**EXHIBIT III**

**DIRECTIVES FOR PRODUCT DEVELOPMENT**

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

**SUMMARY**

[1 GENERAL 3](#_Toc160801434)

[2 REFERENCE DOCUMENTS 4](#_Toc160801435)

[3 COMMUNICATION 5](#_Toc160801436)

[4 PLANNING AND CONTROL ACTIVITIES 7](#_Toc160801437)

[5 DOCUMENT STATUS 10](#_Toc160801438)

[6 ISSUE AND PROCESSING OF DOCUMENTS 12](#_Toc160801439)

[7 DEFINITION OF FLEXIBILITY OF DOCUMENTATION 15](#_Toc160801440)

[8 GENERAL GUIDELINES FOR ENGINEERING DESIGN 17](#_Toc160801441)

***Appendix 1 – STRUCTURE OF THE BUYER CODE NUMBER SYSTEM***

***Appendix 2 – technical query form model***

***Appendix 3 –Vendor Design Analisys (VDA) MODELS***

***Appendix 4 - DOCUMENT DESIGN ANALISYS (dda)***

***Appendix 5 – N-381***

***APPENDIX 6 – ENDORSEMENT REPORT FORM - MINIMUM INFORMATION***

***APPENDIX 7 – ENDORSEMENT TQF VALUATION PROGRESS***

# GENERAL

## This Exhibit defines the minimum requirements to be followed by SELLER and its Subcontractors in carrying out all phases of SELLER’s Engineering Scope for UNIT.

## Engineering Scope includes at least, but is not limited to, the following:

### Execution of the Engineering Scope, following this Agreement and its Exhibits.

### Management of all phases and division interfaces of Engineering scope, considering Engineering Design Company (EDC), Engineering Subcontractors and Equipment vendors and subcontractors, Technical Bid Evaluations (TBE), the issuance of Contracts and engineering documents, vendors’ engineering documentation, equipment/materials certification, follow up of all manufacturing activities and coordination of all final documentation.

#### SELLER is responsible for vendor documents compliance with the basic design specification in all technical division of FPSO and the final equipment/system delivery shall fully comply with international rules and basic design requirements.

## 1.2.2.2 Seller shall have knowledge and resources of engineering to follow up all vendor documents and equipment/system supply during all phases, mainly during vendor technical proposal until final delivery.

### Technical support for construction, assembly, erection, pre-commissioning, commissioning, pre-operation, performance tests and start-up phases, of all systems, as well as acquiring all necessary data to issue the final “as-built” documentation for the whole UNIT, control of all engineering changes implementation on the field.

### Provide the “as-built” for documentation issued under SELLER’s Scope of Supply.

### Technical engineering support for all phases of this Agreement, including the offshore phase in Brazil, as well as management, registration, and acquisition of all data necessary for the issuance of the final drawings and as-builts.

### SELLER shall keep an engineering team considering all disciplines supporting the whole performance of this Agreement.

### Verification of the documents delivered by BUYER as per item 8.2 - Endorsement of the Documents Delivered by Buyer.

### Management of all interfaces between Engineering of Equipment (including those delivered by BUYER)/ Components/ Systems/ Modules/ Hull, also comprising Engineering documentation verification, follow up of all manufacturers’ and subcontractors’ activities, at their job sites, and coordination of all Engineering design activities up to the completion of the UNIT.

### SELLER shall perform a complete HAZOP (Hazard and Operability Study), a PHA (Preliminary Hazard Analysis), Consequence Analysis and any other related studies required for Health, Safety and Environmental (HSE), for the FPSO including the package units and its Subcontractors as per described in item 8.12 – HSE Design.

#### These activities shall be subcontracted by the SELLER to a specialized engineering company previously submitted by the SELLER for BUYER’s approval. SELLER shall implement all recommendations deriving from these studies in the Engineering without any impact in schedule or extra cost to BUYER. In case the recommendations arise from any changes in Legislation, Brazilian Regulation or Safety Standards occurred during the contract execution, it shall be dealt according to the extent of responsibilities stated in Exhibit XIV - Directives for Claims and Change Orders.

## SELLER’s Engineering scope shall be carried out by a single Engineering Design Company (EDC), also acting as engineering development/integration entity for the complete SELLER’s Scope of Supply managing all interfaces with all engineering Subcontractors. BUYER may accept more than one Subcontracted Engineering company (e.g.: one for the hull design and a second one for the topsides design), but they all shall respond to the single EDC.

### SELLER shall select the Engineering Design Company(ies) respecting the criteria defined below:

#### If SELLER decides to subcontract the hull engineering design with a company other than the single EDC, this Subcontractor shall comply with item 19.1.4.1.2. of the PSA.

#### If SELLER decides to subcontract part of the modules engineering design with a company other than the single EDC, this Subcontractor shall comply with item 19.1.4.1.1.2. of the PSA.

#### The single EDC shall comply with items 19.1.4.1.1. and 19.1.4.1.1.1., as well as items 19.1.4.1.1.2 for all modules it will execute the detailed engineering design and 19.1.4.1.2 if they execute the hull’s detailed engineering design.

### Disregarding the numbers of sites, the SELLER shall guarantee that all design divisions (Subcontracted Engineering Companies) are represented at all the construction sites.

### SELLER shall be responsible for the final documentation, including those from Subcontractors, Vendors, Classification Society and Marine Warranty Surveyor.

## BUYER will hand over all original Basic Design documents to SELLER during BID, therefore SELLER shall make use of, revise, and complement this documentation to carry out the Engineering development, providing detailed documentation and generating any other documents related to the SELLER’s Scope of Supply, for the issuance of all documents required for safe and successful completion of the whole UNIT, as specified in this Contract.

### BUYER will deliver to SELLER all electronic files related to the last revision of Basic Design documentation, so that SELLER can carry out the Engineering development from these electronic files.

## The exercise of commenting, releasing or not comment the documents submitted to BUYER, does not exempt the SELLER from the responsibility of carrying out its scope under the terms of the Contract.

## Capitalized terms used but not defined herein shall have the meanings given in the Contract.

# REFERENCE DOCUMENTS

## ISO 9001:2015 - Quality Management Systems.

## IMO (International Maritime Organization) regulations.

## Marpol (International Convention for the Prevention of Pollution from Ships) regulations.

## SOLAS (International Convention for the Safety of Life at Sea) regulations.

## Classification Society Rules.

## ANVISA (Agência Nacional de Vigilância Sanitária) regulations.

## ANP (Agência Nacional do Petróleo) regulations.

## INMETRO (Instituto Nacional de Metrologia, Qualidade e Tecnologia) regulations.

## Brazilian Government Regulatory Norms (NR), such as, but not limited to:

### NR-10 - *Segurança em Instalações e Serviços em Eletricidade.*

### NR-12 – *Segurança no Trabalho em Máquinas e Equipamentos*.

### NR-13 - Caldeiras, Vasos de Pressão, Tubulações e Tanques Metálicos de Armazenamento.

### NR-17 – Ergonomia.

### NR-37 – *Segurança e Saúde em Plataformas de Petróleo.*

## NORMAM - Normas da Autoridade Marítima do Brasil.

## SGSO – Sistema de Gerenciamento da Segurança Operacional as per ANP resolution 43/2007

# COMMUNICATION

## All correspondence shall be issued in English and shall follow the Communication Plan to be agreed between BUYER and SELLER.

## All letters, and other correspondence shall address a single topic, which shall be clearly indicated at the top of the document.

## SELLER shall deliver to BUYER copies of all technical correspondence and documentation exchanged between SELLER and the Classification Society. SELLER shall send these correspondences according to Appendix 1 - Structure of the Buyer Code Number System of this Exhibit. Correspondences between SELLER and Classification Society shall be sent to BUYER at the same time as they are issued or received by SELLER.

### All signed and/or stamped documentation exchanged between SELLER and Classification Society, between SELLER and any other Subcontractor (Vendor and Engineering Scope), and between SELLER and BUYER shall be delivered to BUYER in electronic scanned format, with the necessary information, as required at item 6.3.2 of this Exhibit.

### SELLER shall submit for BUYER approval the Contract between SELLER and the Classification Society.

### SELLER shall guarantee that all Vendors and Subcontractors celebrate specific contracts allowing Classification Society to send to BUYER these correspondences when requested.

## SELLER shall deliver to BUYER copies of all technical procedures, reports, certificates, and letters exchanged between SELLER and the Marine Warranty Surveyor (MWS) according to Exhibit I – Scope of Supply.

### Certificates and letters exchanged between SELLER and Marine Warranty Surveyor (MWS) shall be sent to BUYER at the same time they are issued or received by SELLER.

### All signed and/or stamped documentation exchanged between SELLER and Marine Warranty Surveyor (MWS) shall be delivered to BUYER in electronic scanned format, with the necessary information, as required at item 6.3.2, of this Exhibit.

## BUYER reserves the right to participate in any meeting/ Works held among SELLER, Classification Society, and any other Subcontractor. SELLER shall advise BUYER within 4 (four) days in advance of the date, local, subject and way to connect to the meetings.

## Requests for technical clarification shall be made in writing, using a Technical Query Form (“TQF”), which shall be issued with appropriate BUYER Code Numbers for each subject. SELLER shall not use this document as Change Order Request of the Design Documentation.

### TQFs will be answered within 10 (ten) workdays from the date they are received and shall be prepared according to the model attached as Appendix 2 of this Exhibit.

### Each TQF shall address only one specific subject.

### TQF shall be issued only once. No TQF revision will be accepted. If additional clarification is required, a new TQF shall be issued.

## Technical documents, such as drawings, technical specifications, Contracts, studies, Technical Query Form (TQF), database, calculations, and meeting notes, shall be delivered with a transmittal form. Transmittal Form shall be prepared according to the model attached as Appendix 1 - Structure of the Buyer Code Number System, of this Exhibit.

### All transmittal forms shall be delivered in 1 (one) electronic copy, with a confirmation of received.

## Whenever a change is proposed or recognized in the development of the Engineering or any other phase, a Change Order (CO) or Claim may be issued as described in Exhibit XIV – Directives for Claims and Change Orders. SELLER shall not use a TQF, for example, as a document for a Change Order or Claim request.

## Every document delivered to BUYER from Classification Society shall be transmitted in electronic format (original version editable and PDF version searchable) using Classification Society’s documentation exchange web system to be included at BUYER’s EDM (Electronic Document Management) database following the Exhibit XVI - Computational Tools and Integrated Management System.

## All verbal communications or emails, whenever required, shall be confirmed as soon as possible by letter or meeting notes.

## Meetings between BUYER and SELLER shall be scheduled, for both technical and administrative discussions in a frequency to be agreed between BUYER and SELLER, according to the project needs.

### Meeting notes, issued immediately at the end of each meeting, shall formalize all subjects discussed and shall be signed by all attendees (using digital signature process whenever possible). Meeting notes do not formalize contract scope, schedule, or price changes - a formal amendment, as defined in the Contract, will be necessary for that.

### The meeting notes shall have proper sequential numbers according to the hosting party.

# PLANNING AND CONTROL ACTIVITIES

## SELLER shall submit to BUYER for approval, within thirty (30) Days from Agreement Effective Date, one (1) electronic copy (in an editable file) of its Engineering Planning and Control Documents, including the following:

### “General Engineering Design Work Plan”, which shall include:

#### A section that clearly outlines the interplay (interdependence) of various activities and events, along with the percentage of each activity compared to the complete design.

#### A section with Documents Detailed Schedule Plan, comprising the documents development along Engineering duration, BUYER document number, SELLER document number, document title, issue date, issue status, starting date, and the final date for each discipline pursuant to a detailed schedule, indicating the status of the documents which shall be submitted and the documents that shall be approved by BUYER, Classification Society and Marine Warranty Surveyor. The dates shall comprise the forecasted and actual ones.

#### SELLER shall inform BUYER on a weekly basis the list of the outstanding items and Hold Points from BUYER and SELLER for engineering development and on a monthly basis for Hold Points and documentation status from Classification Society.

#### A Quality Assurance and Control Plan following Exhibit VII - Directives for Quality Assurance System and Exhibit VIII - Directives for Commissioning, of this Contract.

#### Engineering Organization chart structure.

#### Name of the person responsible for each function and number of specialists for each discipline.

#### A Subcontract Plan section with above-mentioned information for each Subcontractor.

#### A section with the complete Design Interface Matrix for each Subcontractor, BUYER, Classification Society and Marine Warranty Surveyor (MWS).

#### Engineering manpower, mobilization schedule, critical path.

#### Physical documents progress schedule.

#### Logistic requirements for job completion.

#### Infrastructure requirements for job completion.

#### Design Work Plan (DWP) including all interfaces (interdependence) among activities and events necessary for job completion. DWP shall indicate all Critical Interfaces that can produce delays in the project milestones.

#### NOT APPLICABLE

#### Interfaces in which BUYER will be responsible shall be clearly defined, including, in accordance with BUYER representatives, the time frame established for comments or approvals.

#### DWP shall indicate the physical percentage of each activity related to the whole job.

#### NOT APPLICABLE

#### Documents transmittal and documents approval procedure.

#### Main Milestones from the procurement plan in connection with documents issue date.

#### List of Job leaders, i.e., the responsible engineer for each Design discipline.

#### Technical requirements, i.e., technical aspects that shall be complied with.

### A Master Deliverable Document List shall be submitted to BUYER monthly. This list shall include the minimum information as follows:

#### BUYER document numbers.

#### SELLER document numbers.

#### Document titles.

#### The latest revision issued.

#### The date of the previous revision.

#### The date for the next revision.

#### The purpose of issue, as per item 5.

#### NOT APPLICABLE.

#### The date to be sent to Classification Society.

#### The purpose of issue for Classification Society (as per CS rules).

#### Module, System and Subsystem related.

#### NOT APPLICABLE.

#### The transmittal form, for the Classification Society, for the Marine Warranty Surveyor (MWS) and the received number and status of corresponding memoranda.

#### Indication of which documents will be issued from 3D Model and 2D Computer Aided Engineering (CAE) Tool.

### Engineering Interfaces Management Procedure.

### Management of Changes Procedure and System

#### SELLER shall carry out a change management process applied to the execution phases of the engineering activities to ensure that all changes occurring during the design, supply, construction, assembly, commissioning, and pre-operation phases are properly identified, analyzed and the risks introduced by them are analyzed, evaluated, and controlled.

#### Change management shall be systematically implemented in the various stages of the project, in a traceable and registered way. Change management shall also include actions to ensure that potentially affected project disciplines are notified of the change and that relevant documents are kept up to date.

#### SELLER must have a change management system, which shall include, at a minimum:

#### Change management of safety studies: guaranteed, at any time during the execution of the project, that safety studies, and all aspects related to these, are representative and appropriate to the installation.

#### Management of recommendations from safety studies: management of recommendations shall ensure that all recommendations generated by safety studies are addressed until the start of the installation's operation.

#### Management of field modifications: this management shall ensure that field modifications are addressed, and the technical documentation updated until the start of the installation operation.

#### An automatic workflow for the approval process of all the parties involved, including the BUYER representatives. The workflow shall be designed and agreed in the engineering kick off meeting.

#### The change management system shall indicate for each change the record of the assessment and whether the change impacts the safety studies. If there is any impact, the necessary revisions shall be issued.

#### SELLER's change management system shall allow the issuance of partial reports for BUYER consult at any time. SELLER shall issue a final report at the end of the project with the content of the entire change system.

### A second master document list shall contain references to the numbering of the VENDORS' document lists and shall be submitted monthly to the BUYER.

### The Change Management System must be fully implemented and be available 60 days from Agreement Effective Date or as soon as the first recommendation from safety studies is issued, which ever occur first.

## Further to the General Engineering Design Work Plan, the SELLER shall issue a detailed monthly work plan for each subject. The monthly plan shall describe the activities to be carried out in the following month and is intended to allow BUYER and SELLER to control the progress of Engineering Scope.

## SELLER shall also prepare and issue to BUYER a detailed monthly report, compatible with Exhibit VI - Directives for Planning and Control, showing the Engineering Scope progress for each phase of the FPSO with all disciplines, including vendors and Subcontractors’ activities. Monthly reports shall contain, at least:

### An updated list of all documents for the FPSO (including Subcontractors and vendors documents) and their status related to BUYER and Classification Society.

### A list of the design documents issued during the preceding month, together with the progress achieved during that month.

### A list of documents scheduled to be issued during the following month.

### Monthly and cumulative S-curves comparing scheduled progress to actual progress of the following activities: issuance of documentation; BUYER approval of documentation; 3D Model progress; Classification Society approval of documentation.

### In the event of any difference between scheduled and achieved progress, deviation analysis and action to be implemented or to be adopted to maintain the original schedule and avoid further delays shall be performed and presented to BUYER.

### Forecast of cumulative physical progress for the following month.

### Weekly (number of documents issued by discipline/ number of documents planned by discipline) and Cumulative graphic (total documents issued/total documents planned);

### A critical path analysis, as per Precedence Diagram and Engineering Service Precedence Diagram.

## All documents included in the monthly report shall indicate the BUYER Document Number, the title, the revision number, the issue date, the document’s status (as indicated on item 5 below), and the progress status of the document planned to be issued.

## BUYER will control, evaluate, and release the Detail Engineering Design.

## In addition to requirement 8.3 (Design and development) of the ISO 9001:2015:

### SELLER shall establish, implement, and maintain a Design Execution Plan, including execution process detailed flowchart, by discipline, presenting:

1. Design execution activities definition
2. Applicable procedures for the activities
3. Identification of information or documents necessary for the development of each design activity
4. Definition of the product of each activity and their relationship with other activities and/or disciplines

### SELLER shall establish, implement, and maintain a Design Verification Plan, including:

1. Method or methods combination to be applied
2. Documents to be verified by discipline and the verification’s levels applicable
3. Period of verification
4. Procedures applicable
5. Responsible personnel
6. Verification copy identification
7. Verification records

### SELLER shall establish, implement, and maintain systems for assuring consistency among documents affected by the same modification.

# DOCUMENT STATUS

## “SELLER’s Engineering documents” are those issued by SELLER to manufacture, construct and erect the equipment, modules, structures, piping and allow integration of the Topsides and the Hull, including their respective facilities to assist with future operation and maintenance.

## Other technical documents, such as technical correspondence and meeting notes, are also considered SELLER’s Engineering documents. Nevertheless, these documents do not require further identification.

## The first issue of the Document List shall be sent to BUYER 10 days after the Engineering phase Kick-Off Meeting.

## BUYER will carry out verification of the quality of the executive project aiming to confirm the fulfillment of the scope by the SELLER.

## All Engineering documents shall be submitted for the BUYER review and shall be returned to SELLER through a document named Design Document Analysis (DDA) that shall be prepared pursuant to the model attached as Appendix 4, indicating their status, as follows:

1. “Released” – BUYER has no technical comments. The next issue shall be considered as “Approved” issue following item 5.6, excepting if a relevant change is further implemented.
2. “Comments Added” – BUYER has technical comments that shall be implemented by SELLER. The next issue shall incorporate BUYER’s comments and shall be resubmitted to BUYER and is possible to update the document purpose following item 5.6.
3. “Not Released” – BUYER finds substantial deviation from the Contractual terms, standards, practices or quality required. The next issue shall be resubmitted to BUYER’s review and is not possible to update the document purpose.
4. “Not commented” – The document is returned to the SELLER with no review from BUYER. The next issue shall be considered as “Approved” issue following item 5.6, excepting if a relevant change is further implemented.

## Each issue of a document shall correspond to a new revision. Document purpose shall be indicated as follows, at least:

## “For Construction”: document issued for construction purpose

## “For Purchase”: document issued for purchase purpose

## “For Design”: document issued with a purpose different from “for purchase” or “for construction”

## “Cancelled”: document for any purpose with the previous issue required to be cancelled

## “Approved for construction”: document for construction with DDA status “Released”, “Comment added” or “Not commented”. No document with pending comments from previous revisions may be issued with this status/purpose, except those issued with the DDA status “Comment added”.

## “Approved for purchase”: document for purchase with DDA status “Released”, “Comment added” or “Not commented”

## “Approved for design”: document for design with DDA status “Released”, “Comment added” or “Not commented”

## “As-Built”: document issued as per 8.20

## “As purchased”: document issued as per 8.20

## For any document to be cancelled, a new revision shall be issued especially for that purpose, with the status “Cancelled”.

## NOT APPLICABLE

## Any consideration from SELLER on BUYER comments stated at respective DDA for one document shall be forwarded by SELLER to BUYER replying to the “DDA” from SELLER. The reply shall be sent as per Appendix 1 - Structure of the Buyer Code Number System of this Exhibit. Informal correspondences like e-mails with the SELLER’s considerations about BUYER comments are not acceptable.

## NOT APPLICABLE

## NOT APPLICABLE

## Any changes in the Design documentation from one revision to the next, related to BUYER comments or Design development, shall be highlighted (cloud marks or highlighted by gray color) by the SELLER and/or Vendor to be clearly identified.

## The act of modifying, cancelling, replacing or renumbering documents is considered a document revision. SELLER and / or Vendor shall revise the current document to inform the cancelled status and the reason for its cancelation. In case of replacing or renumbering, the SELLER and / or Vendor shall include in both documents the cross-reference between the new document and the cancelled document.

## NOT APPLICABLE

## BUYER “Release” of the documents shall not exempt SELLER from responsibility to carry out the Work under the terms of the Contract.

## SELLER shall replace the documentation and drawings that do not have satisfactory quality, at no cost to BUYER. In this situation, BUYER’s review period of ten workdays (10) shall only start after its new re-issuing for BUYER.

## Documents shall be considered “Not Released” for the following reasons, in addition to technical reasons:

#### Documents that do not include the “page number / total number of pages in the set,” or having missing pages,

#### CAD files showing dirt outside the drawing area after a "FIT ALL" command,

#### Files with automatic pagination, like Microsoft Excel, with frozen windows when coming on-line,

#### Different documents in the same file,

#### Different pages in the same file, where software without automatic pagination, like MicroStation, requires only one (1) page per file,

#### CAD files that require unspecified and unavailable reference files to be opened,

#### CAD files that use text fonts not existing in the standard software,

#### MicroStation files where the Border elements are in the level other than 63 or AutoCAD files where the border elements are in an unidentified layer,

#### Microsoft Office files (Word, Excel, etc.) that requires non-Standard Microsoft Windows Fonts to be opened/viewed.

#### Adobe Acrobat Files (PDF) generated from document scanning process or not searchable.

## BUYER reserves the right to comment and request changes if the documents do not comply with the Contract and its Exhibits.

## It is under the SELLER scope of work to have a clear revision control procedure of the design documents released for construction or for purchase, and a controlled copy of those documents. The main objective of the procedure is to avoid rework due to the use of obsolete design documents. SELLER shall present its procedure in the engineering kick of meeting.

# ISSUE AND PROCESSING OF DOCUMENTS

## All drawings, technical documents, 3D Models, CAE databases, calculations and basic data (other than those supplied by BUYER), to be prepared or executed by SELLER, regardless of whether such documents are required by the Contract, its Exhibits or Governmental Requirements, or are otherwise necessary for the purpose of the Contract, shall be sent to BUYER for review.

###  Documents used to perform pre-fabrication, fabrication, construction, assembly, and commissioning, such as shop drawings, shall be available for BUYER whenever requested.

## The 3D model shall be available, ready to use, and consistent with all P&ID information. The information from the instrumentation discipline must be represented in 3D model and must be consistent with the P&ID and discipline documentation. All preceding information shall be available and consolidated to the construction and assembly team from the beginning of this Agreement.

## SELLER shall use a properly licensed electronic document manager system with workflow capabilities, using the workflow facilities provided by the software in all stages of the Design, and shall install all licenses and other software/hardware, necessary to permit BUYER to access the Design documents during all stages of the Design.

### BUYER will use a Electronic Document Management (EDM) system as its internal electronic document manager. SELLER shall supply the necessary information to BUYER for EDM data updating, as per Appendix 1 - Structure of the Buyer Code Number System.

### Every document delivered to BUYER from SELLER, Subcontractors, Classification Society and Vendors shall be also delivered in electronic format (original version editable and PDF version searchable) to be included in BUYER’s EDM database. SELLER is responsible to include all the documents at BUYER’s EDM database. Every single document shall be delivered in a single file in electronic format. Files containing more than one document, or one document divided into many files will not be accepted by BUYER.

## BUYER will ensure that all comments to documents will be delivered within ten (10) workdays of its receipt of electronic copies of those documents through its EDM. Exception made for electrical studies (see item 8.9) and safety studies (see item 8.12) which will be delivered within fifteen (15) workdays.

### Any reply from SELLER on any BUYER comments shall be submitted with ten (10) workdays of its delivery from BUYER.

## Documents not returned by BUYER within the above deadline shall be deemed Released for development unless BUYER justifies the delay and reports it in advance to SELLER. SELLER shall inform BUYER the documents with DDA overdue prior to further actions.

###  It is SELLER responsibility to develop the engineering following all the technical specification. Should the BUYER find a mistake on SELLER’s design, it may request correction at any time, and this will not represent a scope change or may not be subject to claim, as per defective works clause of the contract.

### SELLER shall implement BUYER and Classification Society comments within ten (10) workdays of its receipt. The Contract between SELLER and Classification Society shall contain the same request.

## SELLER shall verify, review and approve Vendors Technical Documentation within fifteen (15) workdays of its receipt. The Vendors Technical Documentation shall also be submitted for BUYER, simultaneously. Within five (5) workdays of the receipt of Vendors Technical Documentation, SELLER shall issue its comments to BUYER, to allow the addition of BUYER comments in the next eight (8) workdays. SELLER shall consolidate and validate all the comments in the next two (2) workdays. If no comments were issued by BUYER during the established time, SELLER shall consider that BUYER has no comments to add and shall send its comments to the Vendors. The BUYER deadline (8 workdays) will start only after the SELLER sends its comments (according to the format defined below) for BUYER analysis.

## The SELLER shall issue Vendor comments to BUYER by means of an Excel spreadsheet document (VDA – Vendor Document Analysis), even if the SELLER considers the Vendor document as released. Each VDA can relate comments about one or multiple documents of only one package purchase. Refer to Appendix 3 for the VDA form model.

## Each VDA shall contain documents with the same status according to the SELLER’s analysis. This status of analysis shall be standardized as RELEASED, COMMENTS ADDED, NOT COMMENTED and NOT RELEASED.

## The VDA shall be sent to BUYER by Transmittal form. The Transmittal shall list all documents commented in the VDA on the appropriate column of the spreadsheet to allow EDM to create appropriate relationships.

## SELLER shall verify the consistency of the technical documentation of the Equipment supplied by BUYER, within ten (10) workdays of its receipt. Within five (5) workdays of the receipt of the technical documentation, SELLER shall issue its comments to BUYER, to allow the addition of BUYER comments in the next three (3) workdays. SELLER shall consolidate and validate all the comments in the next two (2) workdays. If no comments were issued by BUYER within its deadline, SELLER shall consider that BUYER has no comments to add and shall send its comments to the BUYER that will send them to the SELLER of the Equipment. The BUYER deadline (3 workdays) will start only after SELLER sends its comments (according to the format defined below) for BUYER analysis.

## All documents stored and controlled shall be delivered to BUYER as follows:

### Documents shall be delivered in native format and the other one in PDF (Adobe Portable Document Format) searchable version. Scanned documents shall not be accepted.

### Electronic files shall be made available to BUYER through the EDM system, as details on Exhibit XVI - Computational Tools and Integrated Management System. All files shall be compatible with the EDM system.

#### Each compressed file shall contain all attachments and resources necessary to reproduce a paper copy of the document.

### All "As-Built" files shall be issued as per item 8.20.

## Management and responsibility for the documents’ original file format shall remain with SELLER, until the end of the Design, when their fully updated versions shall be delivered to BUYER. This responsibility does not exempt the SELLER and its Subcontractors from submitting to BUYER the original file format during the Engineering development.

## SELLER shall supply an electronic version of all documents to be issued according to the following:

### All detailed drawings shall be presented in CAE 2D applications, according to I-ET-3000.00-1350-94P-P4X-002 – DIGITAL ENGINEERING TECHNICAL REQUIREMENTS FOR DETAILED DESIGN.

### All files presented in CAE 2D software shall have all the reference files incorporated into every document that refers to them.

### All detailed drawings in Adobe Acrobat (PDF) format generated from CAE software shall have the visualization levels enabled.

### For those equipment’s components and instruments, usually content of Manufacturers’ catalogs, Adobe Acrobat PDF searchable format file will be accepted. Scanned documents shall not be accepted.

### All text documents (including manuals) shall be presented in the latest release of Microsoft Word. Exception of this requirement shall be made for the documents of standard materials, equipment and instruments where Adobe Acrobat format file will be accepted.

### All documents produced via spreadsheet shall be in the latest release of Microsoft Excel.

### All lists, including those extracted from drawings, databases and 3-D Models (e.g. Line List, Isometric Lists, Tie-In List, Instrument List, Loop List, etc.), shall be in MDB (Access) format, including a database index, or in latest release of Microsoft Excel. Each document shall be bound into one PDF file, even for those composed by multiple files. All PDF files, including drawings, shall have text search capability.

## The final documentation shall have a unique and uniform standard, according to items below and shall be submitted to BUYER for prior approval.

## All documents, including Subcontractor and vendor documents, delivered to BUYER shall include BUYER Code Number for the UNIT, according to the codification system presented in Appendix 1 - Structure of the Buyer Code Number System

##  References to documents should also include their BUYER Code Numbers. All documents in electronic format, including revisions, should be given the same BUYER Code Number in accordance with Appendix 1 - Structure of the Buyer Code Number System, at their file name.

## The project numbering system shall be in such a way as to aid computerized data management and reporting facilities.

## The form of presentations of all technical documents shall be as established in APPENDIX 5 templates standards. They will be delivered by BUYER at the beginning of the design development.

## All engineering documents, delivered to BUYER from SELLER, Subcontractors, Classification Society, Vendors or any other party shall be issued in contract official language - English - unless otherwise described in the Contract and its Exhibits.

# DEFINITION OF FLEXIBILITY OF DOCUMENTATION

## GENERAL

### NOT APPLICABLE.

### This item defines the Basic Design documents classification regarding the degree of flexibility at which SELLER is allowed to innovate.

## DEFINITIONS

### Technological Solution – Item, subject or requirement that defines the kind, or kinds of technology acceptable to be applied. E.g.: When Main Generations is defined as turbo-generation, the turbine is defined as the technological solution for generator drivers.

### Methodological Solution – Item, subject or requirement that defines a method, or some methods accepted to be applied. E.g.: The rolling sphere is the acceptable method (methodological solution) for lightning stroke protection study.

### Item with Technological Flexibility – Item, subject or requirement when BUYER accepts technological solutions for Detailed Design different from the technological solutions (if any) defined by Basic Design.

### Item with Methodological Flexibility – Item, subject or requirement when BUYER accepts methodological solutions for Detailed Design different from the methodological solutions (if any) defined by Basic Design.

Notes:

1 – Data changing according to the evolution of information in Detailed Design is not considered technological flexibility nor methodological flexibility. These changes are normal activities included in the scope of the Detailed Design phase.

2 – Activities, documents, studies, and definitions of Detailed Design, not included in Basic Design Project are not considered technological flexibility nor methodological flexibility. These are normal activities, documents, studies, or definitions included in the scope of the Detailed Design phase.

## GENERAL CONDITIONS

### The Basic Design documents, listed in XXX and XXX, were classified as the degree of flexibility as "A", "B" or "C", where:

### "A"- Inflexible document, in which there is absolutely no freedom to the SUPPLIER, during the detailing of systems and constructive procedures of the project, to innovate in terms of methodological or technological solutions that were previously outlined in the Basic Design supplied at the bidding phase;

### "B"- Document with relative flexibility, in which there is no freedom to the SELLER during the detailing of systems and constructive procedures of project, to innovate in terms of methodological or technological solutions that were previously outlined in Basic Design supplied at the bidding phase except for the items explicitly listed in the XXX;

### "C"- Flexible document, in which there is total freedom of the SELLER during the detailing of systems and procedures constructive basis of the bidding project, to innovate in terms of methodological or technological solutions regarding the solutions previously outlined in the Basic Design supplied at the bidding phase.

### NOT APPLICABLE

### Methods and technologies defined in inflexible documents, type "A", and in non-flexible items of the type "B" documents, cannot be modified without observing the Change Order procedures provided for the Contract (Exhibit XIV) and without prior approval of the BUYER.

### The documents, regardless of their classification, may present preliminary information or fields to be completed by the SELLER, and it is SELLER's responsibility to provide these data. Although the preliminary information or fields to be completed are defined by the SELLER, they do not characterize flexibility for technological or methodological innovations.

### BUYER requirements defined in the Contract and its Exhibits shall be observed by SELLER regarding the need for approval of the flexible or supplementary data.

### The technical solutions for the flexible parts of the Design and for the parts where it was given option of choice to the SELLER shall be defined by the SELLER during the bidding phase and taken into account in its Commercial Proposal, so that there is technical justification for the prices offered, that shall be perfect and unequivocally reflected in the Statement of Price Formation (SPF) presented at the bid phase.

### All innovations or technical solutions adopted, where permitted, shall be taken into by the SELLER in its Commercial Proposal, which means any further adjustments during the detailed design phase shall not result in any extra cost for BUYER.

### Also, in case SELLER, during the Contract, perceives its innovation proposal as unfeasible, it shall bear all costs of the modifications necessary to revert to the original Design.

### The development of the Scope of Supply during the Contract shall be based on the solutions previously defined in the SELLER’s Technical and Commercial Proposal.

# GENERAL GUIDELINES FOR ENGINEERING DESIGN

## GENERAL

### SELLER’s Engineering shall ensure that the following objectives are met:

1. Full compliance with Contract and its Exhibits
2. Full compliance with the Technical Requirements
3. Full compliance with Classification Society, Regulatory Bodies (IMO, SOLAS, MARPOL, etc.) and Brazilian Authorities (ANVISA, INMETRO, NORMAM, etc.) Rules and Requirements
4. Full Compliance with Brazilian Government Regulatory Standards (NR)
5. Guarantee that the FPSO operates according to the limits defined in the design
6. Intrinsically safe facilities
7. Full compliance with additional requirements of NR-12 according to I-ET-3010.00-1200-970-P4X-012 COMPLIANCE WITH NR-12 REQUIREMENTS
8. Full compliance with additional requirements of NR-13 according to I-ET-3010.00-1200-970-P4X-013 COMPLIANCE WITH NR-13 AND SPIE REQUIREMENTS

### SELLER shall set up and maintain a register of revisions for all documents (calculations, drawings, diagrams, data sheets, specifications and schedules, etc.), issued by SELLER and third parties.

### The technical documentation to be issued on Engineering shall be developed according to and making use of the EXHIBIT II – BASIC DESIGN and EXHIBIT I – SCOPE OF SUPPLY. The following documents shall be issued but not limited to them and shall include the following main items:

1. Schedule of Activities
2. Studies and Analysis
3. Calculations
4. Equipment List
5. Commissioning Report
6. Equipment and Materials Inventory
7. Equipment and Building Layouts and Design Drawings
8. Data Sheets, PFDs, P&IDs and Engineering Design Documents
9. Standards for tagging, numbering and formatting drawings and equipment items
10. 3D Model

### Subcontractor of Engineering is defined at Article 19 of the contract.

### SELLER shall issue all necessary documentation to comply with the NR-13 and SPIE Requirements for equipment, piping and safety devices.

### International System of Units (SI) shall be used during Engineering design execution.

### Engineering from vendors, subcontractors, package suppliers and so on must have the information level and the details in compliance with this Exhibit. The details on their design must allow BUYER to purchase any parts of any equipment as spare, unless there are intellectual proprietary information involved. In case of proprietary information, SELLER shall justify, and the part number will be enough.

### During engineering kick off meeting, SELLER shall present a list of parts with the possibility to perform fabrication using additive manufacturing (3D printing) technology. SELLER and BUYER shall agree with the final version of this list, and the parts of the list must have all the information necessary for additive manufacturing.

## ENDORSEMENT OF THE DOCUMENTS DELIVERED BY BUYER

### The content of the Basic Design (documents and databases) delivered by BUYER is listed in the Applicable Documents in Exhibit II – BASIC DESIGN of this Contract. Such documents have the necessary information for SELLER to develop and execute the Engineering, as per BUYER's requirements.

### To avoid any inconsistency or non-conformity that could cause re-work during the execution of the Contract and ensure the safe and successful accomplishment and completion of the whole Scope of Supply (as per Exhibit I), SELLER shall perform a comprehensive analysis including the verification of consistency and accuracy of the Basic Design.

### Any inconsistency, non-conformity or necessary clarification identified by SELLER during such analysis shall be informed to BUYER through a TQF. SELLER shall include in each TQF the proposed solution, the assumptions, calculation sheets, results and any other necessary design documents, in a way that BUYER can evaluate and reply. The Engineering work to implement the solutions defined by SELLER which do not represent Scope changes agreed by BUYER is considered part of the Detailing Engineering development scope and shall not result in any additional costs to BUYER.

### NOT APPLICABLE

### The consistency between vendor documents and Basic Design provided by BUYER is not part of Endorsement and SELLER is fully responsible for the Engineering in full compliance with the Basic Design.

### The Basic Design analysis shall be concluded in 150 calendar days (a hundred fifty calendar days) after Agreement Effective Date. SELLER shall issue the TQFs, deemed necessary to complete the Basic Design analysis process, within this period.

### SELLER shall present within 45 (forty-five) days counted from the conclusion of the Basic Design analysis, a comprehensive Endorsement report showing all items analyzed by SELLER and clarifications received from BUYER, including reference documents (Basic Design documents, Database and Basic Design), TQF issued and answered.

### The endorsement report shall be submitted to BUYER and shall be divided into service classes according to Appendix 1 - Structure of the Buyer Code Number System.

### The endorsement report shall include, at least:

#### Description of inconsistency, non-conformity or clarification raised by SELLER and BUYER’s answer, for all TQFs issued.

#### Description of inconsistency or non-conformity to which a proposed solution, accepted by BUYER, that will cause no scope change to the contract.

#### Description of inconsistency or non-conformity that will cause a scope change to the contract, duly accepted by BUYER, including engineering technical proposal of the solution to correct the inconsistency or non-conformity identified in the Basic Design.

#### List of Basic Design documents related to each proposed solution.

#### The Endorsement Report shall include all clarification from BUYER for each TQF issued during the 150 days period; final clarification and BUYER's agreement shall be achieved within the 45 days period, prior to the issuance of the endorsement report.

#### During the endorsement period, BUYER and SELLER shall agree the categorization of each TQF regarding to scope, as following:

1. Category A: Findings that were answered by BUYER in an adequate way, not requiring engineering re-design to complete the Basic Design information and not causing impacts on time or cost, according to clause 8.2.9.2 this exhibit.
2. Category B: Findings that were answered by BUYER in an adequate way but, requiring engineering re-design to complete the Basic Design information and/or causing impacts on time or cost, according to clause 8.2.9.3 this exhibit.
3. Category C: Findings that were not answered by BUYER in an adequate way and will require additional clarification to enable to classify them as Category A or B and, besides that, might be a constraint to the development of the Engineering.

Remark: Category C is acceptable only during endorsement period. The final endorsement report shall not have any pending item within this Category.

#### Rules to stablish a standard of interpretation, analysis to categorization of the TQFs:

#### The endorsement of the Basic Design is restricted to checking inconsistencies or nonconformities in the basic design. Everything that arises from the Detailing Design development are not related to Basic Design Endorsement and therefore are not a triggering event for scope change.

#### Any TQF response that clarifies or confirms a contractual technical requirement cannot be considered a triggering event for scope change.

#### In case of change in the contractual technical requirement, this is to be understood as a change in the original scope. Although, if the SELLER adopts solutions different from the Basic Design and is not able to evidence basic design error, the change in original scope does not constitute a Change Order.

#### Technical contractual requirement that was not considered in the preparation of the basic design can be a generating fact for modification.

#### Inconsistency between the basic design and the Vendor's documentation is not a triggering event for changing the original scope (item 8.2.5). Eventually, in case equipment subjected to Project Vendor List (as per Exhibit V – Directives for Acquisitions), if all vendors present the unfeasibility of meeting a contractual technical requirement, it must be submitted for BUYER appraisal.

#### Requirements of the class and/or interpretation thereof for statutory rules (ex: MODU, SOLAS) and that have not been subject to request/interpretation by the certifier of the basic design (ABS) are not triggering events for modification (item 8.4.5).

#### Definitions of materials and technologies not defined in the basic design, as long as the same boundary conditions are maintained (process data, safety, regulatory, etc.), are not generating facts for scope change.

#### Documents not generated or not made available in the basic design are not facts that generate a scope change.

#### In case the basic design states that BUYER shall be consulted, it’s SELLER responsibility and obligation to consult BUYER. If SELLER does not consult BUYER, SELLER is entirely responsible to perform the necessary modifications, without impact in cost and schedule, and to revert the design if the solution adopted is unfeasible.

#### On weekly basis, SELLER shall update TQF valuation progress according to APPENDIX 7. An initial categorization shall be informed by SELLER for all TQFs. BUYER and SELLER shall get an agreement to final categorization (A or B) during the endorsement period (150 days).

#### A proposed format to Endorsement report is suggested on APPENDIX 6 of this Exhibit. The final format shall be agreed between SELLER and BUYER before its issuance.

### The solution to the inconsistencies or non-conformities identified in the Endorsement, after BUYER’s approval, shall be implemented at Engineering issued by SELLER.

### Endorsement Scope change agreed by BUYER, if any, shall be considered as a Change Order to be sent by BUYER and executed according to the provisions set on Exhibit XIV - Directives for Claims and Change Orders.

### All necessary engineering, material and services to correct inconsistencies or discrepancies in the Basic Design shall be performed within the contractual period, without postponement of the handover date. If SELLER understands that a scope change affects the critical path schedule, SELLER shall clearly inform BUYER at the Endorsement report, providing the critical path analysis.

### NOT APPLICABLE.

### The Endorsement report issued by SELLER is a declaration of full Endorsement of the Basic Design, without limitation, and of ability to develop and execute the Engineering, in accordance with BUYER requirements. From this moment on, all detailed engineering, certification, technical support, procurement, construction, test and commissioning activities required to remedy deficiencies or omissions in the technical documents provided by BUYER shall be considered as standard development of the Engineering Scope and shall not give reason to additional compensation or extension of the project milestones.

## DESIGN REVIEW EVENTS

### SELLER shall provide design review sessions with the participation of BUYER to verify, clarify and solve issues found in the progress of the detailed design. Design review sessions shall comply with I-ET-3000.00-0000-940-P4X-003.

## DETAILED DESIGN CERTIFICATION

### SELLER shall be responsible for the engineering, procurement, construction, commissioning and start-up of the UNIT, including all requirements for certification issued by the Classification Society. SELLER shall designate one (1) senior engineer to be the coordinator responsible for establishing and keeping a close liaison with the Classification Society.

### All design certification procedures shall be agreed upon by SELLER and the Classification Society.

### SELLER shall provide all necessary support studies required by the Classification Society.

### SELLER is responsible for the Certification of Vendor documents and of the Equipment under its scope of supply according to Classification Society requirements.

### SELLER shall implement any necessary changes to the documents deriving from the Detailed Design development or/and Classification Society or/and Regulatory Bodies requests without any extra cost to BUYER and within contractual period, without postponement of the handover date.

### SELLER shall select a Classification Society to complies with the certification scope as defined at Exhibit XV - DIRECTIVES FOR FPSO CLASSIFICATION.

## HULL AND TOPSIDES STRUCTURAL DESIGN

### SELLER shall develop detailed structural drawings to accommodate all requirements for Topsides and Hull FPSO Construction, Assembly, Installation and Operation.

### All FPSO structures shall be in full accordance with Classification Society (CS) requirements. If there are differences between Classification Society, Regulatory Bodies and Brazilian Authorities Rules and Requirements, the more restrictive one shall be considered.

### All structural elements shall be designed and verified using yielding, buckling and fatigue criteria according to the latest revision of CS Rules and shall comply with the Technical Specifications with structural requirements (I-ET-3010.2E-1351-140-P4X-001 – HULL and I-ET-3010.2D-1400-140-P4X-001 – TOPSIDES) and other documents of BUYER Engineering.

### International System of Units (SI) shall be used in structural analyses, studies, reports and drawings.

### SELLER shall continuously maintain structural design data that provides a record of all structural calculations, development of load cases and computer model development. This data shall be available to BUYER as required.

### SELLER shall issue, but not restricted to, the main documents related to:

### Hull structures;

### Offshore Structures (all structures required for FPSO operation that are not present in regular ships’ hull);

### Modules’ Structures;

### Hull and Modules’ Outfitting Structures;

### Temporary Structures;

### Module’s Supports;

### Load plan with support reactions of Topside’s Structures on the Hull;

### Welding Details;

### Material Specification and Design Areas;

### Structural Verification of all structural components and parts;

### Fatigue Analysis;

### Material Requisitions;

### Weight Control;

### “As-Built”.

### TOPSIDE’S ADDITIONAL REQUIREMENTS

#### Engineering analyses and studies shall include all applicable aspects of Construction, Assembly, Modules’ flexibility, load-out / load-off, lifting, transportation, transit, installation, and in-place conditions, considering the information to be provided by SELLER and/or its subcontractors for construction and assembly. The lifting analysis shall be only considered approved after the module weighing.

#### SELLER shall deliver to BUYER all documentation related to all global and local structural analyses and studies, including numerical models input files of the structural analyses, considering the final weights of equipment and final loads, lifting system design, load-out and transportation design and procedure where applicable, all material requisitions, structural fabrication drawings, erection and assembly of the main and secondary structures, as well as all outfitting (stairs, ladders, pathways, walkways, handrails, wooden decks, operation platforms etc.) required for the perfect operation of the UNIT.

#### The verification of all structural elements, considering the relevant draft range, wave headings and design conditions shall be performed during the structural design.

#### The structural load conditions to be considered in the analyses, studies and design of the Topsides FPSO structures shall include, but not be restricted to the following:

### Load-out / Load-off;

### Fabrication;

### Modules, Systems and Equipment Transportation;

### Modules, Systems and Equipment Lifting;

### Modules, Systems and Equipment Installation;

### Transit (from Integration yard to Santos Basin);

### FPSO Motion Analysis;

### Static Condition;

### Operation Condition;

### Extreme Condition;

### Serviceability Condition;

### Blast Accidental Condition;

### Dropped Object Condition;

### Damage Condition;

### Uplift Condition;

### Damage and Accidental Condition (including Blast);

### Remark: Data related to subsea layout such as risers loads, mooring lines loads and FPSO heading that may affect Motion and Acceleration for the FPSO will be provided by BUYER.

### HULL ADDITIONAL REQUIREMENTS

#### SELLER shall deliver to BUYER all documentation related to all global and local structural analyses and studies, including numerical models input files, in a format compatible with FEMAP 11.2 or earlier, required for the perfect operation of the UNIT.

#### Riser loads shall be evaluated by SELLER during engineering phase and shall be in accordance with BUYER’s subsea area specifications.

#### SELLER is responsible for risers’ tube guide design and construction in accordance with BUYER’s subsea area specifications.

## PROCESS DESIGN

### SELLER shall develop, but not limited to, the following main items:

#### Engineering work required for process, production, and utility systems, including the interface with Hull Systems.

#### Develop/update utility consumption summary, instrument set point list, drawings, process data sheets and other associated documents according to Engineering development and information from vendors throughout the work.

#### Submission to BUYER’s approval all information necessary to update the Engineering according to vendors requirements.

#### Develop/update Process Flow Diagrams (PFD) and Utility Flow Diagrams (UFD) and P&ID. Drawings and reports shall be issued and updated concomitantly with PFD, UFD and P&ID for approval. Sizing all equipment, piping lines and valves to meet process requirements. Design criteria and all special requirements shall comply with the documentation delivered by BUYER.

#### Cause and Effect Matrix.

#### Develop/update Process Data Sheets (FD) for equipment and instruments.

#### Line List and Special Items List.

#### Relief and Depressurization Study.

#### Calculation Report for Drainage System.

#### Utility Consumption Report.

#### Process Description.

#### Calculation Report for all systems and equipment.

#### Develop/update Electrical Power Consumption – Process Plant.

#### Vendor’s drawings Analysis.

#### NOT APPLICABLE

### P&IDs drawings shall be free of inconsistencies with the process CAE tool database and shall include at least the following information:

#### Issue of drawing with general notes, typical details, legend, and symbology for all other engineering drawings.

#### Identification and description of all notes.

#### Indication of reference documents.

#### Representation of all equipment indicating tag, name, type, capacity, quantity, dimensions, main characteristics, all nozzles, thermal insulation, operating levels/alarm/interlock, and all internals (coils, baffles, mist eliminator, etc.).

#### For pump representation: motor indication, speed control, permanent or temporary suction filters, connections, automatic starting systems, and interlocks.

#### For the representation of shell and tube heat exchangers, the representation of each shell shall be indicated.

#### For the representation of compact heat exchangers, all permanent or temporary connections, instruments, and filters shall be represented.

#### Representation of all instrumented valves (XV, SDV, BDV, HV) indicating type, diameter, process requirements or distance safety.

#### Representation of all hand valves indicating type, diameter, specification, lockout requirement, process requirements for distance.

#### Representation of all pipes indicating diameters, fluid, specification, sequential numbering, spec break, insulation and tracing, inclination, non-pockets, pipe fittings, spectacle blind, blind flange, spade.

#### Representation of all relief valves and rupture discs indicating sizing criteria, pressure set and symbology for the relief systems to which they are connected.

#### Representation of all package units with their respective battery limits and interfaces with other systems and indication of vendor’s P&ID documents.

#### Representation of all control loops including control valves indicating actuators, bypasses and shutoff valves, safe fault position, locking position indication, tightness requirements, etc.

#### Representation of interlocking logic and associated instrumentation.

#### Representation of sampling points with their typical details.

#### Representation of connections with and/or different drainage systems (content basin, open drainage, closed drainage, overboard).

#### Representation of measurement points and types (flow rate, analyzers).

#### Representation of chemical injection points with their typical details.

#### Representation and types of corrosion monitoring points.

#### Representation of all instrument flushing connections.

### The relief and depressurization study shall include at least the following information:

#### Evidence of meeting the criteria described in the Technical Specification of the project for sizing PSVs, BDVs and relief systems.

#### Compliance with sizing cases adopted.

#### Evidence of compliance with validation of relief temperature versus design temperature of relief systems, including calculated minimum relief temperatures.

#### Evidence of compliance with the technical specifications of the relief system design.

#### Absence of pending item (hold item list).

#### Identification of calculation and modeling assumptions.

#### Results of all relief cases applicable to system sizing.

## MECHANICAL DESIGN

### SELLER shall develop, document and maintain all studies and calculations required to design, construct and install, commissioning, pre-operate and operate the equipment.

### These studies and documents shall be submitted to BUYER and shall include, not being restricted to, the following:

### Determine the minimum required temperature for vessel and piping taking into account all predictable normal and abnormal operating conditions including start-ups, shut-downs, blowdowns, etc.

### Specify and design systems to dampen vibration to acceptable standards based on an evaluation of the dynamic behavior of relevant equipment.

### Prepare, check and update specifications, data sheets (FD), material requirements (RM) and engineering design documents, equipment sizing reports and bills of material as required for the procurement, fabrication and installation of the mechanical equipment.

### Ensure that mechanical systems are capable of support the expected motions, deflections and accelerations of the UNIT.

### Perform acoustical analyses of the facilities to determine noise mitigation measures and establish special equipment requirements and define mandatory hearing protection areas.

### Perform Settle-out Pressure Study and ensure that all equipment is properly designed and protected for this condition.

### Perform process dynamic simulation for evaluation of Anti-Surge protection and start-up procedures for compressors.

### Perform process dynamic simulation for evaluation of water hammer and transient effects on pipping and component for sea water and fire water system start-up.

### Perform calculation of the noise level of the equipment and systems.

### Perform and/or update the Crane and Mechanical Handling study to ensure that adequate cranes, hoists, and other fixed or mobile lifting devices are provided for all operation and maintenance activities to minimize double handling.

### Supply to BUYER the Consolidation of the noise level reports of the whole UNIT, including all Modules/ Equipment / Systems / Modules supplied by BUYER and the Hull Equipment and Systems, to design the sound system of the UNIT.

### Prepare and issue a consolidated final report of noise levels after the FPSO in operation.

### Prepare and maintain a detailed Equipment List.

### Issue Material Requisitions (RM).

### Technical Bid Evaluations (TBE).

### Issue Mechanical Data Sheets.

### Review vendor data for conformity to specifications, and for documentation of the type, model, serial number, performance diagrams, etc. for all relevant equipment.

### Vendor’s drawings analysis.

### Review and approve Pressure Vessel / Equipment Calculations (supplied by vendors).

### All sections of equipment or piping segments containing flammable liquid or gas (isolated sections between SDVs, check valves or control valves), whose inventory is higher than 1000Kg, shall be equipped with a depressurizing system (BDV). For segments with less than 100Kg it is not necessary to provide a depressurization system. Detailed Design shall confirm/review the need of depressurization of piping segments. Segments with inventory between 100Kg and 1000Kg shall be evaluated regarding the need for protection against the scenarios that could lead to pipe rupture (Collapse Analysis). The protections to be considered are, in hierarchical order: depressurization system, passive fire protection, water deluge system.

### Issue NR-13 and SPIE Equipment List.

### Issue NR-13 Equipment Arrangement.

## PIPING/LAY-OUT DESIGN

### SELLER shall execute, but is not restricted to, the following activities:

### Develop an overall piping system regarding pipe runs, elevations, pockets, vapor locks, location of instruments, specification breaks, equipment connections, location of high point vents, low point drains, isolation/spectacle blind, etc. Vents, drains, piping and other process connections shall be oriented to prevent damage to other equipment, prevent harm to personnel and comply with HSE requirements.

### Perform piping design for all lines, branches, and connections.

### Design vents and drains necessary to the execution of hydrostatic tests, cleaning procedures and any other commissioning activities, for all systems and subsystems, where necessary.

### Prepare a schedule of tie-ins for all hook-up piping spools between Modules, Hull and Topsides. Interconnect data such as “to/from”, ship loose, installations details, etc., shall be included in the tie-in schedule.

### Prepare and maintain a detailed Line List containing pertinent data such as tag, size, class, service, painting and insulation requirements, module designation, etc.

### Prepare the following design calculation to verify piping configuration:

1. Pipe Stress Analysis including vibration, acoustical analysis, hydraulic hammer, thermal expansion, and hull and structural deflections during the tow, operation and storm conditions using Caesar 2 stress analysis system (also, different displacements between modules due to hull flexure effects).
2. Machinery and piping induced vibration.

### Provide suitable isolation valves and/or capabilities to facilitate risers’ tie-in.

### Prepare Isometric drawings of all piping.

### Perform flexibility piping analysis.

### Develop modal analyses.

### Pressure vessel outlines, nozzle and internal drawings.

### Prepare material list and supports list, for all piping.

### Support drawings, including typical and special, for all piping. All Support Drawings shall inform allowable loads and stiffness.

### Handling Studies.

### Data Sheets (FD).

### Material Requisitions (RM).

### Piping plan.

### Layout plan.

### Issue NR-13 and SPIE piping list.

## ELECTRICAL DESIGN

### SELLER shall issue the whole documentation required in BUYER documents, by Classification Society and Brazilian Governmental Requirements, including, but not limited to, all documents listed in I-ET-3010.00-5140-700-P4X-001 - SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS and I-ET-3010.00-5140-797-P4X-001 – ELECTRICAL SYSTEM AUTOMATION ARCHITECTURE.

### SELLER shall guarantee the requirements defined in BUYER documentation, regarding Electrical System, including at least the following conditions (but not limited to): the Minimum Requirements for Electrical System as per I-MD-3010.2D-5140-700-P4X-001 - ELECTRICAL SYSTEM DESCRIPTIVE MEMORANDUM and I-ET-3010.00-5140-700-P4X-001 - SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS.

### SELLER shall submit to BUYER approval the providences or alternative specifications needed to assure the minimum requirements previously listed.

### SELLER shall contract a specialized consultant on electrical systems (including harmonics, short-circuit, TRV, stability, protection, etc.), hereafter known as “Consultant Company”.

#### The Consultant Company shall be contracted immediately after the signature of the main contract between BUYER and SELLER to obtain, at an early stage of the design, all necessary recommendations to be added to the project.

#### The Consultant Company shall be previously submitted by SELLER for BUYER approval. This Company shall provide evidence that previously carried out Detailed Electrical Studies for at least three Oil & Gas Industrial Plants with electrical power supplied by self-generators rated equal to or higher than 11kV, whether connected in parallel to a utility system or not. At least the following documents shall be provided to BUYER approval:

#### Previous studies portfolio.

#### Software licenses.

### Personnel curriculum.

### The Consultant Company shall elaborate all the Electrical Studies scope for the SELLER, which shall be in accordance with I-ET-3010.00-5140-700-P4X-006 - REQUIREMENTS FOR ELECTRICAL STUDIES FOR OFFSHORE UNITS, I-ET-3010.00-5140-700-P4X-001 - SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS and I-MD-3010.2D-5140-700-P4X-001 - ELECTRICAL SYSTEM DESCRIPTIVE MEMORANDUM.

### Consultant Company shall provide training for BUYER in each software used to perform the electrical studies.

### SELLER is responsible to implement all recommendations deriving from Consultant Company Electrical Studies in the Engineering design.

### The BUYER can elaborate additional Electrical Studies and SELLER shall implement the recommendations deriving from them. In case of conflicting between BUYER Electrical Studies recommendations and Consultant Company Electrical Studies recommendations, SELLER shall implement the BUYER Electrical Studies recommendation.

### SELLER shall provide to BUYER inspector free access to services and Electrical studies in execution. BUYER shall participate in technical discussions with the Consultant Company and with all Subcontractors during all stages of the Electrical studies, including establishing of basic assumptions, modelling of equipment and system, discussion of the results and analysis of the proposed remedy actions.

### SELLER shall use the data of the Preliminary Studies, developed by Consultant Company, as information for purchase main electrical equipment such as generators, electrical panels, transformers, cables, short-circuit limiting reactors, VSDs, soft-starters, grounding resistors etc., see I-ET-3010.00-5140-700-P4X-006, in a proper timing, to not cause any impacts in the project schedule. It is SELLER responsibility to perform the procurement considering the project schedule and its critical path, as it is SELLER responsibility to implement eventual changes in equipment due to conclusions of Preliminary, Intermediate and Final Electrical Studies, even for already purchased equipment. These will not be considered as a change in the project and are not acceptable as motivation for change orders or claims.

### BUYER will ensure that all comments to Electrical Studies will be delivered within fifteen (15) workdays of its receipt of electronic copies of those documents through EDM.

### SELLER shall be responsible for integrating the whole Electrical system, including integration among MODULES, and integration between Topsides and Hull. In this way, SELLER shall carry out the following actions:

#### To be responsible for the entire adequacy of the electrical system. Individual performance of equipment provided by others, if any, is not SELLER responsibility, however, the overall performance of the electrical system is SELLER responsibility. To achieve this performance requirement, SELLER shall provide all necessary services, equipment, and modifications (approved by BUYER).

#### To provide all necessary information for the Consultant Company.

#### To be responsible for keeping close interrelationship among all electrical equipment Subcontractors, to guarantee that each of them will proceed conveniently with the recommendations arisen from Electrical System Studies.

#### To be responsible to identify all electrical interfaces among different MODULES, among MODULES and the UNIT, among MODULES and PACKAGES, and among MODULES and Hull. SELLER shall be responsible to equalize and implement information concerning electrical interfaces and to manage the information flow among parts involved.

#### To complement BUYER documents with all necessary requirements to assure that the furnished system, equipment, or materials will comply with BUYER, Classification Society and legal requirements.

#### To detect any situation not covered by the documentation issued by BUYER. In these cases, SELLER shall submit the providences or alternative specifications needed to assure the operational conditions of the related systems to BUYER approval.

#### To include in its material requisitions (RM) all complementary requirements to documents issued by BUYER.

## INSTRUMENTATION AND AUTOMATION DESIGN

### SELLER shall develop, but is not restricted to, the activities described in the following items:

### Detail design for all electrical, pneumatic, hydraulic and process hook-ups.

### Elaborate general interconnection diagrams (overview), showing all electrical, pneumatic, and hydraulic details between panels, racks, and equipment.

### Elaborate general drawings showing all cable trays, supports, fixation details, panels, racks, Junction Boxes, etc.

### Elaborate general drawings showing Automation Network, including all equipment, Network Address, Virtual Local Address Network (VLAN) and the complete Network Topology.

### Elaborate calculation memories to demonstrate that cable and multicable entity parameters are adequate for intrinsically safe circuits and also that voltage drop is within acceptable limits for all circuits.

### Elaborate the drawings, specifications, data sheets (FD), and other documentation for detailed design, procurement, fabrication, construction and installation of all instrumentation, control, and supervision system.

### Data consolidation for SPI (Smart Plant Instrumentation), which will be used for issuing the documents described in the item below.

### SELLER shall elaborate/issue, but not limited to, the following documents:

#### Instrument Index.

#### Instrument Loop Diagrams.

#### Multicable Transit (MCT).

#### Control Panel Cabinet Arrangement.

#### Control and Communication System I/C Wiring Diagrams.

#### Instrumentation Cable List.

#### Instrumentation Cable List Routing Plan.

#### Cable List.

#### Instrumentation Cable Code List.

####  Instrumentation Cable entity parameters calculation memory.

####  Installation Hook-up Drawings.

####  I/O List.

####  Instrumentation Plans.

####  Interconnection Diagram.

####  Instrumentation and Equipment Data sheets (FD).

####  Automation and Control Architecture.

####  Addressable fire network diagrams.

####  Interface block diagrams.

####  Flow Metering Locations.

####  Flow Metering Architecture.

####  C&E Diagrams.

####  Setpoint list.

####  Control Narratives.

####  Memory Maps.

####  Network Typical details – Hook up.

####  Packages control plan.

####  Automation Network Topologic Diagrams.

####  Automation Network Address List.

####  Logic Control Diagrams.

####  Event and Alarm Message and Priority List.

####  HMI Screens/Windows Drawings.

####  Instrumentation Cable Technical Specification.

####  Automation System Communication Memory Maps.

####  Calculation Memory of Flow Instruments.

####  Calculation Memory of Control Valves.

####  Calculation Memory of Valves’ Actuators.

####  Calculation Memory of Relief Valves.

####  Calculation Memory of Thermowells.

####  Calculation Memory of Cable Tray Free Space.

####  Calculation Memory of Control and Safety Processor Units Availability.

####  Automation and Control System Technical Specification

####  Instrumentation Material Technical Specification

####  Calculation Memory of SIL verification and MTTFS

####  Technical Evaluation (for all purchased items)

####  Material Requisition (for all purchased items)

####  Descriptive Memorial

####  Material List

####  Control Room Layout

### SELLER shall issue two Instrument Index, one for top side and other for hull. These documents shall contain all instruments of the unit, including the instrument provided with subvendor’s or BUYER’s supplied equipment and packages. The instruments shall be listed per loop, in alphabetical and ascending order. The instrument index shall be prepared in the beginning of the design and used as a tool to control the progress of the design, therefore it shall be revised, after inclusion or exclusion of instruments, issuance or cancellation of documents, or as needed. The documents shall only be added to the list after their issuance. The Instrument Index shall contain, at least, the following information:

1. TAG
2. Location (Local, IHM, etc.)
3. Service/Equipment description
4. PI&D document number
5. Instrument Data Sheet document number
6. Material Requisition/invoice document number
7. Isometric or piping plan document number
8. Process hook up document number
9. Pneumatic hook up document number
10. Electrical hook up document number
11. Hydraulic hook up document number
12. Instrument supplier’s name and model
13. General notes

## TELECOMMUNICATIONS DESIGN

### SELLER shall develop, but is not limited to, the following activities:

#### Detailed design drawings showing, as a minimum, the following items:

1. Telecommunications equipment to be interconnected,
2. Cable trays routes and supporting devices,
3. Identification and detailed design of all penetrations,
4. Junction boxes,
5. Any additional information required for the adequate installation of the facilities.

#### Issue the following types of detailed interconnection diagrams:

1. General interconnection diagram, containing all equipment to be interconnected,
2. Specific interconnection diagram, detailing all interconnections, power, control, and protection cables, with the respective extremity borne connections.

#### Detailed drawings, one-line diagrams, technical specifications, data sheets (FD), material requisition (RM), Technical Bid Evaluation (TBE) and other documentation required for the detailed design, procurement, fabrication, construction and installation and integration between Topsides and Hull of the telecommunications systems.

#### Develop a completely operational and integrated Telecommunication System, in accordance with the technical specifications.

#### Issue Schedule of interconnections for Topsides and for Topsides/Hull Integration. Interconnect data such as “to/from”, ship loose, installations details, etc., shall be included in the interconnections schedule.

#### Develop the following detailed studies/ drawings:

1. System Architecture/ Block Diagram,
2. Communications equipment specifications and calculations where appropriate.

#### Elaboration and updating of telecommunications equipment arrangements drawings.

#### Issue cable schedule.

#### Issue a cable list.

#### Issue a material list.

#### Issue Typical Details of Installations.

#### Equipment Specification and Data Sheet (including manufacturers documents).

#### Review and approve the documentation from manufacturers for all equipment, including:

1. Specification for transport, storage, installation, operation and maintenance,
2. Test reports,
3. Dimensional, section and detail drawings,
4. Total weight and the indication of gravity center position,
5. Thermal dissipation,
6. Detailed parts list.

#### Develop the Telecommunications’ System Calculation Reports, using appropriated software, for the following systems:

1. PAGA sound coverage,
2. WiFi coverage,
3. UHF signal coverage.

#### Issue the As-built documentation.

#### SELLER shall issue GPS Antenna drawings, considering the issuance of “As-Built” revision taking into consideration final coordinates measured by topographic survey and registered on field installation reports.

## HSE (HEALTH, SAFETY AND ENVIRONMENT) DESIGN

### SELLER shall develop/elaborate, but is not restricted to, the following:

1. Detailed Safety Plan (Integrated and per module), including the escape routes inside the Modules and the location of the lifesaving appliances,
2. Detailed drawings to comply with Brazilian Regulation,
3. Detailed Safety Devices Data Sheets (FD),
4. Dimensioning and Design of Life Saving Appliances,
5. Detailed specifications, data sheets (FD), material requisition (RM), Technical Bid Evaluation (TBE) and engineering design documents, equipment sizing reports and bills of material as required for the procurement, fabrication, and installation of the HSE equipment.

### As-built documentation

### Dimensioning and design of fixed active firefighting protection systems (Water, foam, CO2 and Water Mist systems)

### Dimensioning and design of manual protection system

### Dimensioning and design of passive fire protection

### Material list (LI) of the HSE equipment and systems

### Hazardous Area Classification List and Drawings

### Fire & Gas detection System Plans

### Design of Emergency Shutdown System and Safety Interlocking System

### Fire & Gas Matrix

### Fire Fighting System plans

### Hydrant and Fire Monitors Location study

### Perform acoustical analysis and design devices to achieve the noise permitted limits in the rooms

### Technical description (MD), memory calculations (MC), data sheets (FD), technical specifications (ET), material requisition (RM) and all necessary engineering design documents of the HSE equipment and systems to perform the detail design.

### The following documentation shall be issued in bilingual format (English and Portuguese):

1. Safety Plan and Fire Control Plan,
2. Escape Route Plan,
3. Hazardous Area Classification Plan.

### SELLER shall issue Safety studies listed in DR-ENGP-M-I-1.3 - Safety Engineering Guideline and implement all recommendations deriving from them in all required documents. The related technical specification shall be followed to develop the studies.

### SELLER shall subcontract a specialized engineering company, previously submitted by SELLER for BUYER approval, to perform these studies/analyses. The specialized engineering company shall have minimum experience in developing similar studies for at least 120KBPD units. The committee to be formed by SELLER to develop these activities shall include BUYER’s representatives as members.

### SELLER shall consider in GAS DISPERSION STUDY Scope of Supply the issuance of an “As-Built” revision taking into consideration final coordinates measured by topographic survey and registered on field installation reports.

### SELLER shall issue Flame detectors coverage report, considering the issuance of “As-Built” revision taking into consideration final coordinates and angles measured by topographic survey and registered on field installation reports.

### To carry out safety studies such as PHA (Preliminary Hazard Analysis) and HAZOP (Hazard and Operability Study), or to review them at any time, SELLER shall follow the provisions of the related technical specification, and BUYER shall be informed about the planning at least 45 days in advance to indicate a team that will be part of SELLER’s Multidisciplinary Group. The specialized engineering company shall be responsible for leading these studies.

### SELLER shall manage the implementation of such recommendations, collecting and recording the evidence (in the Engineering documents and Field Implementation) in the specific reports that shall be updated periodically, at a frequency that shall be agreed with BUYER. All recommendations derived from safety studies shall be controlled by SELLER, in Safety Study Recommendation Management System, mentioned on I-ET-3000.00-5400-947-P4X-001 and each recommendation shall be linked to the proper subsystem (SSOP).

### SELLER shall be responsible to implement all recommendations of Risk Assessment and Safety Studies (RL) done by SELLER.

### SELLER shall be responsible for the overall integrity of the fire protection, adequacy of design and demonstration that these systems meet the required and applicable regulations, codes, standards, approvals, listings, and certifications.

### SELLER shall implement all recommendations deriving from studies listed on item 8.12 without any impact in cost or project schedule and milestones.

### The Safety Study Recommendation Management System, mentioned on I-ET-3000.00-5400-947-P4X-001, must be fully implemented and be available 60 days from Agreement Effective Date or as soon as the first recommendation from safety studies is issued, which ever occur first.

### SELLER shall be responsible issue all safety studies reports, before issue the studies, SELLER shall execute a multidisciplinary evaluation in order to warranty the details of detail design was correctly used at the studies.

## NAVAL ARCHITECTURE DESIGN

### SELLER shall prepare a set of drawings, computer models and calculation reports for detailed design and operation of the hull as an FPSO.

### SELLER shall develop and/or update the detailed design of the corrosion protection systems (galvanic system, ICCP system and painting), including all drawings, calculations, and specifications, to accommodate all requirements for execution of the Scope of Supply related to the HULL Design, Construction, Assembly, Commissioning, Installation and Operation.

### SELLER shall develop monthly Weight Control Report comparing actual status with the Basic Design and monthly changes.

### SELLER shall supply all necessary information in fully editable files in the original format used for calculation, including computer models, such as, but not limited to:

#### Freeboard calculation, hull intact and damage stability calculation, preliminary trim and stability booklet, sounding and ullage tables,hull longitudinal strength (bending moments and shear forces), motion analysis, capacity plan, draft marks plan, ship descriptive memorandum, inclination test report, deadweight calculation, equipment number calculation, lines plan, Bonjean-Vlasov table/curves, hydrostatic table/curves, docking plan, arrangement and details for submarine inspection, etc.

## VENTILATION AND AIR CONDITIONING SYSTEM (HVAC) DESIGN

### SELLER shall develop or revise document and maintain all studies, drawings, lists, data sheets and calculations required to design, construct, and install the HVAC System for Modules, including the activities for the integration of the system in the Topsides and the interface with Hull Systems.

### SELLER shall develop/elaborate, not being restricted to, the following main activities, and the related documents shall be submitted for BUYER approval:

1. Confirm or update airflows of ventilated rooms, based on heat dissipation of the equipment defined in the Engineering phase of the project or room volumes (MC),
2. Confirm or update the cooling loads and conditioned air flows rooms, based on heat dissipation of the equipment defined in the Engineering phase of the project (MC),
3. Issuance of air conditioning and ventilation ducts design and pressure drop calculation (MC),
4. Issuance of equipment and components data sheets (FD),
5. Issuance of P&ID and flow diagrams (DE) for air conditioning, ventilation, and refrigerant systems, all of them issued with SPPID and the related database submitted to BUYER,
6. Issuance of air conditioning and ventilation ducts arrangements (DE),
7. Issuance of refrigerant arrangements (DE),
8. Issuance of HVAC Machinery Spaces arrangements (DE),
9. Issuance of Typical Installation Details for the HVAC System (DE),
10. Issuance of HVAC Instrumentation - Typical Commands and Loops (DE),
11. Develop and maintain updated the associated Equipment List (LI) during the work,
12. Review vendor data for conformity to specifications and ensure that type, model, serial number, performance diagrams or curves are included,
13. Issue the As-Built documentation.

## ARCHITECTURE DESIGN

### SELLER shall elaborate, but not limited to, the drawings, specifications, 3D model and other documentation required for the detailed design, procurement, fabrication, construction, assembling and installation for all closed compartments of the FPSO Unit, including those located at Accommodation Module, Engine Room, Poop Deck, Forecastle and Topsides Modules.

### SELLER shall develop its documents according to all documents of Basic design including Architecture and Ergonomics documents.

### The required documents shall include, at least, the following:

1. BIM (Building Information Modeling) according to BUYER guidelines presented on I-ET-3000.00-1350-94P-P4X-002 - DIGITAL ENGINEERING TECHNICAL REQUIREMENTS FOR DETAILED DESIGN, being guaranteed the interoperability of its modeling with all correlated systems, without loss of information, and including the integration of all facilities in closed spaces with topsides systems (example: ventilation ducts, piping, sewage system, etc.),
2. Architecture design (plans, sections, views, and details),
3. Architecture specification (floors, panels, linings, etc.),
4. Technical specifications of the equipment and furniture (laboratory, workshops, etc.),
5. Insulation plans (Thermal, Acoustic and Passive Fire Protection),
6. Insulation technical specification,
7. Doors, windows, scuttles, and removable panels’ specifications,
8. Plans of stairways, pathways, corridors, doors, windows, and side scuttles,
9. Ergonomic Analysis Report and Ergonomics Evaluation Report according to Brazilian Regulation NR-17 (Ergonomics) and Project’s Ergonomics Technical Documentation,
10. Data sheets (FD),
11. Material requisition (RM),
12. Technical bid evaluation (TBE),
13. As-Built documentation.

## ERGONOMICS ANALYSIS, ASSESSMENTS AND EVALUATION

### SELLER shall elaborate Ergonomic Work Analysis (EWA) which requires a visit to a similar reference work situation. SELLER shall issue a set of preliminary reports with Ergonomics recommendations based on field assessment and operators’ interviews. SELLER shall then conduct the validation of all recommendations in meetings with respective team assigned by BUYER.

### SELLER shall issue:

1. Final Validated Ergonomic Analysis Reports describing the EWA and the validation, with all engineering requisites necessary for full NR-17 compliance
2. Ergonomics Evaluation Report, including evidence of compliance with all Project’s Ergonomics Technical Documentation and Detail Design EWA Recommendations

### All Ergonomics documentation shall be developed by a certified Ergonomics Expert, be according to Brazilian Regulation NR-17 (Ergonomics) and to all Project’s Ergonomics Technical Documentation.

### SELLER shall conduct Ergonomics assessments throughout design, procurement, and construction of the Unit in several systems (such as, but not limited to valves, cargo handling, furniture, general equipment usability for CCR, offices, workshops, warehouses, infirmary, food supply rooms, laundry, gymnasium, leisure areas, crane cabin and operational areas, illumination systems, HVAC systems and arrangement designs) so all work posts are adequate to psychophysiological conditions of workers.

### Ergonomics specialist shall attend to all Design Review meetings.

## MARINE SYSTEMS DESIGN

### SELLER shall develop and/or revise documents and maintain all studies, drawings, specifications, computer models, lists, data sheets and calculations required for detailed design, construction, and installation of Hull Marine Systems, including activities for integration with Topsides and 3D model.

### These items mentioned above shall be submitted for BUYER review and shall include, not being restricted to, the following:

1. Determine the minimum and maximum required temperature for tanks and equipment, considering all predictable normal and abnormal operating conditions,
2. Prepare, check, and update specifications, data sheets (FD), material requirements (RM) and engineering design documents, equipment sizing reports and bills of material as required for the procurement, fabrication, and installation of marine systems,
3. Ensure that all systems can accommodate the expected motions, deflections and accelerations of the UNIT,
4. Review and approve drawings and equipment/valve/instrument calculations for conformity to specifications (supplied by vendors),
5. Perform acoustical analyses and noise level of the facilities to determine noise mitigation measures and establish special equipment requirements and define mandatory hearing protection areas,
6. Perform piping design for all lines, branches and connections and flexibility analysis considering hull flexure effects during the tow, operation, and storm conditions,
7. Prepare arrangements, piping layout, piping plan and isometric drawings of all piping,
8. Prepare and maintain a detailed line list and valve list containing pertinent data such as tag, size, type, class, service, material, system, painting, and insulation requirements, etc.,
9. Prepare and maintain detailed equipment list and material list for all piping,
10. Provide all documentation and computer models, including vendors documentation, calculation memories, etc. All original models, software input and output files used for calculations shall be made available to the BUYER,
11. Issue the As-Built documentation.

## DESIGN AUTOMATION REQUIREMENTS

### All diagrams and instrumentation Design shall be elaborated by SELLER and its Subcontractors using a CAE software package, according to I-ET-3000.00-1350-94P-P4X-002 – DIGITAL ENGINEERING TECHNICAL REQUIREMENTS FOR DETAILED DESIGN.

### For each Module/System to be supplied by SELLER or by any Sub-supplier, all piping, equipment, electrical, instrumentation and telecommunication cableway, HVAC, ducts, accommodation, naval, escape routes, and structural shall be developed in a complete three-dimensional scale model generated by the CAE software package, according to I-ET-3000.00-1350-94P-P4X-002 – DIGITAL ENGINEERING TECHNICAL REQUIREMENTS FOR DETAILED DESIGN as well as to produce input data for pipe stress analysis.

### The three-dimensional scale models generated for each Module/Equipment/System of the FPSO shall be integrated into only one complete three-dimensional model for the complete UNIT.

### 3D model technical specification shall be issued at the beginning of the Engineering design and updated at least every six months, to establish the assumptions and to organize the development of the model.

### SELLER must regularly perform updating of all documents and 3D model, incorporating any changes, attaching data that become available during the engineering design, construction, and integration phase up to final delivery of the FPSO to BUYER, and ensuring the reliability of the databases.

### SELLER shall be responsible for attaching all additional data or applications necessary to automatically extract documents from the databases.

### SELLER shall use the customization supplied by BUYER, at the signature of the Agreement Effective Date, and update with any additional necessary data.

### Final delivery includes the “As-Built” of the 3D Model, all files used to build the 3D design, all DOCUMENTS and additional computerized documentation or files of SELLER engineering activities.

### SELLER shall monthly issue in FTP area or cloud area updated releases of the engineering databases and all document files or applications for BUYER supervision.

### SELLER shall guarantee BUYER permanent remote access to files related to SELLER’s engineering activities, providing integrity reports consultation of all databases (P&ID, 3D, instrumentation, etc.), during the engineering and construction phases.

### SELLER shall provide all software used in item 8.18.8, and the maintenance contract from the software provider to guarantee software updates and maintenance until delivery of FPSO to BUYER.

## RISER SYSTEM DESIGN

### SELLER shall follow I-ET-3010.00-1300-279-PPC-350, I-ET-3010.00-1300-279-PEK-002, I-DE-3010.00-1300-279-PEK-003 and I-LI-3010.00-1300-279-PPC-350 to supply the BSDLs (Diverless Bellmouths).

### NOT APPLICABLE

### NOT APPLICABLE

### SELLER shall follow I-ET-3A50.00-1350-940-P56-001 (for XXXX field) and I-ET-3A40.03-1350-940-P56-001 (for XXXX field) for the FPSO Structures and Facilities for Riser Systems.

### SELLER shall follow ​I-ET-3010.00-5529-812-PAZ-001 for the Annulus Pressure Monitoring and Relief System of the flexible risers.

### SELLER shall follow I-ET-3000.00-5529-850-PEK-005 for the Rigid Riser Monitoring Systems.

### SELLER shall follow I-ET-3010.00-5529-854-PEK-001 for the MODA Flexible Riser Monitoring System.

### SELLER shall follow I-ET-3010.00-1519-140-P56-001, I-ET-3010.00-1519-140-P56-002, I-LI-3010.00-1300-270-P56-001, I-DE-0000.00-0000-140-P56-002 and I-ET-3010.00-1519-140-P56-001 to supply the Unified Diverless Support Tube (TSUDL).

### SELLER shall follow I-ET-3010.2D-1200-200-P4X-010 for Hard Pipe Specification.

### SELLER shall follow I-ET-3010.00-1300-850-PEK-001 for Control and Monitoring System for Risers Support.

### SELLER shall follow I-ET-3000.00-1516-823-PEK-006 for Wet Monitoring Signals.

### SELLER shall follow I-DE-3010.00-5529-850-PEK-001 for Riser Monitoring System Diagram.

### SELLER shall follow I-DE-3A50.00-1500-941-P56-001 (for XXXX field), I-DE-3A40.03-1500-941-P56-001 (for XXXX field) and I-DE-3010.00-1300-850-PEK-001 for Riser Supports.

### SELLER shall follow I-ET-3010.00-1500-274-PLR-001 for Riser Top Interface Load Analysis.

### SELLER shall follow I-ET-3000.00-1300-941-PEH-002 for Diving System of the Riser, Mooring and Hull.

### SELLER shall follow I-ET-3010.00-1300-850-PEK-002 to supply the Hull side Umbilicals.

## AS-BUILT DOCUMENTS

### All documents shall have a final “As-Built” revision and shall incorporate the changes made during construction, commissioning, and testing. The BUYER Code Number shall be included. All documents shall be marked “As-Built,” and delivered in tagged USB flash drive, HD, SD or other storage media.

#### BUYER will request 1 (one) printed copy of some As-builts and data books due to law attendance, regulatory agencies exigences, legal conformity, classification society rules or any other international or Brazilian applicable regulation. In these cases, SELLER shall delivery the printed copies without any cost to BUYER.

### All purchase documents shall also have a final “As Purchased” revision and shall incorporate the changes made during purchasing, fabrication and engineering phases.

### The “As-Built” operation manuals of the FPSO (Vessel and Process Plant) produced by SELLER shall be delivered in English and Brazilian Portuguese Language. If the original document is issued in English, two (2) electronic copies (one in editable native format and one in PDF – Adobe Portable Document Format version) shall be issued in Brazilian Portuguese language.

### The “As-Built” Safety Plan, Hazardous Area Plan and Key One Line Diagram (AC, DC/ UPS) produced by SELLER shall be delivered bilingual (English/ Brazilian Portuguese language).

### All other “As-Built” documents and drawings may be issued in either Brazilian Portuguese or English. BUYER may request additional documents or drawings in Brazilian Portuguese, according to the project needs. To issue or translate any drawing or document in Brazilian Portuguese is under SELLER scope of work.

### SELLER shall deliver the as-built documentation in a data book format approved by BUYER.

### SELLER shall present its procedure about controlling the modifications during construction, assembly and commissioning, to keep track of these modifications and to incorporate them in the “As-Built” revision, including in the 3D model.

#### An As-Built review event shall be agreed between BUYER and SELLER to evaluate the as built progress.

## DATA BOOK

### SELLER shall issue to BUYER approval the complete Data Book including the documents/registers of the Engineering, Construction and Commissioning. SELLER shall refer to I-ET-3010.2D-1200-91A-P4X-001 – REQUIREMENTS FOR O&M MANUALS AND DATABOOKS for additional requirements. The basic organization of the Data Book is:

* + 1. Part I – Operation and Maintenance Manuals – English and Portuguese Versions
		2. Part II – Engineering Data Book – including final as-built and as-purchased documents duly stamped by Classification Society, where applicable
		3. Part III – Vendor Data Books, according to the Exhibit V - Directives for Acquisitions and details presented on item 8.21.2
		4. Part IV – NR-13 dossiers
		5. Part V – Construction Data Book
		6. Part VI – Commissioning Data Book
		7. Part VII – NR-10 dossiers

### Vendor Data Book

#### SELLER shall issue to BUYER approval the complete Data Book, which shall include all final version of the approved documents of Engineering, Construction, Installation, Preservation, Commissioning, Operational and Maintenance produced for the equipment/system, stamped by Classification Society, when applicable. The basic organization of the Vendor Data Book shall be as follows:

1. Part I – Engineering Documents
2. Part II – Operation & Maintenance Manual, Instruction for Installation, Preservation and Commissioning
3. Part III – Quality Manual, comprising Material Certificates, Tests and Procedures, Weld and NDT reports and traceability
4. Part IV – NR-13 dossiers and documentation for compliance with regulatory agencies and Classification Society, with the approval stamp of the Classification Society
5. Part V – NR-10 dossiers and documentation for compliance with regulatory agencies and Classification Society, with the approval stamp of the Classification Society

#### SELLER shall upload to BUYER’s Electronic Document Management (EDM) system the approved Data Book for the modules’ packages

#### SELLER shall issue the Data Books for all equipment included on SELLER’s Scope of Supply

### Engineering Data Book

#### The purpose of this directive is to describe the Engineering Data Book structure.

#### SELLER shall issue Engineering Data Books with at least the content described below, on STRUCTURE ENGINEERING DATA BOOK section.

#### NOT APPLICABLE

1. SELLER shall issue Engineering Data Books as part of the final documentation.
2. SELLER shall upload to BUYER’s Electronic Document Management (EDM) system all “As-Built” documents produced by SELLER and Subcontractors, approved and stamped by the Classification Society, in both native file and searchable PDF file for both text and image.
* BASIC STRUCTURE ENGINEERING DATA BOOK

UEP

P-XX

PART “1”

Process

Lay Out and Piping

PART “2”

PART “3”

Mechanical Equipment

PART “9”

PART “8”

PART “7”

PART “6”

PART “5”

PART “4”

Structural

Noise/Vibration reports

Heating, Ventilation and Air Conditioning

Safety

Electrical

Instrumentation and Control

Description of documents disposal and methodology of location and consultation

Document List

PART “10”

Outfitting

PART “11”

Accommodation and Architectural

Naval Architecture

PART “12”

PART “13”

Telecommunications

PART “14”

Naval Systems

General Calculation Reports

PART “15”

Hazop Studies

PART “16”

Project Automation

PART “17”

Miscellaneous Documents

PART “18”

PART “19”

Classification Society original stamp approved documents

##### DETAILED STRUCTURE ENGINEERING DATA BOOK

**PART “1”**

Process

|  |  |  |
| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “2”**

Lay Out and Piping

|  |  |  |
| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “3”**

Mechanical Equipment

|  |  |  |
| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “4”**

Instrumentation and Control

|  |  |  |
| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “5”**

Electrical

|  |  |  |
| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “6”**

Safety

|  |  |  |
| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “7”**

Heating, Ventilation and Air Conditioning

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| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “8”**

Noise / Vibration Reports

|  |  |  |
| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “9”**

Structural

|  |  |  |
| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “10”**

Outfitting

|  |  |  |
| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

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| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “12”**

Naval Architectural

**PART “11”**

Accommadation and Architectural

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| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “13”**

Telecommunic-ations

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| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “14”**

Naval Systems

|  |  |  |
| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “15”**

General Calculation Reports

|  |  |  |
| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “16”**

Hazop Studies

|  |  |  |
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| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “17”**

Project Automation

|  |  |  |
| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “18”**

Miscellaneous documents

|  |  |  |
| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

**PART “19”**

Classification Society original stamp approved documents

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| --- | --- | --- |
| ITEM | DOCUMENTS | INDEXED BY |
| 1 | Technical Specification (ET) | Sequential order |
| 2 | Drawing (DE) | Sequential order |
| 3 | Calculation Sheet (MC) | Sequential order |
| 4 | List (LI) | Sequential order |
| 5 | Report (RL) | Sequential order |

## NOT APPLICABLE

## OTHER DOCUMENTS

### Field Modifications’ documents shall be made available at a EDM system. A corresponding Electronic Transmittal shall follow all electronic files, as indicated in Appendix 1 - Structure of the Buyer Code Number System.

### All purchase documents issued by the SELLER shall also have a final “As Purchased” revision and shall incorporate the changes made during purchasing and engineering phases.