.
    4. Factory Acceptance Test equipment reports are to be delivered and uploaded at Document Management System together with equipment receiving inspection.

## Preservation

* + 1. SELLER is responsible for preservation of all material and equipment of its scope of supply. It is SELLER’s obligation maintain resources necessary and compatible with the activities to be performed.
    2. SELLER shall mobilize a preservation team exclusive for preservation activities.
    3. Equipment’s preservation shall start immediately upon release from the factory before shipment to SELLER’s premises.
    4. SELLER is responsible for the systems preservation up to system handover to BUYER at TTAS-1. At shipyard, preservation and any maintenance activities always remain under SELLER responsibilities, even with TTAS-1 signed. At offshore location, with TTAS-1 being issued, BUYER will assume preservation responsibilities.
    5. Preservation shall be applied in accordance with the manufacturer’s recommendations whenever or as recognized best practices of that activity. The procedure shall specify the materials to be used in each type of preservation routine.
    6. Manufacturers' Technical recommendations for equipment preservation are mandatory. VENDOR technical support for preservation can be necessary and, in this case, shall be provided by SELLER in order to follow Manufacturer’s recommendations when applicable.
    7. The SELLER shall submit a Preservation Procedure that shall include identification, handling, packaging, storage and protection of the equipment, as well as the parts and their commissioning spare parts. This procedure should clearly specify the techniques, materials and routines for carrying out the preservation activities.
    8. SELLER shall submit to BUYER approval a Winter Preservation Plan, 90 days prior to beginning of winter season, for all systems and equipment where site minimum temperatures decrease below four degrees Celsius (4˚C). Specially for equipment or piping filled with fluids. Lack of preservation shall be borne by SELLER. This statement is applied to both BUYER and SELLER’s supply.
    9. SELLER shall provide proper storage condition for all items into warehouse, during onshore and offshore phase. The warehouse shall be preferably dedicated for materials belonging the UNIT. If a dedicated warehouse is not feasible, SELLER shall provide dedicated demarked and identified areas for UNIT items.
    10. SELLER shall provide a sheltered area, when the storage is established out of warehouse, in order to store valves, equipment, cable trays and any other items deemed under this requirement by the Vendor`s or BUYER’s personnel.
    11. Preservation activities and actual status of all equipment to be preserved shall be recorded in the Commissioning Integration Tool (FIC).
    12. SELLER shall apply plastic caps, plastic blind flanges and VCI (or similar appliance) on piping spools and valve extremities as a preservation method. Plastic caps shall be applied during storage, construction and assembly phases in order to avoid any dirty or debris entrance. The appliance of such features shall be detailed in the Preservation Plan submitted for BUYER’s approval.
    13. SELLER shall guarantee permanent and continuous power supply for preservation heating elements of equipment with local means to confirm such energization, such as lighting indication. SELLER shall pay special attention with nominal voltage of each heating elements before power on. In case of heating system shutdown, SELLER shall communicate BUYER, and present shutdown time report and justify.
    14. SELLER shall provide subsystems hibernation on the following conditions:

1. Hull subsystems that will not operate during the integration phase.
2. Hull subsystems for trip from Hull to Integration Yards.
3. All FPSO subsystems for trip from foreign country until handover, when applicable.
4. Topside subsystems that will not operate on a short time (90 days) after handover.
   * 1. SELLER shall execute the hibernation plan using procedures approved by BUYER. The hibernation activities include cleaning, drying, metal passivation, N2 inertization, application of corrosion inhibitor, lubricants e other forms of protection to guarantee physical and operating integrity of subsystem components until it´s return to operation.
     2. SELLER shall prepare facilities distribution in order to allow Nitrogen and Dry Air preservation on equipment as needed. Critical equipment such as Main Generator, Gas Compressor, Main Gear Box shall be preserved as per VENDOR requirements, but in case of no clear information, Nitrogen or dry air shall be continuously applied to the mentioned equipment in order to keep the environment clean and dry, with a minimal positive pressure. Humidity condition shall be periodically verified and recorded.
     3. SELLER shall present a weekly Preservation Report with activities carried out, including all related information and photos when applicable.
     4. SELLER shall provide preservation of all stainless steel (SS) surfaces using a clear varnish-like product as coating. This preservation shall cover items like piping, tubings, cable trays, cable ladders, panels, junction boxes, tanks, turbine hoods and others SS items submitted to harsh environment such as Construction & Assembly Yards. This coating shall be applied upon receiving items at warehouse and touched-up after assembly; during all Construction & Assembly and Commissioning period this coating shall be maintained and restored upon coming off. A specific procedure shall be submitted by SELLER for OWNER's.
     5. After finishing the construction and assembly, tests, and final painting, all the modules shall be washed with fresh water with chloride index under 50 ppm.
     6. SELLER shall submit to BUYER’s approval preservation methods and procedures for each piping system/subsystem, in accordance with item 3.1 and 3.11 of this Exhibit.
     7. The preservation of the membrane elements shall be applied in accordance with the MANUFACTURER's recommendations. SELLER shall provide all necessary resources and bear all costs to ensure proper storage and protection from direct sunlight and damage. Membrane elements packages shall be stored in a cool, dry container with controlled temperature and humidity. The scope of preservation mentioned above is under SELLER’s responsibility until elements assembly in offshore phase.

## Mechanical Completion Phase

* + 1. SELLER shall perform the assembly and certification tests to demonstrate that all equipment / items for all disciplines within a system/sub-system have been supplied, installed, non-energized testing completed and can be handed over to the responsible Pre-commissioning Team.
    2. SELLER is the responsible to perform all prior construction & assembly activities and certification tests activities in accordance with applicable standards, recording them on the Item Check Sheet (FVI) and Control Loop Check List (FVM).
    3. All NR-10 inspections related to the Subsystem shall be completed and reports shall be presented, including EX Certificates when applicable, together during Item Check Sheet execution
    4. From the beginning of the mechanical completion activities, a work schedule should be prepared continuously, integrated with the construction & assembly schedule. This schedule shall be organized with the following hierarchy:

1. Progress Report, periodically [informing period] and reporting the physical progress of organized work according in three steps: by the commissioning WBS, by the list of systems /subsystems and by discipline:
2. Monthly Report with information of mechanical completion phase progress.
   * 1. SELLER shall ensure the clearance of the FATs (Factory Acceptance Tests) pending issues and provide all evidence to BUYER.
        1. SELLER shall issue an Inspection and Test Plan (PIT), based on Vendors’ proposition and containing activities to be appointed at the factories and construction sites by BUYER’s personnel. This Inspection and Test Plan shall be approved by BUYER.
        2. SELLER shall submit to BUYER’s and Classification Society`s approval the Inspection and Test Plan (PIT) of SELLER’s supplied equipment, compatible with the scheduled completion and delivery dates of equipment.
     2. All instruments and safety devices shall have their calibration certificate valid functional testing. The calibration requirements for each instrument shall be according to the regulatory agencies rules, technical standards, manufacturers' manuals and in accordance with item 3.11 of this Exhibit
     3. Systems/subsystems shall be subjected to a formal Mechanical Completion Inspection, which shall be physically, and documentary proven, meeting applicable legal and contractual requirements.
        1. SELLER shall notify BUYER for Mechanical Completion Inspection and approval.
        2. SELLER will not be allowed to proceed on pre-commissioning activities without completion of FVI (Field III) and FVM (Field III) and approval by BUYER.
     4. **Mechanical Equipment**
        1. All rotating equipment shall be already leveled, aligned, balanced (if necessary), oil systems flushed and with the lubrication system filled with the specified lubricant and inspected by video borescope, prior to MCC. All recorded videos shall be handed out to BUYER as evidence.
        2. Stationary equipment shall be already cleaned, hydrostatically tested, internally / externally inspected (video borescope) and preserved, prior to MCC. All recorded videos shall be handed out to BUYER as evidence.
        3. All cylinders - except those according NR-13 item 13.2.1 - shall be hydrostatically tested within 2 years before sail away.
     5. **Instrumentation**
        1. SELLER shall recalibrate any replaced or damaged instrument during any tests. All instruments shall have their calibration certificates according with regulatory and standard requirements, such as ANP Flow Measurement System.
        2. SELLER shall recalibrate all the pressure indicator instruments (PI, PIT) associated to NR-13 pressure vessels and piping system with calibration executed earlier than 2 years at the UNIT’s sail away date.
        3. SELLER shall recalibrate all Pressure Safety Valves (PSVs), after final alignment of piping in subsystems, independently of the calibration certificate supplied by valve manufacturer. This calibration shall be in accordance with API-RP 520, API-RP 576 and witnessed by BUYER and Classification Society. SELLER shall provide a PSV calibration container on board for this activity.
        4. Pressure Safety Valves (PSVs) associated to NR-13 Equipment Category I and II shall be recalibrated no earlier than 12 months of the UNIT's sail away, preferably not before carrying out the internal examination of their respective equipment.
        5. Requirements described at IEC-62337 - Milestones and Activities during Commissioning of Electrical Instrumentation and Control System in the Process Industry shall be foreseen by SELLER as requirements for the commissioning activities.
        6. Requirements described at IEC-62381 - Automation systems in the process industry – Factory acceptance test (FAT), site acceptance test (SAT), and site integration test (SIT), shall be foreseen by SELLER as requirements for the commissioning activities.
        7. SELLER shall inspect all field instruments.
        8. SELLER shall perform certification test of all instruments after assembly at field in order to confirm its integrity.
        9. SELLER shall provide calibration certificates for all instruments under its scope of supply.
        10. SELLER shall guarantee on pressure sensing instruments the correct manifold assembly, where applicable, following manufacturer recommendations about tightness to be applied to the bolts, as well as parallelism and gap between manifold and instrument.
        11. For all pressure sensing instruments, SELLER shall perform a static pressure test, at project operational pressure, in order to confirm the correct manifold assembly.
        12. SELLER shall include all instrument impulse lines in piping leakage tests plan in order to guarantee its integrity.
     6. **Automation**
        1. SELLER shall perform a mechanical completion inspection and execute certification tests in all equipment within CSS (Control and Safety System) and SOS (Supervisory and Operating System) in accordance with design requirements, standards, and regulatory bodies.
     7. **Electrical**
        1. SELLER shall check the wiring integrity, referred to electrical diagram of equipment under test, to verify continuity in power, control, command, signalization, and grounding circuits.
        2. SELLER shall perform insulation and ohmic resistance tests in all equipment, including measurement of the medium voltage motors and generators polarization index.
        3. SELLER shall verify periodically the free movement condition of rotate electrical machines shaft.
        4. SELLER shall issue tightness report applied to all Motor Control Center and switchboard connections, including a specific tightness report related to the fixation of the panel to this base. The location and torque values shall be confirmed by the specific vendor documentation.
        5. For Insulation tests in Rotating Machinery and Transformers, SELLER shall follow the IEEE STD 43-2000 - Recommended Practice for Testing Insulation Resistance of Rotating Machinery.
        6. For electrical equipment insulating oil, SELLER shall proceed according to IEC - 60296 - Fluids for Electro technical Applications Unused Mineral Insulating Oils for Transformers and Switchgear.
        7. SELLER shall follow the vendors documentation for the following tests:
3. Insulation tests on electrical cables, electrical panels and components (e.g. breakers, drawers, and contactors), Uninterruptible Power Supply (UPS), battery chargers and similar tests.
4. Hi-Pot tests on medium voltage cables, panels and components (when applicable).
5. Duct resistance tests on bus bars (all panels, exception to small lighting panels and control panels), circuit breakers (low voltage power breakers and medium voltage circuit breakers) and medium voltage contactors.
   * + 1. About circuit breakers phase simultaneity and plotting test, SELLER shall apply opening, closing and re-opening (trip free) tests to ensure it is according to the breaker operating curve and check time discrepancies between different phases.
       2. About the Transformer Turn Ratio Test (TTR), SELLER shall determine transformation ratio, terminal identification and winding polarity, using the ratio-measuring instrument.
       3. About the transformer winding ohmic resistance test, SELLER shall perform the transformer winding resistance measurements according to equipment type and vendor standards.
       4. SELLER shall perform the polarity test, saturation curve, current ratio and insulation test for the current transformers (TCs).
       5. SELLER shall perform the polarity test, Transformer Turn Ratio test and insulation test for the voltage transformers (TPs).
     1. **HVAC System**
        1. SELLER shall proceed the steps of Mechanical Completion Procedure, which has, among others, the following items:
6. Document Verification: all necessary certificates and reports (including NR-13, if applicable) shall be presented.
7. Punches Verification: all punches from the construction and assembly stages shall be cleared.
8. Design Compliance: the SSOP shall comply with all approved design documents.
9. The Blank Test shall be performed and approved by BUYER.
10. The Control Logic of the Cause & Effect Matrix and the Equipment Logic Interlock shall be installed.
    * 1. **Piping and Equipment Cleaning Directives**
         1. SELLER shall submit to BUYER’s approval cleaning methods and procedures for each piping system/subsystem, in accordance with item 3.1 of this Exhibit.
         2. SELLER shall call BUYER to witness the video borescope operation in order to check the effectiveness of piping cleaning. SELLER shall repeat any cleaning operation that BUYER may deem unsatisfactory after borescope checking.
         3. Video borescope inspection is mandatory for piping cleaning approval by BUYER. SELLER shall issue and submit to BUYER’s approval cleanings report for each system/subsystem, including documentation and video. In order to keep piping cleaned during all construction and commissioning phase, SELLER shall ensure proper preservation and control it periodically.
      2. **Bolted Flange Joint Management** 
         1. SELLER shall follow the requirements of item 3.2 in order to ensure that all bolted joints are consistently leak-free during testing and operation.
      3. **Brazilian Regulation Standards**
         1. SELLER shall follow the requirements described on item 8.1.1 of Exhibit III – DIRECTIVES FOR PRODUCT DEVELOPMENT.
      4. **Classification Society** 
         1. SELLER shall perform all necessary tests for the compliance with item 1.3 of the Exhibit XV– DIRECTIVES FOR FPSO CLASSIFICATION.
      5. **Technical Documentation**
         1. SELLER shall keep up to date electronic records of the tasks (FVI, FVM, certificates, etc.) that, after their first issuance by FIC, shall be kept filed in the Operational System/subsystem folders, together with the other related documents, composing them progressively until their conclusion.
         2. For the transfer of each SOP/SSOP, SELLER shall deliver one (1) scanned copy of the respective SOP/SSOP folder, organized with all commissioning information of the commissionable items, loop and subsystems that make up the SOP.
         3. SELLER shall deliver the complete operation and maintenance manuals according to Exhibit V – Directives for Acquisitions.
         4. SELLER may propose technological solutions, to be evaluated by BUYER, for the delivery of electronic documentation using digital signature.

## Pre-operation & Startup Phase

* + 1. SELLER shall perform and evidence all Pre-commissioning and Commissioning Phase activities of commissionable items, loops and subsystems through of FIC.
    2. Related to Hydraulic Valves System, the opening and closing time for every SDV shall be inspected and recorded during function tests of these items. During the Performance Test of this Subsystem, all SDVs shall be evaluated together regarding opening and closing times, and results shall be recorded in order to ensure the System is working as per design requirements.
    3. SELLER shall supply a Winter Tests Plan, 90 days prior to beginning of winter season, for all systems at sites in which temperatures falls below +4°C. Fluids shall be chemically balanced or calibrated to eliminate freezing risks, as well as Piping Heat Tracing, Insulation and heaters shall be used wherever necessary for safe operation. System fluid drainage can be applied in case of no continuous operation requirement All systems shall remain available during the winter in order to eliminate schedule impacts. Winter Test Plan shall take into account, for each equipment and piping, the Minimum Design Metal Temperature (MDMT) and the Design Minimum Temperature determined by the design standard, respectively.
    4. SELLER shall bear the costs of renew all cooling water inventory plus anticorrosion fluid before sail away. All residues such as water mixtures and other chemicals shall be given proper destination as per EXHIBIT IX Health, Safety and Environment.
    5. SELLER shall generate specific procedures for Functional Tests execution.
    6. SELLER shall perform and evidence the execution of the functional tests of the commissionable items and loops by completing the related activities in the respective FVI / FVM.
    7. SELLER shall coordinate support of manufacturers to Yards to follow up the tests, in accordance with the Supplier Technical Support Plan.
    8. SELLER shall provide all documentation necessary for the execution of the Performance Acceptance Tests (TAP), including any legal mandatory authorizations.
    9. Performance Acceptance Tests (TAPs) may only be performed if commissioning spare parts and consumables described at test procedure are available.
    10. According to the characteristics of each subsystem, TAPs may require the use of temporary devices. Such devices shall be specified in the subsystem test procedure, together with instructions necessary for their installation and use. Where applicable, temporary devices shall also be function tested prior to the completion of the TAPs.
    11. Performance Acceptance Tests (TAP) execution procedures shall cover all commissionable subsystem items and cannot be considered complete if performed in part or by sampling.
    12. SELLER shall measure actual levels of vibration, temperature and noise of machines and submit to BUYER the results. The approval criteria will be based on vendor documentation.
    13. SELLER shall elaborate and submit subsystems commissioning phase manuals and procedures for BUYER’s approval.
    14. It is also SELLER's scope keeping the hibernation, remove the hibernation, check and replaces/repair if necessary for the re-starting of all systems kept in hibernation.
    15. If any punch item were identified during the TAP execution it shall be classified in Type A or B in accordance with item 2 of this exhibit and to be updated at the database. After all the type A punch list items have been solved, a technical evaluation shall be performed by BUYER to define whether or not a retesting is necessary.
    16. During tests, if any materials, equipment or work were reported faulty, it shall be corrected. The cost of repair or replacement of the faulty material or equipment shall be borne by SELLER. In this case, a technical evaluation shall be performed by BUYER to define whether or not a retesting is necessary.
    17. During the execution of performance tests, all reported results shall be compared with the expected Design requirements.
    18. SELLER shall provide Vendor Technical Support according to exhibit V – DIRECTIVES FOR ACQUISITIONS to support onshore pre-commissioning and commissioning activities and offshore preparation for start-up, when applicable.
    19. **Instrumentation and Automation** 
        1. Requirements described at IEC-62337 - Milestones and Activities during Commissioning of Electrical Instrumentation and Control System in the Process Industry shall be foreseen by SELLER as requirements for the commissioning activities.
        2. Requirements described at IEC-62381 - Automation systems in the process industry – Factory acceptance test (FAT), site acceptance test (SAT), and site integration test (SIT), shall be foreseen by SELLER as requirements for the commissioning activities.
        3. Requirements described at IEC-62382 - Control systems in the process industry – Electrical and instrumentation loop check, shall be foreseen by SELLER as requirements for the commissioning activities.
        4. SELLER commissioning team shall guarantee that all field devices and automation hardware are fully operational, verified, and functional. Whenever required, certification shall be issued after commissioning phase completion, i.e. fiscal measurements.
        5. SELLER shall test PLC programming and Supervisory Operation System (SOS) screens during Factory Acceptance Test and Site Acceptance Test activities of each System / Subsystem.
        6. For each ESD level, during shutdown tests of UNIT, SELLER shall check performance of each function, according to Classification Society`s and BUYER’s rules/ requirements.
        7. SELLER shall perform all Subsystem Cause and Effect Tests (Interlock Tests) prior to Subsystem Functional Tests or TAP. If part of Cause and Effect Tests of a Subsystem cannot be tested before Subsystem Functional tests or TAP, SELLER shall inform BUYER the reasons to be verified and approved by BUYER’s Team.
    20. **Electrical**
        1. SELLER is responsible for providing all electric power needed for commissioning activities.
        2. SELLER shall prepare and provide 13.8kV (3 phases - 60Hz) electrical shore supply (for Integration Phase) to be connected at high voltage panel at UNIT in order to allow commissioning of high voltage Subsystem when turbogenerators are not available. SELLER shall plan cables route, signaling, connection and relays protection set-up at spare cubicles at 13,8kV panel. The 13.8kV shore supply power shall be calculated to attend daily commissioning activities according to SELLER commissioning plan and shall not be less than 7.5MW.
        3. SELLER shall prepare and provide temporary electrical power shore supply in 6,6kV and 690V (60Hz) for Hull Commissioning. For 6,6kV temporary power, SELLER shall plan cables route, signaling, connections and relays protection set-up at spare cubicles at 6,6kV panel. Related to 690V, SELLER shall plan cables route, signaling and connection at Hull Shore Supply cubicle, designed specifically for its purpose. Both rated voltages (6,6kV and 690V) electrical power supply shall be available during Hull Commissioning Phase and whole Integration Phase.
        4. SELLER is also responsible to prepare and provide temporary UPS System for all needs during Pre-Commissioning and Commissioning Phases. SELLER shall prepare and provide Temporary HVAC (hot and cold) for Automation and Electrical Rooms during Pre-Commissioning and Commissioning Phase if UNIT HVAC is not available, in order to avoid damages to equipment caused by high temperature deviations inside these rooms.
        5. SELLER is allowed to use the Electrical Turbo Generators (SOP 5147) to supply energy for testing loads in 13.8 kV during commissioning phase.
        6. SELLER shall verify, before load final coupling, appropriate rotation sense of all electric motors.
        7. Regarding 800 kW motors and higher, SELLER shall execute the following tests, as minimum:

1. Stator temperature measurement.
2. Internal Motor Videoscopy.
3. Dissipation factor ("tangent delta").
4. Partial discharge.
5. Surge comparison test to be applied to one machine out of each group of machines of the same power rating.
6. Polarization index.
   * + 1. SELLER shall verify and implement protection relays parameters. The parameters table for each relay shall be developed by SELLER according to the selectivity study. SELLER shall simulate the performance of each protection function for several points of time x current characteristic. All parameter table for every relay shall be tested and recorded at reports. No sampling test will be accepted. In order to ensure all relay tests, SELLER shall provide a specific and specialized team to perform tests, including all equipment as needed, or hire a specialized company or hire vendor to carry out all tests.
       2. SELLER shall perform functional tests of electrical panels and between them, including logical selectivity, interlocks, network communication and performance.
       3. For all electrical equipment and systems, SELLER shall verify, as minimum, the following operational procedures, as per Equipment Operation Manual and Project Documentation:
7. Start-up.
8. Shutdown.
9. Local and remote operations
   * + 1. SELLER shall execute vibration analysis of electrical equipment according to IEC 60034-14 - rotating electrical machines - Part 14: mechanical vibration of certain machines with shaft heights 56 mm and higher - measurement, evaluation and limits of vibration.
       2. Regarding 800 kW motors and higher, SELLER shall execute videoscopy 1 (one) month after start-up.
     1. **HVAC System**
        1. The SELLER Commissioning Team shall proceed the steps of the Commissioning Procedure, which has, among others, the following items:
10. Pre-Startup: check if the SSOP is ready to run with all necessary adjustments performed, if all instruments are operational and if all necessary information about the SSOP (nameplates, signs etc.) is properly provided. Also, check if the environment is following the safety procedures.
11. Start-up: execute the necessary steps to start the system and test all starting modes (remote, local, interlocked by control logic, etc.) to verify if the manual and automatic control systems are working properly.
12. Operational Test: SSOP running to verify all design parameters, air balancing, set points and to check if all equipment and accessories are working properly.
13. Preservation: perform the steps to preserve the SSOP and the routine to keep the preservation along the necessary time to ensure the proper conditions of the equipment since ducts fabrication until the UNIT handover to BUYER.
14. Punch List: all observations, deviations, inconsistences, punches or attention points shall be registered in this section.
    * + 1. The Commissioning Report shall be filled along the Pre-Commissioning and Commissioning stages to register all verified and measured information. This Report shall be accepted by BUYER to consider both mentioned stages properly finished.
        2. The SELLER Commissioning Team shall have all necessary and correct instruments to perform all tests, to verify all design parameters and register the operational parameters. The air filters shall be changed after the commissioning is finished and approved by BUYER.
        3. SELLER shall perform HVAC Ducts cleaning in accordance with Brazilian Standards (ANVISA RDC Nº 72, Resolução - RE Nº 09) and exchange the air filters. Both activities shall be performed after TAP-1 signed and within 3 months prior to Sail Away. SELLER shall present all evidence.
      1. **Safety Systems** 
         1. SELLER shall test helideck firefighting foam system according to Classification Society, BRAZILIAN NAVY (NORMAM / CAP 437), NATIONAL CIVIL AVIATION AGENCY (ANAC) and BUYER’s requirements, including the Foam Generating Liquid supply. After the test being performed, the system shall be filled up and prepared by SELLER for normal operation. Helideck drainage system shall also be verified for their containment of oil spillage and foam.
         2. SELLER shall test the foam and water firefighting systems, according to Classification Society, BRAZILIAN NAVY, NFPA Standards and BUYER’s requirements, assuring its required coverage and functionality. SELLER shall supply all materials, consumables and resources for this test, such as Foam Concentrate Liquid, which shall have proper validity for sail away. SELLER shall provide foam concentration test according to NFPA16.
         3. SELLER shall test all water and foam firefighting system and verify each remote-actuated valve as well as area coverage and flooding with water, monitoring pressure at worst point condition and flow for each test executed. Drainage system shall also be verified in order to verify its capacity to flow the deluge according design requirements.
         4. SELLER shall check all firefighting subsystems and verify their correct functionality. SELLER shall execute real discharge test before UNIT sail away for all protected rooms considering the inert gas defined by Safety Design for each case (CO2 or IG-541). All cylinders shall be reloaded after real discharge test approval. This test shall comply with BUYER and Classification Society requirements as well as NFPA 12, NFPA 2001, IMO SOLAS and IMO FSS code.
         5. Firefighting devices, including all portable fire extinguishers, hydrant stations, safety lockers, hoses, and connections, shall be checked upon their area coverage and functionality, as per Classification Society and/or Brazilian Naval Authority requirements. Escape routes are to be checked according to Safety Plan and design requirements.
         6. SELLER shall inspect all Safety Plan items compliance with design document approved by Classification Society and present applicable certificates (INMETRO, NBR 12543, NBR 13716, NFPA 1852, IMO/SOLAS) within 3 months before sail away. It shall include lifeboats, inflatable life rafts, fast rescue boat, hand flares, davits, EPIRB, SCBA (Self-Contained Breathing Apparatus), EEBD (Emergency Escape Breathing Devices), fire extinguishers, firefighting hoses, fire man clothes, CO2 and IG-541 cylinders, and others. SELLER shall coordinate proper timing for the safety items certification, in such way that at the arrival date of the UNIT in offshore final location, the remaining valid time of each certificate shall be at least half of its total validity period. Any kind of rework, such as an additional recertification to bring any item to full compliance to this requirement is under SELLER scope.
         7. SELLER shall test and calibrate fire and gas detection system, assuring detectors’ proper positioning, direction and sensibility set, in accordance with design, manufacture requirements, safety studies and NFPA 72.
         8. SELLER shall test integration between Fire and Gas (F&G) system and Public Address (PA) systems (general alarm).
         9. SELLER shall check the functionality of the lifeboats and rescue boats as well their hoisting / lowering system.
         10. SELLER shall test the safety interlock system. Assuring that the actions foreseen for each emergency shut down level were performed.
      2. **Other Hull’s Systems Checking** 
         1. For the re-starting of the Hulls systems kept in hibernation during the integration works, SELLER shall retest other Hull’ systems deemed necessary by BUYER and Classification Society, such as emergency lighting, navigation aid systems, accommodation systems, helideck lights, environmental system, radio communication system, PA, telephone, calling stations and recreational system (TV and audio) and others.
         2. SELLER shall be responsible for the verification and renovation of any Hull’s equipment or system certificates, whose certification shall be updated.
         3. Prior to UNIT Sail Away, SELLER shall ensure Water Tanks Cleaning in accordance with respective Brazilian Agency and Brazilian Standards (ANVISA RDC Nº 72, RDC Nº 91 and PRC 05/2017 Annex XX, NR-37), including water analysis and providing all evidence.
      3. **Special Tests** 
         1. SELLER shall execute Special Tests listed below in accordance with item 3.11 of this Exhibit.
15. ON SHORE N2/He LEAK TEST
16. HYDRAULIC AND LUBE OIL SYSTEMS FLUSHING
17. HULL SYSTEMS SPECIAL TESTS
18. ON SHORE FULL LOAD TEST
19. ON SHORE GAS COMPRESSION AND INJECTION SYSTEMS AND CO2 COMPRESSION TESTS
20. ON SHORE PLANT SIMULATION
21. ON SHORE GAS DEHYDRATION (GDU)
22. ON SHORE DEW POINT TEST
23. ON SHORE WATER INJECTION TESTS
24. ON SHORE VAPOR RECOVERY UNIT TEST
25. ON SHORE FLARE GAS RECOVERY UNIT
    * 1. **Energy Control Management**
         1. SELLER shall develop an Energy Management Plan and submit for BUYER’s analysis to be adopted during onshore phase. The Energy Management Plan shall contain at least following points:
26. Necessary steps to shut down, intervention, isolation and block of a device or system.
27. Necessary steps for the placement and removal of locking devices.
28. Specific guard place of labels, padlocks, chains, straps and other devices capable of blocking machine and equipment of energy sources.
29. Points that will be blocked and what types of block that will be used.
30. Those responsible for the activities of isolation and blocking of energy sources.
31. Good practices of IOGP – Report-577/2018 (see chapters 5, 7, 11, 12, 14).
32. SELLER Operational team procedure training (include HSE items).
33. Control plan to be adopted for power on/off and equipment status.
34. Identify and promote a control plan for all risks involved during each equipment/system commissioning, considering I-ET-3010.00-1200-970-P4X-005 as reference.
    * + 1. SELLER shall coordinate all activities related to energy control during the execution of the commissioning activities.
        2. SELLER is responsible for supplying all materials and / or equipment necessary for energy control implementation.
        3. SELLER shall specify the necessary training for all employees involved, paying particular attention, among others that it deems necessary to those responsible for each step, the correct identification of the locking and isolation devices through labels, the correct removal of the devices.
        4. From the beginning of the Functional Tests, the items or loops involved should receive warning signs indicating this situation, and access control and / or triggering devices should be installed as necessary.
        5. Before starting any Commissioning activities, the affected working areas shall be isolated, clean, dry, free from oil, and the erection debris removed.

## Operation Specialized Support

* + 1. Operation Specialized Support comprises Vendor Technical Support and Troubleshooting Team, both to be provided by SELLER.
    2. In addition to vendor support for onshore pre-commissioning and commissioning activities and offshore preparation for start-up, SELLER shall provide Vendor Technical Support, in accordance with Appendix 2 of this exhibit, to operation specialized support phase. According to Appendix 2 the total manhour does not consider mobilization / demobilization time. The daily number of hours consumed on board is 12 hours, per technician/engineer. For each SOP described in Appendix 2, by its own judgement, BUYER can request VENDOR technical support for any equipment that belongs to the SOP. SELLER will have up to 30 days (maximum) to mobilize.
    3. SELLER shall provide a Troubleshooting team to support BUYER until TTAS-2 approval of all system/subsystem.
    4. The number and qualifications of the troubleshooting specialists mobilized for operation specialized support shall be defined by SELLER to ensure the operation specified above, and shall be submitted to BUYER for approval.
    5. Operation Specialized Support during offshore phase shall also have the purpose to reinforce concepts and procedure instructions provided previously during systems training program.

## Ready to Operate

* + 1. Requirements necessary to attest the accomplishment of “Ready to Operate” condition for each offshore payment milestone, described on Exhibit XI – Lump Sum Price Distribution and Measurement Criteria, shall be proposed by SELLER and accepted by BUYER.

# SYSTEMS/SUBSYSTEMS TRANSFER

* 1. The Subsystem Acceptance and Transfer Term (TTAS-1) is approved when the sub-system can operate continuously and on stable conditions according to Vendors’ and BUYER’s acceptance and with the following conditions:

1. The Performance Acceptance Tests (TAP) of Operational Systems (SSOPs) have been performed satisfactorily and there are non-impeditive out standings for continuous and safe operation, according to safety studies.
2. All special tools, licensed software and hard keys handed over to BUYER.
3. All operation and maintenance manuals delivered to BUYER.
4. All trainings have been provided to BUYER according to approved Training Program.
5. All data of commissionable items, loop, SSOPs, SOPs and commissioning spare parts updated in the control commissioning tool.
6. All SOP-related design and legal and regulatory documentation updated, including data-books, P&IDs, PFDs, operating and maintenance system manuals.
7. All non-impeditive punch item addressed to treatment.
8. There are no planned or corrective maintenance orders opened.
   1. To ensure TTAS-2 issue of each system/subsystem, the SELLER shall provide evidence of each for sub-item 5.1, plus the following items:
9. All long-term tests described in appendix 1 executed with success.
10. All punch items cleared.
11. There are no corrective maintenance orders opened.

* 1. When TTAS-2 is approved the definitive transference of the system operation and maintenance is confirmed.
  2. SELLER’s and BUYER’s responsibilities before and after unit handover are summarized on Appendix 3 of this exhibit.

# OPERATION AND MAINTENANCE OF SYSTEM/SUBSYSTEM/EQUIPMENT

* 1. SELLER shall provide operating team with expertise and trained according to item 4.5.25, to plan and execute operation tasks in all subsystems, including those that requires continuous operation for commissioning from TAP-1 until handover.
  2. SELLER shall provide a preservation and maintenance team and execute preservation and maintenance plans and activities (predictive, preventive, and corrective) in accordance with manufacturers of equipment and subsystems, until UNIT Handover or until TTAS-1 signed at final offshore location, in accordance with Appendix 3.
  3. The maintenance plans shall be submitted to BUYER for comments.
  4. SELLER shall provide access to BUYER on the maintenance activities plan control and transfer to BUYER all data and record of predictive, preventive, and corrective maintenance activities.
  5. BUYER shall be notified by SELLER of any operational concern and failure in the system/subsystem.
  6. At offshore final location, all subsystems with TTAS-1 approved shall be handed over to BUYER which, from this point, will be responsible to execute planned maintenance activities. SELLER remains responsible for closing of corrective maintenance orders due to equipment failure.
  7. Any intervention to subsystems after TTAS-1 shall only be performed upon BUYER’s supervision.
  8. SELLER is responsible to provide corrective maintenance, including all resources needed, related to failures not expected to occur in normal operation conditions until TTAS-2 signed.
  9. SELLER shall plan various systems configuration, such as low and high-power modes as per planning of manpower, equipment, health, and safety to comply with Commissioning Plan for a faster and safer work sequence.
  10. BUYER reserves the right to assume the responsibility for the operation tasks as indicated on item 6.1 of sub-system at any time after TTAS-1 signature at shipyard phase, other obligations will remain under SELLER responsibility.
  11. The following systems are expected when needed to be operated continuously during 24 (twenty-four) hours and 7 (seven) days a week from TAP-1 until handover. For each SSOP TAP-1 signed, SELLER shall present an operation plan for BUYER approval before continuous operation starts. The other systems/subsystems shall be kept preserved after TTAS-1 signature during onshore commissioning.

**SOP DESCRIPTION**

1263 CHEMICAL INJECTION FOR INJECTION WATER / SEA WATER

5111 SEA WATER

5115 FRESH WATER

5121 POTABLE WATER

5124 COOLING WATER

5125 HOT WATER

5133 DIESEL

5134 COMPRESSED AIR

5138 START UP AIR

5139 HYDRAULIC POWER UNIT

5140 ELETRICAL

5143 NORMAL ELECTRICAL DISTRIBUTION

5145 NORMAL LIGHTING

5147 ELECTRICAL TURBO GENERATOR

5148 ESSENTIAL ELECTRICAL DISTRIBUTION

5149 ESSENTIAL LIGHTING

5251 VENTILATION

5252 AIR CONDITIONING

5262 AUXIALIARY GENERATOR

5263 EMERGENCY LIGHTING

5264 TELECOMMUNICATION POWER

5265 DIRECT CURRENT AND UPS

5267 CATHODIC PROTECTION

5269 EMERGENCY ELECTRICAL DISTRIBUTION

5310 SEWAGE

5335 BALLAST

5336 DRAINAGE / SLOP

5415 ATMOSPHERIC VENT

5423 FIREFIGHTING WATER

5424 FIREFIGHTING FOAM

5425 FIREFIGHTING INERT GAS

5517 TELECOMMUNICATION DATA

5520 DATA ACQUISITION SYSTEM

5522 FIRE AND GAS DETECTION

5523 AUTOMATION / SUPERVISION AND OPERATION CONTROL

5591 AUTOMATION NETWORK

6410 FILLING STATION

# COMMISSIONING MONITORING AND CONTROL

## FIC

* + 1. SELLER shall use Commissioning and Integration Tool (FIC) and Certificare, both provided by BUYER.
    2. BUYER will provide the SELLER with the necessary number of licenses, initial support for operation and training.
    3. SELLER shall start FIC operation at least 30 (thirty) days calendar days prior to receipt of the first commissionable item at the site. Prior to the start of FIC operation, the professionals responsible for this activity shall have been mobilized and trained.
    4. SELLER shall keep FIC continuously updated as a result of field tasks compatible with the physical progress of the commissioning. The records shall be updated and certified through the signatures of the person responsible for the task, SELLER quality control team and BUYER’s inspection team.
    5. SELLER shall execute all commissioning activities and preservation tasks for each commissionable item registered on FIC. FIC documents such as, FVI/FVM and certificates, shall be available on system/subsystem commissioning data book.
    6. At discretion of the SELLER, it allowed the use of another commissioning control tool, but in this case, it shall develop the data integration with FIC. FIC or the replacing system indicated by BUYER as per item 7.1.9 are the only software tool recognized by BUYER to contractually certify the physical commissioning progress.
    7. All FVIs and FVMs (Field III and Field IV) shall be inspected, signed and uploaded to FIC system within 5 days after signature. All tests requested in FVIs and FVMs shall have certificates to be presented and uploaded to FIC system together with FVIs and FVMs.
    8. For all Piping Activities, it shall have total correspondence between Piping Folders and FIC FVMs.
    9. In case of FIC discontinuation, BUYER will provide a replacing system with similar features and workflows. All requirements indicated for FIC will remain valid for the replacing system and shall be complied by SELLER. Database migration from FIC to replacing system, if applicable, will be carried out by BUYER.

## Punch Items Control

* + 1. SELLER shall use BUYER Punch List Management System to control all punch items.
    2. BUYER will provide to SELLER the necessary number of licenses, and initial support for operation and training.
    3. SELLER shall provide the necessary resources to use BUYER Punch List Management System immediately after Agreement Effective Date.
    4. SELLER shall call BUYER to inspect system/subsystem in order to identify punch list in each phase: Mechanical Completion, Performance and Acceptance Tests (TAP-1 and TAP-2) and Subsystem Acceptance and Transfer Term (TTAS-1 and TTAS-2).
    5. The Following activities shall be done using BUYER Punch List Management System:
       1. Keep records of punch items updated.
       2. Make Punch items request records and follow-up reports.
       3. Monitor and inform BUYER about the progress of punch items resolution.
       4. After analysis conducted by inspection teams, analyze non-conformities found during the various stages of work, classify and treat prior to be recorded.
       5. Issue weekly based reports setting forth proposed action and schedule to correct non-conformities.
    6. SELLER undertakes to form a team for non-conformities correction since receiving stage, directly related to Commissioning.
    7. BUYER, at any time of the Agreement and in case of used software discontinuity, may provide an alternative software to replace BUYER Punch List Management System, with the similar features and workflows. In this case, SELLER shall comply with the same requirements indicated for BUYER Punch List Management System. System database will be supported by BUYER.

# COMMISSIONING SUPPLY

* 1. SELLER shall supply all materials, spares and resources for pre-commissioning, commissioning, operation tests and start up.
  2. SELLER shall supply all necessary gases and mixtures required to carry out contract scope of supply such as, but not limited to: nitrogen, helium, carbon dioxide, dry air, calibration gases, carrier gases for chromatograph, refrigerant gases, etc.
     1. SELLER gases supply responsibility for each system/subsystem goes until TAP-2 approval by BUYER at offshore phase.
  3. SELLER shall supply diesel oil for all Pre-Commissioning and Commissioning phase needs, including but not limited to, Turbo-Generators and Motor Generator daily operations, Diesel Equipment daily operation or commissioning tests, PMS (Power Management System) full tests including all parallel tests, loading sharing, loading shedding, full load tests of main turbo-generators and all other electrical generators, inclination tests and for all equipment that have to operate during the trip from Integration Yard to final offshore location.
  4. SELLER scope of supply regarding lubrication systems includes:
     1. Mineral/synthetic lube oil to be used on compressors and turbo-generators lubrication systems. Mineral according to specifications provided by BUYER and synthetic according to VENDOR’s requirements.
     2. All lube oil tanks fully loaded, plus 20% in storage drums at TTAS-1 for each specific system. This requirement of plus 20% is not applied to the main compressors and turbo generators mineral lube oil systems.
     3. Flushing oil, temporary pump, and all devices necessary to perform the flushing on the lube and hydraulic oil systems. The same fluid or lube oil defined on the vendor specifications for equipment operation shall be considered for flushing purpose. For use of a different lubricant oil from specification, BUYER shall be consulted, and the application is conditioned to BUYER’s and equipment vendor’s approval.
     4. A NAS analyzer shall be available in case of Oil NAS evaluation be required by vendor as a flushing approval condition. SELLER shall send oil samples to a certified LAB for analysis and present reports to ensure oil NAS, water content and other parameters as needed.
     5. Lubricant and hydraulic oil analysis in order to ensure integrity of all oil features described on the oil vendor datasheet. Oil analysis shall be performed after flushing and equipment tests accomplished during the commissioning.
     6. The following items shall be provided by SELLER, but not limited to:

1. Hydraulic fluids: All tanks fully loaded at TTAS-1 for each specific system.
2. Greases: Enough quantity for make up during 60 days of normal operations after TTAS-1 for each specific system.
   1. Turbo generator firefighting bottles recharge: After turbo generators firefighting systems tests the SELLER shall take into its account bottles recharge.
   2. SELLER is responsible for the supply of electric power for all pre-commissioning and commissioning activities, see temporary electrical power (according to items 4.5.20.1 to 5).
   3. SELLER shall supply electrical load banks compatible with thermographic tests, electrical generators tests and battery systems tests.
   4. All other commissioning consumables shall be considered under SELLER scope of supply.

# COMMISSIONING SPARE PARTS

* 1. SELLER shall provide commissioning spare parts to perform all commissioning and startup activities, as well as consumables for commissioning, including:

1. All consumables spare parts recommended by equipment and material vendors for the construction, testing, commissioning, pre-operation, and start-up phases, up to the TAP-2.
2. All special tools required for construction, pre-commissioning, commissioning and all levels of maintenance and operation.
3. All Commissioning and start-up spare parts defined in item 3.12 of this exhibit, as a minimum.
   1. All spare parts and special tools for commissioning and startup shall be in accordance with Manufacturers’ recommendation and Classification Society (C.S.) requirements.
   2. All spare parts and special tools, for commissioning and start-up shall be supplied along with the delivery of each piece of equipment at construction site.
      1. Spare parts with expiring date earlier than its expected applying date (such as special glues, greases, lubricants, chemicals, calibration gases and mixtures) may be delivered after the equipment, in timely manner to not delay the commissioning. Details about postponed items shall be clearly informed at spare part list, including its description, average expiring time (in months or years), and foreseen delivery date, before the respective equipment delivery. In case of any spare part expired by the time of its use, SELLER shall replace the expired item with no extra costs to BUYER.
   3. SELLER shall keep properly preserved, identified, and inventoried in the warehouse all spare parts and special tools for commissioning and start-up.

# APPENDIX

Appendix 1 – Minimum Conditions for acceptance and approval of performance tests of the unit

Appendix 2 -Vendor technical support for operation specialized support phase (offshore phase)

Appendix 3 - Handover Responsibilities

Appendix 4 - Guidelines for use of the FIC

## Appendix 1 - Minimum Conditions for Acceptance and Approval of Performance Tests of the Unit

1 - The Commissioning and Acceptance Procedures to be prepared by SELLER for the various Systems mentioned herein shall fulfill the Classification Society requirements for the certification of the UNIT.

2 - Besides the Classification Society Requirements, SELLER shall consider the following conditions of uninterrupted operation without defects, to be confirmed by BUYER’s representative during the Performance Acceptance Test (TAP).

3 - All Systems shall be tested under operating conditions, in compliance with the requirements of the Classification Society and/or other applicable regulatory bodies. For systems where the conditions are not defined by these Entities, the conditions of uninterrupted operation without defects to be complied with shall be agreed between BUYER and the SELLER. Additional requirements can be found in item 3.11.

4 - To reach acceptance of the Equipment/Systems Test Performance, the Design conditions and/or the conditions specified herein shall be achieved during the test period at offshore site.

5 - In case of any impossibility to follow strictly all described requirements on Appendix 1, SELLER shall submit a new proposal to BUYER’s approval.

| **SOP** | **SYSTEM DESCRIPTION** | **TAP-1 MINIMUM REQUIREMENTS**  **FOR ACCEPTANCE** | **TAP-2 MINIMUM REQUIREMENTS**  **FOR ACCEPTANCE** | **TAP-1** | **TTAS-1** | **TAP-2** | **TTAS-2** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1210 | WELL | Valves functional test (manual and choke valves stroke test, ESDVs opening/ closing maximum time, interlock tests for pig launching/receiving operations  HPU well loop cleanness final checking. | 120 hours operation after each SSOP starts its operation. | Shipyard | Shipyard | Offshore | Offshore |
| 1212 | CRUDE OIL AND GAS METERING | General checking on regulatory compliance and all system piping folders concluded. | 72 hours operation after flare out and conclusion of first fiscal metering calibration according to ANP requirements. Approval criteria for metering points to start operation after flare out shall be discussed during commissioning plan. | Shipyard | Shipyard | Offshore | Offshore |
| 1223 | PETROLEUM PROCESS | Plant Simulation as per item 3.11 of this Exhibit. | 240 hours operation after flare-out. Within this period both production trains and all standby equipment are to be tested (A, B, C, etc). | Shipyard | Shipyard | Offshore | Offshore |
| 1225 | VAPOR RECOVERY | Shipyard acceptance test (SYAT) as per 3.5 of this Exhibit. | According to Reliability Acceptance Test Criteria (SAT) described on item 3.5. | Shipyard | Shipyard | Offshore | Offshore |
| 1231 | GAS PROCESSING / HANDLING | Shipyard acceptance test (SYAT) as per item 3.6 of this Exhibit. | According to Reliability Acceptance Test Criteria (SAT) described on item 3.6. | Shipyard | Shipyard | Offshore | Offshore |
| 1233 | GAS DEHYDRATION GDU | GDU simulation as per items 3.11 and 3.19 of this Exhibit. | 120 hours operation running with process gas. | Shipyard | Shipyard | Offshore | Offshore |
| 1235 | CO2 REMOVAL | Valves functional test (manual and remote valves), including Cause and Effect Matrix.  Membranes cartridges loading, leak test executed after membranes assembly and N2 blanketing. | 120 hours of continuous operation without “trips” due to failures caused by system 1235 and achievement of parameters specified in detail design. | Shipyard | Shipyard | Offshore | Offshore |
| 1238 | HYDROCARBON DEW POINT | Simulation of HDPC system with compressors running test and water circulation in evaporator. | 120 hours operation per compressor after flare out | Shipyard | Shipyard | Offshore | Offshore |
| 1244 | WELL PIG LAUNCHERS | Simulate valves opening, closing and interlock tests for pig launching/receiving operations. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 1251.1 | WATER INJECTION | Water injection pumps running test to well riser connection, overboard or provisional alignment to produced water tank.  4 hours of operation per pump and filter.  As per item 3.11 of this Exhibit. | According to reliability acceptance test (SAT) criteria, described on item 3.16. | Shipyard | Shipyard | Offshore | Offshore |
| 1251.2 | WATER INJECTION - (SULPHATE REMOVAL UNIT) | Commissioning of equipment, valves and instruments, before membranes assembling. Obs: SELLER shall assemble Membranes in offshore phase. | 120 hours of continuous operation without “trips” due to failures caused by system 1251 and achievement of parameters specified in detail design. | Shipyard | Offshore | Offshore | Offshore |
| 1252 | GAS INJECTION | Shipyard acceptance test (SYAT) test as per item 3.6 of this Exhibit. | According to Reliability Acceptance Test (SAT) Criteria described on item 3.6. | Shipyard | Shipyard | Offshore | Offshore |
| 1254 | CO2  COMPRESSION | Shipyard acceptance test (SYAT) test as per item 3.6 of this Exhibit. | According to Reliability Acceptance Test (SAT) Criteria described on item 3.6. | Shipyard | Shipyard | Offshore | Offshore |
| 1261 | CHEMICAL INJECTION FOR OIL AND GAS | Pumps running test for line fresh water flushing from storage tank to all injection point. | 72 hours operation with definitive fluid including all stand-by equipment. | Shipyard | Shipyard | Offshore | Offshore |
| 1262 | CHEMICAL INJECTION FOR OILY WATER | Pumps running test for line fresh water flushing from storage tank to all injection point. | 72 hours operation with definitive fluid including all stand-by equipment. | Shipyard | Shipyard | Offshore | Offshore |
| 1263 | CHEMICAL INJECTION FOR INJECTION WATER / SEA WATER | Pumps running test for line fresh water flushing from storage tank to all injection point. | 120 hours operation with definitive fluid including all stand-by equipment. | Shipyard | Shipyard | Offshore | Offshore |
| 1300 | CONTROL AND MONITORING SYSTEM FOR RISERS SUPPORTS - BSDL (DIVERLESS BELL MOUTH) AND TSUDL (DIVERLESS UNIFIED SUPPORT TUBE) | Test and register the risers support actuation performance according to design documents using temporary HPU as driving force, during dry dock phase. | System functional test at integration yard, after connection to SUBSEA HPU and signals connected at M17 module.at M17 module.  System operational during pull-ins until flare out. | Shipyard | Shipyard | Offshore | Offshore |
| 1351 | HSHMS – HULL STRUCTURE HEALTH MONITORING SYSTEM | Functional test of the whole system from Main Panel and integration tests with Metocean, Loadmaster, navigation and digital twin dashboard. | TAP-2 covered by TAP-1 | Shipyard | Shipyard | NA | Offshore |
| 1353 | HELIDECK | Fire water and foam monitors functional test with sea water and foam.  Helideck shall comply with all NAVY requirements.  72-hour Helideck light test fed by UPS. | Helideck released for operation by Authorities. | Shipyard | Shipyard | Shipyard | Offshore |
| 1357 | MOORING | Mooring Chain / Wire / Rope  Fairlead readiness for offshore operations  Chain jack Functional test and movement to all slots | Conclude offshore mooring hook-up and final tensioning, and excess of chains disposal of all mooring lines  Mooring tension remote monitoring. | Shipyard | Shipyard | Offshore Note: onboard vendor supervision (1 mechanical and 1 E&I specialists) required during full hook-up and tensioning | Offshore |
| 1358 | CARGO TANKS, CARGO PUMPS AND VOID SPACES | Pressure, temperature, and level monitoring functional test.  Execute pneumatic pressure test with all manholes tanks check.  Valves functional tests.  4 hours functional test per cargo pumps. | First offloading operation concluded. | Shipyard | Shipyard | Offshore | Offshore |
| 1359 | OFFLOADING AND TELEMETRY | Hose and hawser reel launch/retrieval functional test including brake system.  All cargo pumps functional test with fresh water.  Regulatory compliance at Custody Metering Skid. | 3 offloading operations in accordance with item 3.11. | Shipyard | Shipyard | Offshore  Note: offloading and telemetry onboard vendors supervision for the first offshore system operation | Offshore |
| 5111 | SEA WATER | 4 hours operation test per pump.  Control valves test. | According to Reliability Acceptance Test (SAT) Criteria described on item 3.18. Conclude all deep seawater intake flexible hose assembly. | Shipyard | Shipyard | Offshore | Offshore |
| 5115 | FRESH WATER | 24 hours system functional test, encompassing storage tanks, living quarter and water distribution, including stand-by equipment.  Fresh water quality checking (ANVISA RDC Nº72, RDC Nº 91 and PRC 05/2017 Annex XX, NR-37). | 240 hours system functional test including modules utility stations. | Shipyard | Shipyard | Offshore | Offshore |
| 5121.1 | POTABLE WATER | Storage tanks, Mineralizer and UV Sterilizer, Hydrophore package, Living quarter and distribution potable water functional test.  Potable water quality test (ANVISA RDC Nº72, RDC Nº 91 and PRC 05/2017 Annex XX, NR-37). | ANVISA inspection and approval. | Shipyard | Shipyard | Shipyard | Offshore |
| 5121.2 | HYPOCHLORITE INJECTION | Pre commissioning and start-up test. | 240 hours full capacity system functional test with all hypochlorite injection points aligned | Shipyard | Offshore after pre-operation activities completion | Offshore | Offshore |
| 5121.3 | HULL MARINE GROWTH PROTECTION SYSTEM | 24 hours System Functional Test, including stand-by equipment operating. | 240 hours System Functional Test, including stand-by equipment operating. | Shipyard | Shipyard | Offshore | Offshore |
| 5122.1 | FRESH WATER MAKER | Pre commissioning and start-up test. | 240 hours system functional test with fresh water maker, including stand-by equipment. | Shipyard | Offshore after pre-operation activities completion | Offshore | Offshore |
| 5122.2 | FRESH WATER MAKER FOR OIL DILUTION | Pre commissioning and start-up test. | 240 hours system functional test with fresh water maker, including stand-by equipment. | Shipyard | Offshore after pre-operation activities completion | Offshore | Offshore |
| 5124 | COOLING WATER | 4 hours per pump system functional test.  General system test, running with all heat exchangers aligned.  Water quality test according to item 3.11. | 240 hours general system test after flare-out, running with all heat exchangers aligned, including stand-by equipment. Pressure drop through heat exchanger to be checked. | Shipyard | Shipyard | Offshore | Offshore |
| 5125 | HOT WATER | 4 hours per pump system functional test.  General system test with all heat exchangers aligned.  Water quality test according to item 3.11. | 240 hours general system test running with all heat exchangers aligned. Pressure drop through heat exchanger to be checked. | Shipyard | Shipyard | Offshore | Offshore |
| 5133.1 | DIESEL | 4 hours system functional test, recirculating diesel to storage and service tank, including al std by equipment.  System functional test during GTGs/Hull Auxiliaries Generators Full Load Test. | 120 hours offshore system operation. | Shipyard | Shipyard | Offshore | Offshore |
| 5133.2 | DIESEL (WELL SERVICE PUMP) | 4 h system functional test per pump in water closed circuit to test separator. | Complete well start-up procedures for first & second well. | Shipyard | Shipyard | Offshore | Offshore |
| 5134 | COMPRESSED AIR | 4 hours test for each compressor, including air quality checking (according to item 2.10 of I-RL-3010.2D-1200-940-P4X-001).  Opening and closing time for every valve (XVs, SDVs, BDVs) shall be inspected and recorded. | According to Reliability Acceptance Test (SAT) Criteria described on item 3.17. | Shipyard | Shipyard | Offshore | Offshore |
| 5135.1 | FUEL GAS | Valves functional test and all system piping folder conclusion. | 120 hours of operation of GTGs with specified gas. | Shipyard | Shipyard | Offshore | Offshore |
| 5135.2 | FUEL GAS (STRUCTURAL TANKS GAS RECOVERY COMPRESSOR) | Air Running test of compressors according to item 3.21. | According to Site Acceptance Test Criteria (SAT) described on item 3.21. | Shipyard | Shipyard | Offshore | Offshore |
| 5138 | START UP AIR | Vessel shall have capacity to start Emergency generator at least 3 times, without vessel repressure. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5139.1 | HYDRAULIC POWER UNIT  (VESSEL) | Hydraulic fluid cleanness and leak test approved.  Opening and closing time for every valve (XVs, SDVs) shall be inspected and recorded. All valves shall be evaluated together in Emergency condition (i.e., Multiple actuators returning hydraulic fluid at the same time) regarding opening and closing times, and results shall be recorded in order to ensure the system and valves are working as per design requirements. | 120 hours overall system operation after first oil. | Shipyard | Shipyard | Offshore | Offshore |
| 5139.2 | HYDRAULIC POWER UNIT  (TOPSIDE) | Hydraulic fluid cleanness and leak test approved.  Opening and closing time for every valve (XVs, SDVs) shall be inspected and recorded. All valves shall be evaluated together in Emergency condition (i.e., Multiple actuators returning hydraulic fluid at the same time) regarding opening and closing times, and results shall be recorded in order to ensure the system and valves are working as per design requirements. | 120 hours overall system operation after flare out, including XVs, SDVs. | Shipyard | Shipyard | Offshore | Offshore |
| 5139.3 | HYDRAULIC POWER UNIT  (SUBSEA) | Hydraulic fluid cleanness and leak test approved in all well tutu plates.  Execute individual test for each hydraulic line to confirm the correct line addressing (output at TUTU plate). | 120 hours operation after first oil. | Shipyard | Shipyard | Offshore | Offshore |
| 5143 | NORMAL ELECTRICAL DISTRIBUTION | Cubicle functional test | Uninterruptable 120 hours onshore operation after interlock tests among all panels. | Shipyard | Shipyard | Shipyard | Offshore |
| 5145 | NORMAL LIGHTING | Compliance with design for amount of light (illuminance) in all areas of UNIT (report shall be issued) | Uninterruptable 120 hours onshore operation within 3 months before UNIT sail away. | Shipyard | Shipyard | Shipyard | Offshore |
| 5147 | ELECTRICAL TURBO GENERATOR  (GTG – Gas Turbine Generator) | 4 hours Full load test of each turbo-generator and PMS (power management system), synchronism, load shedding, parallel operation and load sharing shall be tested among the Generators.  Obs: Load Banks/Transformers shall be kept till PMS/Load Shedding/Sharing/parallelism tests are concluded including all GTGs, Hull Auxiliaries Generators, Auxiliary Generator and Emergency Generator according to item 3.3, 3.10, 3.11 and 3.13 of this Exhibit. All Classification Society requirements also shall be considered. | 72 hours operation for each set including change over diesel x gas, according to item 3.10 and 3.11 of this Exhibit. | Shipyard | Shipyard | Offshore | Offshore |
| 5148 | ESSENTIAL ELECTRICAL DISTRIBUTION | Cubicles functional test. | Uninterruptable 120 hours onshore operation after interlock tests among all panels. | Shipyard | Shipyard | Shipyard | Offshore |
| 5149 | ESSENTIAL LIGHTING | Compliance with design for amount of light (illuminance) in all areas of UNIT (report shall be issued). | Uninterruptable 120 hours onshore operation within 3 months before UNIT sail away. | Shipyard | Shipyard | Shipyard | Offshore |
| 5241.1 | INERT GAS FOR CARGO TANKS BLANKETING | 12 hours system operating test per IGG, with diesel, including analyzer and remote valves functionality. | 24 hours offloading operation with fuel gas, and switch over diesel x gas | Shipyard | Shipyard | Offshore  Note: onboard vendor supervision for the first offshore system operation | Offshore |
| 5241.2 | N2 GENERATOR FOR PROCESS PLANT | 48 hours system operating test. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5241.3 | N2 GENERATOR FOR FLARE SYSTEM | 4 hours system operating test. | 48 hours offshore system operating after first oil. | Shipyard | Shipyard | Offshore | Offshore |
| 5241.4 | HYDROCARBON (HC) FOR CARGO TANKS BLANKETING | System operational simulation according to item 3.11 of this Exhibit. | Conclusion of 3 offloading operations with HC blanket system running. | Shipyard | Shipyard | Offshore | Offshore |
| 5251 | VENTILATION | 4 hours system operating test and compliance with design requirements. | 120 hours onshore system operation within 3 months before UNIT sail away. | Shipyard | Shipyard | Shipyard | Offshore |
| 5252 | AIR CONDITIONING | 4 hours system operating test and compliance with design requirements. | 120 hours onshore system operation within 3 months before UNIT sail away. | Shipyard | Shipyard | Shipyard | Offshore |
| 5261 | ELECTRICAL EMERGENCY GENERATOR | 4 hours Full load test of auxiliary generator and PMS (power management system), synchronism, load shedding, parallel operation and load sharing shall be tested among the Auxiliary/Emergency Generators and Gas Turbine Generators. According to item 3.3, 3.10, 3.11, 3.13 and 3.14 of this Exhibit. All Classification Society requirements also shall be considered. | Black start execution according to item 3.11. | Shipyard | Shipyard | Shipyard | Offshore |
| 5262 | ELECTRICAL AUXILIARY GENERATOR | 4 hours Full load test of auxiliary generators and PMS (power management system), synchronism, load shedding, parallel operation and load sharing shall be tested among the Auxiliary/Emergency Generators and Gas Turbine Generators. According to item 3.3, 3.10, 3.11, 3.13 and 3.15 of this Exhibit. All Classification Society requirements also shall be considered. | TAP-2 covered by TAP-1 | Shipyard | Shipyard | NA | Offshore |
| 5263 | UPS FOR EMERGENCY LIGHTING | Test discharge time check and autonomy tests.  Transfer Test automatic transfer between nobreaks.  Intensity test in all areas of UNIT. Also, dark areas shall be marked for correction. The lighting levels shall be according to the requirements of design technical specifications. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5264 | TELECOMMUNICATION POWER | Capacity and autonomy tests for battery banks and chargers.  ESD simulation test. | ESD Telecom simulation test including CSS system. | Shipyard | Shipyard | Onshore | Offshore |
| 5265 | DIRECT CURRENT AND UPS | Tests of rectifier, inverter (if any), battery bank at full load (or agreed amount, if  Not available) for 72-hour period of operation without failure.  Capacity Tests for all battery banks according to manufacturer and technical  Specification, checking the autonomy. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5266 | CARGO HANDLING | Crane Overload & Functional Test following design and Class requirements.  Material Handling Equipment load and functional test to check displacement and accesses, according to design and Class requirements. After test all equipment shall be hibernate.  Delivery related certificates. | 120 hours offshore operation only for main cranes. | Shipyard | Shipyard | NA | Offshore |
| 5267 | CATHODIC PROTECTION | FWD and AFT system functional test | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5268 | PULL IN / PULL OUT STATION | Pull-in System functional test including pull-in tensioning test at max design operational load.  Hard pipes, temporary PLR (Pig Launcher and Receiver) and Spool Pieces handling simulation. | Offshore riser pull-in and hook-up operations for 2 first oil production wells and first gas injection well. | Shipyard | Shipyard | Offshore  Note: onboard vendor supervision for the first oil production well pull-in | Offshore |
| 5271 | CARGO TANK CLEANING AND RECIRCULATION | Tank Cleaning System Functional Test with fresh water. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5310 | SEWAGE | 8 hours system functional test including collecting and treatment.  For TTAS-1 signature system shall be operational during Habitability Test at Shipyard. | 240 hours system functional test including collecting and treatment. | Shipyard | Shipyard | Offshore | Offshore |
| 5331 | PRODUCED WATER TREATMENT | Plant Simulation as per item 3.11 of this exhibit. | 120 hours continuous operation. | Shipyard | Shipyard | Offshore | Offshore |
| 5335 | BALLAST | Level s and valves functional test  4 hours functional test per ballast pumps | Conclusion of de-ballasting operation at final location. | Shipyard | Shipyard | Offshore | Offshore |
| 5336 | DRAINAGE / SLOP (OPEN DRAIN) | System Functional Test of topsides open drains systems using deluge water at design conditions flow rates.  Slop Treatment Unit commissioning. TOG analyzers calibrated and one complete operation discharge. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5336 | DRAINAGE / SLOP (CLOSED DRAIN) | System Functional Test of closed drain systems using water. | 120 hours operation  System functional test after flare out | Shipyard | Shipyard | Offshore | Offshore |
| 5412.1 | FLARE | Test lighting of flare pilots for all ignition methods. Repeat two times for each method. | 120 hours system operational after flare out. | Shipyard | Shipyard | Offshore | Offshore |
| 5412.2 | FLARE  (FGRS - COMPRESSION UNIT) | Air Running test of compressors according to 3.20. | According to Site Acceptance Test Criteria (SAT) described on item 3.20. | Shipyard | Shipyard | Offshore | Offshore |
| 5415 | ATMOSPHERIC VENT | System assembly in compliance with safety, design and Class requirements. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5423 | FIREFIGHTING WATER | Operation of pumps, fire monitors, deluge tests for all modules and areas according to NFPA 15, NFPA 20 and NFPA-25 together with drainage system. Pressure & Flow design requirement to be checked. Water mist systems are to be tested according to NFPA 25 and NFPA 750. Wet chemical fire extinguishing system are to be tested according to NFPA 17A and NFPA 96. | Overload test 150% to be executed according to NFPA 20. | Shipyard | Shipyard | Offshore | Offshore |
| 5424 | FIREFIGHTING FOAM | Operation of pumps, fire monitors and foam tests according to NFPA-11, NFPA-16 and NFPA-25 for all modules and areas. Pressure & Flow design requirement to be checked. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5425 | FIREFIGHTING INERT GAS | CO2 and IG-541 battery real discharge test according to NFPA 12 and NFPA 2001. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5428 | FIREFIGHTING PORTABLE EQUIPMENT | Confirm that all items are assembled and identified at field according to Safety Plan approved by Classification Society.  Submit valid certificates (INMETRO, NBR 12543, NBR 13716, NFPA 1852, IMO/SOLAS) according to item 4.5.22.6 from this Exhibit and present a control plan for all items. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5431 | LIFE SAVING | Life raft, lifeboat, and rescue boats launching and retrieving test and sea trial test. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5511.1 | TELECOMMUNICATION SPECIALIZED | Tools and instruments delivered, calibrated and individually tested as per manufacturer requirements. IT equipment delivered and connected to BUYER corporate LAN to be local and remotely used and tested, with their main functionalities available to be used. | Servers and computers shall be updated and re-entered corporate domain controller just before UNIT arrival at final location. | Shipyard | Shipyard | Offshore | Offshore |
| 5511.2 | TELECOMMUNICATION SPECIALIZED (PERSONNEL ONBOARD CONTROL SYSTEM - POB) | Systems activated with displays monitors in each muster point and desk computers installed with system software available to identify each trackable TAG delivered and spread everywhere around the unit.  WLAN System coverage completely tested and approved. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5512 | TELECOMMUNICATION TRANSMISSION | Functional tests and automatically switchover between AC to DC power and vice-versa. | VSAT Antennas balanced and cross polarization test successfully done with modems activated with final parameters from contracted provider, connected to BUYER corporate LAN.  LTE coverage at UNIT and around it, at offshore location. | Shipyard | Shipyard | Offshore | Offshore |
| 5513 | VIDEOCONFERENCE | Videoconference sessions terminated at and originated from BUYER corporative network, with image and intelligible audio. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5514.1 | CLOSED-CIRCUIT TELEVISION - CCTV | All cameras test presenting real images at display monitors (including mobile ones). Desk computers and mobile devices working with VMS software. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5514.2 | CLOSED-CIRCUIT TELEVISION – CCTV (VOICE AND VIDEO RECORDER FOR  EPTA-M) | Audio from aeronautical base stations, portable radios and CCTV helideck camera locally recorded and retrieved to external media to be presented synchronized. Records protected by password.  HMS system displayed and locally recorded. | Aeronautical base stations and portable radios configured with the final frequency homologated to operate in Brazil at site operation. | Shipyard | Shipyard | Offshore | Offshore |
| 5515.1 | OPERATIONAL RADIO | Capacity and autonomy tests for battery banks and chargers. Communication tests between radios (UHF and VHF). Automatically switchover between AC to DC power and vice-versa. | Equipment UHF configured with final allowed frequencies and other parameters to operate in site operation. Functionality coverage attended everywhere around the vessel, tested with mobile devices in the vessel for all frequencies. Remote channel access from BUYER corporate network. | Shipyard | Shipyard | Offshore | Offshore |
| 5515.2 | OPERATIONAL RADIO (GMDSS) | Capacity and autonomy tests for battery banks and chargers; parameters configured (IMO, MMSI, Call Sign). Radios voice tested. AIS tested and connected to BUYER's LAN. Inmarsat C tested. Printer tested. SSAS tested. SART radios self-tested. EPIRB self-tested. GDMSSS watertight test. Sealed batteries delivered. Automatically switchover between AC to DC power and vice-versa. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5515.3 | OPERATIONAL RADIO (AERONAUTICAL VHF) | Communication tests between radios. Automatically switchover between AC to DC power and vice-versa. | Equipment configured and locked with final allowed frequency and other parameters to operate at final location (offshore) tested between them and with mobile radios. Test between radios and helicopter witnessed by Brazilian Air Force or Navy. | Shipyard | Shipyard | Offshore | Offshore |
| 5516.1 | TELECOMMUNICATION VOICE | Incoming and outcoming call tests done locally and to Brazil. Automatically switchover between AC to DC power and vice-versa. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5516.2 | TELECOMMUNICATION VOICE  (SATELLITAL) | Telephone configured and available to operate by provider. Incoming and outcoming call tests done locally and to Brazil. | Functional tests to be done after service provider has been hired by BUYER. | Shipyard | Shipyard | Offshore | Offshore |
| 5517 | TELECOMMUNICATION DATA | Cables certified by calibrated certifier tool. Data equipment remotely accessed from BUYER Corporate network. WLAN coverage attended everywhere around the vessel and tested with mobile devices. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5518 | PUBLIC ADDRESS AND GENERAL ALARM (PAGA) | Capacity and autonomy tests for battery banks and chargers. Alarm and announcement tests done. Intelligibility of alarms and announcements successes reached. PABX interface test and remote access from Corporative Network successfully done. | TAP-2 covered by TAP-1 | Shipyard | Shipyard | NA | Offshore |
| 5521 | ENVIRONMENTAL MONITORING | Control panel commissioning and rack computer working with dedicated software. | 24 hours operations of system functional test of field environmental data acquisition including valid instruments calibration. ADCP, Wave radar and current meter tested on site operation with information displayed on monitors. | Shipyard | Shipyard | Offshore | Offshore |
| 5522 | FIRE AND GAS DETECTION | Individual test of all fire and gas detectors and its effects.  Report issuance for detectors compliance with design requirements. | Operation from sail away until flare out, considering treatment for all spurious actuations within this period. | Shipyard | Shipyard | Offshore | Offshore |
| 5523 | AUTOMATION / SUPERVISION AND OPERATION CONTROL | System and SOS screen functionality test along with all other TAP-1 systems/sub-systems execution. | System and SOS screen functionality test along with all other TAP-2 systems/sub-systems execution | Shipyard | Shipyard | Offshore | Offshore |
| 5524.1 | SUBSEA | Mechanical completion, panels assembled, cable termination and related tests. | SOS integration and testing according to Subsea requirements. | Shipyard | Shipyard | Offshore | Offshore |
| 5524.2 | SUBSEA  (RESERVOIR MONITORING – PRM) | Mechanical completion, all related cables laid up with certification, and all infrastructure for PRM SYSTEM accordingly to I-ET-3010.2D-5524-941-P54-001. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5529.1 | RISER MONITORING  (RIGID RISER) | Equipment powered, assembled, configured, and cabled to interface cabinet (located at Electrical and Automation Module).  Local cabling tests with certification.  Interface functional check. | Offshore interface functional tests (connectors, communication). | Shipyard | Shipyard | Offshore | Offshore |
| 5529.2 | RISER MONITORING (FLEXIBLE RISER -MODA) | Equipment powered, assembled, configured and cabled to main cabinet. Local cabling tests with certification, rack computer working with dedicated software.  System functional test and remotely accessed. | Equipment tested offshore after first flexible riser pull-in. | Shipyard | Shipyard | Offshore | Offshore |
| 5529.3 | SESDV SUBSEA EMERGENCY SHUTDOWN VALVE | System functional test. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 5537 | POSITIONING | Control panels configured, calibration certificates issued for sensors, rack computer working with dedicated software.  Execution of system topography measures. | Offshore telemetry test (DARPS, ARTEMIS and Fan bean test)  DGNSS and AHRS tested on site operation and other devices tested with real information displayed on monitors after first offloading. | Shipyard | Shipyard | Offshore | Offshore |
| 5590 | TELEVISION (TV) | Television set, STB functional tests with any content and UHF source. | Provider contracted and channels presented on all TVs. | Shipyard | Shipyard | Offshore | Offshore |
| 5591 | AUTOMATION NETWORK | Automation network integrated tests according to item 3.11. | Automation network operational until all TAP-2 systems/sub-systems conclusion | Shipyard | Shipyard | Offshore | Offshore |
| 5592 | TELECOM TOWER | Telecom tower assembled with antennas and trays assembled and painted. | TAP-2 covered by TAP-1. | Shipyard | Shipyard | NA | Offshore |
| 6410 | FILLING STATION | 3 launching and retrieving system functional dry test | Water and diesel bunkering system functional test. | Shipyard | Shipyard | Offshore | Offshore |
| 8215 | HOSPITAL | System functional test of hydraulic and pneumatic pipes, including oxygen system and alarm test.  Arrangement installation according to design requirements. | Final handover to BUYER 3 months before sail away to final location. | Shipyard | Shipyard | Shipyard | Offshore |
| 8217 | COMMUNICATION CENTRAL STATION | Arrangement installation according to design requirements, including boards. | Final handover to BUYER 3 months before sail away to final location | Shipyard | Shipyard | Shipyard | Offshore |
| 8221 | CENTRAL CONTROL ROOM | Arrangement installation according to design requirements, including boards. | Final handover to BUYER 3 months before sail away to final location. | Shipyard | Shipyard | Shipyard | Offshore |
| 8224 | MAINTENANCE WORKSHOP | Workshop equipment and installations compliance with legal requirements, including NR-12. | Final handover to BUYER 3 months before sail away to final location. | Shipyard | Shipyard | Shipyard | Offshore |
| 8226 | WAREHOUSE | Warehouse equipment and installations checking. | Final handover to BUYER 3 months before sail away to final location. | Shipyard | Shipyard | Shipyard | Offshore |

## Appendix 2 - Vendor Technical Support for Operation Specialized Support Phase

| **SOP** | **System Description** | **Vendor Support for Operation Specialized Support Phase (h)** |
| --- | --- | --- |
| 1212 | CRUDE OIL AND GAS METERING | 84 |
| 1225 | VAPOR RECOVERY UNIT VRU | 336 |
| 1231 | GAS PROCESSING / HANDLING | 672 |
| 1233 | GAS DEHYDRATION GDU | 168 |
| 1235 | CO2 REMOVAL | 84 |
| 1238 | HYDROCARBON DEW POINT | 168 |
| 1251 | WATER INJECTION | 168 |
| 1252 | GAS INJECTION | 336 |
| 1254 | CO2 INJECTION | 336 |
| 1357 | MOORING | 84 |
| 1358 | CARGO TANKS, CARGO PUMPS AND VOID SPACES | 84 |
| 1359 | OFFLOADING AND TELEMETRY | 84 |
| 5111 | SEA WATER | 84 |
| 5133.2 | DIESEL – WELL SERVICE PUMP | 168 |
| 5134 | COMPRESSED AIR | 168 |
| 5135.2 | FUEL GAS - STRUCTURAL TANKS GAS RECOVERY COMPRESSOR | 84 |
| 5139.2 | HYDRAULIC POWER UNIT - TOPSIDE | 168 |
| 5139.3 | HYDRAULIC POWER UNIT- SUBSEA | 168 |
| 5147 | ELECTRICAL TURBO GENERATOR  (GTG - Gas Turbine Generator) | 672 |
| 5241.1 | INERT GAS for Cargo Tanks blanketing | 168 |
| 5241.2 | N2 Generator for Process Plant | 168 |
| 5261 | ELECTRICAL EMERGENCY GENERATOR | 168 |
| 5262 | ELECTRICAL AUXILIARY GENERATOR | 168 |
| 5265 | DIRECT CURRENT AND UPS | 168 |
| 5266 | CARGO HANDLING | 168 |
| 5268 | PULL IN / PULL OUT STATION | 336 |
| 5412 | FLARE and FGRS | 168 |
| 5522 | FIRE AND GAS DETECTION | 168 |
| 5523 | AUTOMATION / SUPERVISION AND OPERATION CONTROL | 336 |
| 5591 | AUTOMATION NETWORK | 336 |

**Notes:** 1 - Vendor technical support window (days) and start counting period will be considered separately for each SSOP (to be broken down).

2- Total manhour here presented does not consider mobilization/demobilization time.

## Appendix 3 - Handover Responsibilities

| **SHIPYARD** | | | **FINAL OFFSHORE LOCATION** | **FINAL OFFSHORE LOCATION** | | |
| --- | --- | --- | --- | --- | --- | --- |
| **System Activities** | **TTAS-1 Not Signed** | **TTAS-1  Signed** | **Unit Handover** | **TTAS-1 Not Signed** | **TTAS-1 Signed** | **TTAS-2 Signed** |
| **Operation** | SELLER | SELLER | NA | BUYER | BUYER |
| **HSE Standards & Management** | SELLER | SELLER | BUYER | BUYER | BUYER |
| **Planned Maintenance** | SELLER | SELLER | SELLER | BUYER | BUYER |
| **Commissioning Spare Parts and Consumables** | SELLER | SELLER | SELLER | SELLER, until TAP-2 | BUYER, from TAP-2 |
| **Commissioning Activities** | SELLER | SELLER | SELLER | SELLER, until TAP-2 | NA |
| **General Cleaning, Preservation and Hibernation** | SELLER | SELLER | SELLER | BUYER | BUYER |
| **Corrective and not planned Maintenance caused by failures** | SELLER | SELLER | SELLER | SELLER | Warranty |
| **Vendor Technical Support for operation specialized support phase** | NA | NA | NA | SELLER APPENDIX 2 | SELLER APPENDIX 2 |
| **Vendor Technical Support for pre-commissioning and commissioning** | SELLER | SELLER | SELLER | SELLER | NA |

## [PE-2SRG-00299 - EXECUTAR ATIVIDADES DE FISCALIZAÇÃO DE CONTRATOS NAS IMPLEMENTAÇÕES DE SISTEMAS DE SUPERFÍCIE, REFINO, GÁS, ENERGIA E LOGÍSTICA](https://rjln202.petrobras.com.br/SINPEP/REST/sinp_ptrl_p.nsf/xp_padrao_portal.xsp?urlpadrao=http://RJLN202.petrobras.com.br/SINPEP/REST/DP%26T/SINP_MODP_R_P_DPT.NSF&E0114D68584D5617832583FD00691327" \t "_blank) Appendix 4 - Guidelines for use of the FIC

### Objectives and main characteristics

Major goals of FIC are to provide means to monitor, ensure traceability and allow extraction of useful information to help decision makers to optimize the management of the commissioning process.

Main Features:

* Control of assembly and commissioning activities of tagged items and systems;
* Preservation control;
* System available on the web;
* Access control per user;
* Different access profiles;
* Ability to bulk load of project information data;
* Does not control manufacturing activities;
* Does not control untagged items.

### Commissioning Process

Linha do tempo

Descrição gerada automaticamente

### Project hierarchy

Diagrama

Descrição gerada automaticamente

Commissioning Documents: the tool controls 100% of the commissionable items and commissioning verifications required for Offshore Units.

* One FVI for each TAG;
* One FVM for each Loop Check;
* One CCM for each SSOP;
* One TAP for each SSOP or set of SSOPs;
* One TTAS for each SSOP;
* A TTI for the Unit.

Preservation:

* Preservation plans by equipment class;
* Preservation routines for each commissionable item during the project lifecycle;
* Preservation plans shall be customized according to vendor recommendations.

### Detailing of definitions for FIC purposes

**TAG:** It is the type of registration used for all \*project equipment that will undergo commissioning activities. For each registered TAG, a classification (equipment family) is assigned. It is understood as equipment: instruments, instrumented valves, panels, dynamic equipment, static, etc.

**Commissionable Item:** Record related to a project TAG, saves the details of the actual equipment (asset). In case of irreparable damage, the Commissionable Item is canceled, and another Item is created for the same TAG. The entire asset lifecycle (inspections and preservations) is stored in relation to the Commissionable Item, even if it has been replaced.

**Lines:** Pipelines or circuits (electrical, instrumentation or telecom).

**Loop:** group of components with the objective of performing tests, such as STH (pipelines), blank test (circuits and electrical equipment), loop test (instruments, instrumented valves, circuits).

**Operational Systems (SOP) and Sub-systems (SSOP):** group of equipment, instruments, pipelines, circuits, etc. that works physically or logically together to develop a certain process function in the UNIT. SSOPs are smaller groups, fractions of their parent SOPs, that perform functionality of the same nature, but with a more specific scope.

**FVI or ICS (Item Check Sheet):** document related to the Commissionable Item/TAG, which covers all inspection activities of the item from its receipt to functional tests. In addition to completing the tasks, quality reports and evidence produced in the inspections should be attached, **or preferably linked,** in the respective stages of the FVI, they are:

* Receiving (Field 2);
* Technical Inspection (Field 2);
* Mechanical Inspection (Field 3 and 4); and
* Functional Tests (Field 5).

**FVM or LCS (Loop Check Sheet):** similar to FVI but related to the loop, with the difference that the FVM starts in mechanical inspection after assembly. As well as the FVI, quality reports and evidence produced in the inspections and tests should be attached, **or preferably** **linked,** to the respective stages of the FVM. FVMs have the following steps:

* Mechanical Inspection (Field 3 and 4); and
* Functional Tests (Field 5).

**Receiving (Field 2):** It is the quantitative receipt of the Commissionable Item, at the construction and assembly site and for this it is sufficient to inform the date of receipt and the responsible (if the documentation has been delivered, this information can also be included). After that FIC will allow the activation of the preservation for the Commissionable Item received.

**Technical Inspection (Field 2):** Set of technical inspections to identify the suitability with design documents (technical specifications, data sheets, etc.) and visual inspection to evaluate the condition of the Commissionable Item upon received. The Receive Inspection Report (RIR) should be linked as evidence. Commissionable Item information such as manufacturer, model, serial number shall be recorded at FIC by the inspector.

**Mechanical Inspection (Field 3 / 4):** Inspection activities that attest to the proper mechanical assembly, in the field, of a Commissionable Item (ICS) or a Loop (LCS). Field survey to be realized by SELLER and approved by BUYER. For ICSs and LCSs SELLER shall present to BUYER, all necessary documentation to fulfill each item on ICS or LCS, including punch list.

**Functional Tests (Field 5):** Set of inspections and tests, carried out separately in Commissionable Items (FVI) or Loops (FVM).

**CCM (Certificate of Mechanical Completion):** Term that attests the mechanical assembly of the sub-system.

**Preservation:** Activities carried out on Commissionable Items to prevent accelerated deterioration, caused by exposure to environmental conditions, and protection against potential damage by the dynamics of the work or handling of loads. The preservation of a Commissionable Item can be activated after the Item has been received and extends until the transfer of the respective system occurs. The activities of each preservation plan are based on the class defined for the TAG and customized according to vendor recommendations. Preservation Orders are automatically generated weekly, based on the frequencies of each Item preservation plan activity, and shall be executed within one week. The Status of the Commissionable Item defines the preservation plan (Warehouse, Field or Operation), each of these plans can contain different tasks and different frequencies for its tasks. When there is preservation plan defined by manufacturers, these shall be customized in FIC and prevail over the activities available by default.

**Punch item:** It is any activity not carried out as planned, carried out in a non-conformance manner or in disagreement with the project. BUYER Punch List Management System is the system that manages them and FIC works integrated to it. Pending issues are registered with the attribute “impeditive to” where the commissioning step that this punch item impacts (CCM, TAP, TTAS or TTI) is recorded and thus FIC will not allow the progress of a certain step until the impeditive punch item is solved.

### Hierarchy of records at FIC

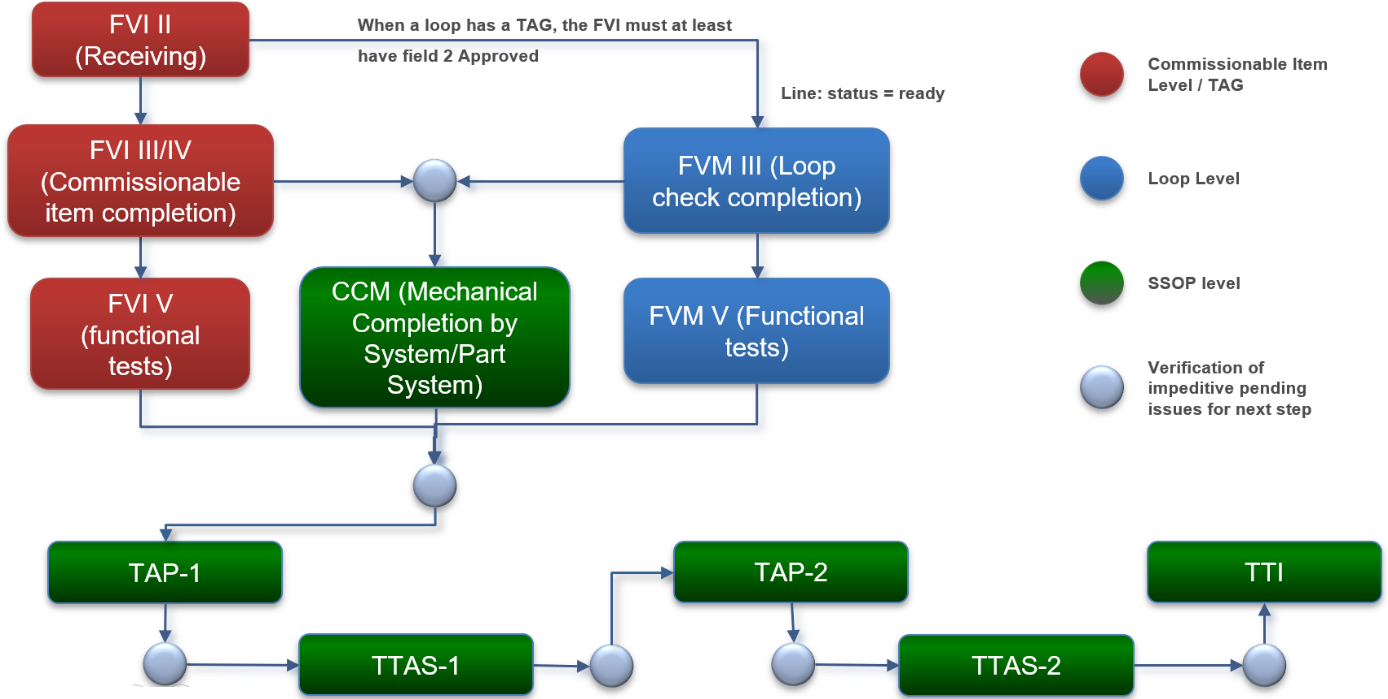
Gráfico

Descrição gerada automaticamente

* Every SSOP shall necessarily have at least one TAG;
* A SSOP may not contain only Lines;
* Gráfico

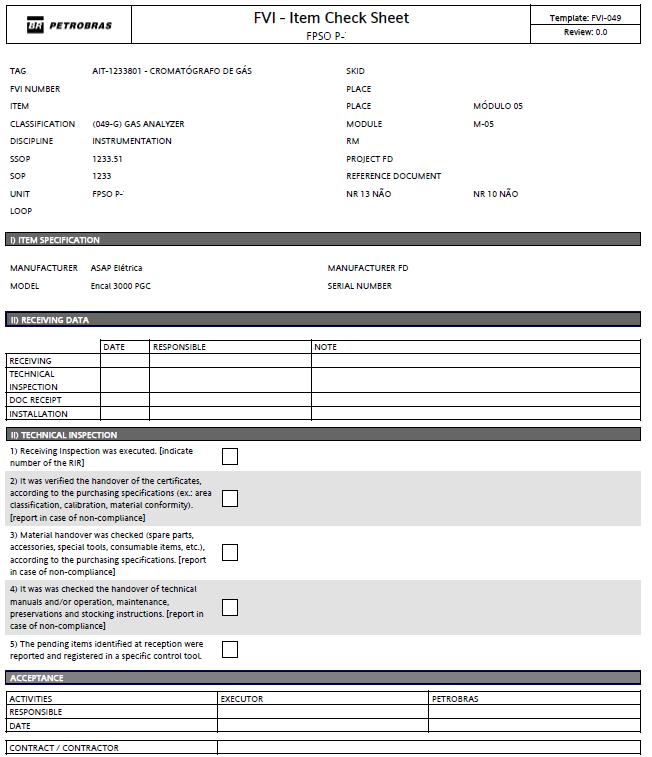
  Descrição gerada automaticamenteLoops are not directly associated with SSOPs, this relation happens through its child components;
* Every Line shall be associated with a Loop;
* TAGs may but should not necessarily be associated with a loop;

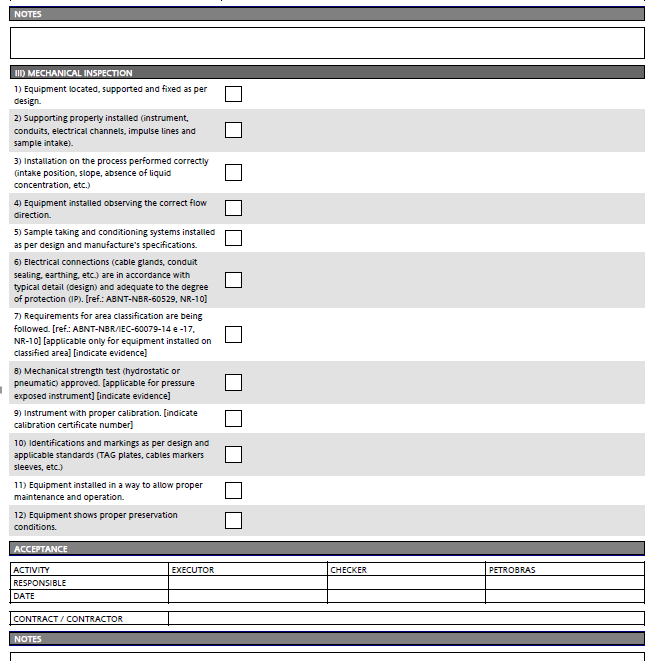
### Workflow of the commissioning process at FIC



### FVI Example (Item verification Sheet)

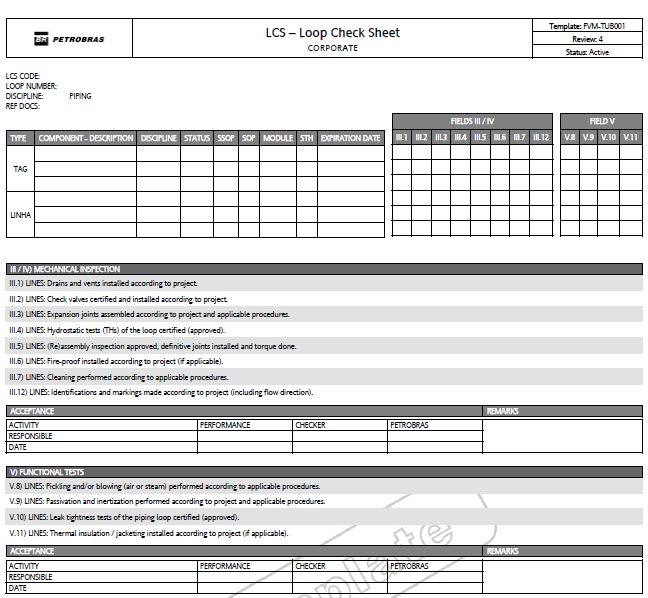
An illustrative example of FVI (Item Verification Sheet) follows.





### FVM Example (Loop Check Sheet)

An illustrative example of FVM (Loop Check Sheet) follows.



## Appendix 5 - Identification of elements with QR-CODE

SELLER shall provide the identification of commissionable items through QR-CODE. The QR-CODEs shall be generated through a system provided by BUYER or in a SELLER’s system approved by BUYER.

Each QR-CODE shall contain at least the following information:

**Unit:** Unit ID

**TAG:** Element code (equipment/instrument) in the design

**Class:** Equipment class (FIC Class)

**IC:** ID and description of the commissionable item (information extracted from the FIC)

**Manufacturer**: Equipment manufacturer

**Serial Number:** Equipment serial number (if any)

**NM code**: NM code at BUYER’s system - SAP (if available)

**Module:** Module identifier (when applicable)

**SSOP:** SSOP code to which the equipment belongs

**URL:** Internet address where detailed information about commissioning tasks about the element can be found, containing the performed and scheduled tasks related to it. Whenever possible the URL should be shortened. This URL will be provided by the BUYER, containing all the information provided. Major goals of FIC are to provide means to monitor, ensure traceability and allow extraction of useful information to help decision makers to optimize the management of the commissioning.