PETROBRAS	**TECHNICAL SPECIFICATION**	Nº :	I-ET-3010.2Q-1350-196-P4X-002
	CLIENT:	MARLIM LESTE E SUL	SHEET 01 OF 71
	JOB:	BASIC DESIGN – REVIT I	
	AREA:	MARLIM LESTE E SUL	ESUP
	TITLE:	**ERGONOMICS REQUIREMENTS FOR HULL**	INTERNAL

INDEX OF REVISIONS

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0	ORIGINAL ISSUE
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SUMMARY

1 OBJECTIVE

The purpose of this document is to guide Detailed Design teams that will develop the Detail, Construction, and Integration Design, providing minimum design requisites. Beyond these requisites, the design shall respect all referenced applicable codes, norms, regulations, and, when appropriate, the Classification Society (CS) regulations, current Ergonomics legislation, and Petrobras' internal rules.

2 INTRODUCTION

This specification is part of the basic design. It aims to allow the implementation of Ergonomics principles in maritime unit projects to improve working conditions, minimize the need for corrections during operation, and consequently reduce costs and time lost.
During the basic design, work analyses were carried out on similar platforms (reference situations) to know the main typical work situations and to identify the characteristics desired for the different areas.

According to the ergonomic work analysis method (EWA method), new work analyses shall be carried out in the next stages of the project to detail the specifications presented here, especially helping the technical specifications for furniture and equipment. Specifications' development shall consider the comprehension of the work on similar platforms. It shall also consider the decisions regarding equipment and work organization that will be taken progressively throughout the project. Theinteraction with designers of different disciplines and project managers is necessary for future working conditions' adequacy.

These conditions (which can originate diverse combinations) guide project recommendations for creating material resources configurations (different but integrated equipment), making the situation management easier, either more or less complex, by the teams. Specifications created by the Ergonomics team for valves, cargo handling, pig launching/receiving system, access ways and laboratory, can be found in the document “ERGONOMICS REQUIREMENTS FOR TOPSIDE”.

In subsequent project phases (Detail, Construction, and Integration) the contractor company(ies) shall evaluate Ergonomics studies and evidence through **Ergonomic Report** that "Ergonomic Requirements for Hull" is being kept.

The requirements of this document shall be applied in all supplier packages, if applicable.

The Ergonomic Work Analysis (EWA) shall be developed by qualified Ergonomics professionals, whose qualification and method can be evaluated by Petrobras, according to NR-17 – “*Ergonomia”* (Regulatory Rule 17 - Ergonomics), Brazilian Secretary of Labor Regulation. The EWA shall be presented separately by each area of analysis.

The **Ergonomic Report** of Detailing Design Phase shall also be undertaken by qualified Ergonomics professionals whose qualifications and methods can be evaluated by Petrobras and shall present evidence that the Project is complying with all requirements presented in this document. The Ergonomic Report can be presented separately, by topic or area.

The final versions of all documents (reports) developed by the SELLER during the detailing, construction and assembly design phases shall also be delivered both in English and in Portuguese.

All stated requirements presented in this document are mandatory and shall be complied with. The non-observance of any of these recommendations, the absence of the requested Ergonomic Analysis or the lack of information demanded in the Ergonomic Report shall be considered as a reduction of scope and shall be charged by the Owner as such, with the proportional cost for necessary adjustments of the work situation for full compliance.

3 NORMATIVE REFERENCES

3.1. Rules and Regulations

The following Rules and Regulations shall be considered for the development of ergonomics design and report:

- ABS Guidance Notes on the Application of Ergonomics to Marine Systems, 2018,
- ABS Guidance Notes on the Implementation of Human Factors Engineering into the Design of Offshore Installations, 2014,
- ABS Guide for Ergonomic Notations, September 2021,
- ANP Resolução 43/2007, Regulamento Técnico do Sistema de Gerenciamento da Segurança Operacional das Instalações Marítimas de Perfuração e Produção de Petróleo e Gás Natural (SGSO) – National Petroleum Agency Resolution 43/2007, Technical Regulation of the Operational Safety Management System for Offshore Oil and Natural Gas Drilling and Production Facilities,
- ANP Resolução 41/2015, Regulamento Técnico do Sistema de Gerenciamento de Segurança Operacional de Sistemas Submarinos (SGSS) – National Petroleum Agency Resolution 41/2015, Technical Regulation of the Subsea Systems Operational Safety Management System,
- ASTM F1166 – Standard Practice for Human Engineering Design for Marine Systems, Equipment and Facilities,
- NR-11 – “Transporte, Movimentação, Armazenagem e Manuseio de Materiais” – Transport, Movement, Storage and Handling of Materials,
- NR-12 – “Segurança no Trabalho em Máquinas e Equipamentos” – Safety at Work in Machinery and Equipment,
- NR-17 – “Ergonomia – Ergonomics ,

- NR-35 –"Trabalho em altura" – Work at height,
- NR 37 – "Segurança e Saúde em Plataformas de Petróleo" – Safety and Health in Oil Platforms,
- NHO-11 – "Avaliação dos Níveis de Iluminamento em Ambientes Internos de Trabalho" – Assessment of Lighting Levels in Internal Work Environments,
- IEC 61892-2 – Unidades marítimas fixas e móveis — Instalações elétricas Parte 2: Projeto de sistemas elétricos,
- ABNT NBR 13962 – Office Furniture – Chairs – Requirements and Test Methods
- ABNT NBR 13967 – Office Furniture – Workstation Systems – Classification and Test Methods,
- ISO 6940 – Textile Fabrics - Burning Behaviour. Determination of ease of ignition of vertically oriented specimens,
- ISO 11064-6 – Ergonomic design of control centres,
- IOGP- REPORT 454 – Human Factors Engineering in Projects – International Association of oil and gas producers.
- NORMAM-223/DPC – "Normas da Autoridade Marítima para registro de Helideques" – Maritime Authority Rules for Registration of Helidecks.

Reference Documents

I-ET-3010.2Q-1400-196-P4X-001	ERGONOMICS REQUIREMENTS FOR TOPSIDE
I-MD-3010.2Q-1200-800-P4X-002	AUTOMATION AND CONTROL SYSTEM - SCOPE DEFINITION
I-ET-3010.2Q-1350-190-P4X-001	ACCOMMODATION ARCHITECTURE MATERIALS AND EQUIPMENT SPECIFICATION
I-ET-3000.00-1350-940-1JD-005	BASIC INFORMATION FOR HEALTH COMPARTMENTS
I-ET-3010.00-5140-700-P4X-008	SPECIFICATION FOR LIGHTING AND ELECTRICAL SIGNALLING FOR OFFSHORE UNITS
I-ET-3010.00-5140-700-P4X-001	SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS
I-DE-3010.00-5140-700-P4X-001	LIGHTING INSTALLATION TYPICAL DETAILS
I-ET-3010.00-1200-300-P4X-001	NOISE AND VIBRATION CONTROL REQUIREMENTS
I-ET-3010.2Q-5266-630-P4X-002	HULL MECHANICAL HANDLING PROCEDURES
I-DE-3010.2Q-1200-800-P4X-001	CENTRAL CONTROL ROOM LAYOUT
I-ET-3010.00-1359-940-P4X-002	OFFLOADING SYSTEM

1 SCOPE

This document is oriented to the application of Ergonomics to the design of the hull, including basic guidelines for the following rooms:

- Central Control Room (CCR), including Emergency Response activities,
- Radio and telecommunication rooms,
- Galley, messroom, and provision stores,
- Hospital,
- Laundry,
- Offices and meeting rooms,
- Leisure rooms, including a physical activity room,
- Warehouse, Stores and Workshops,
- Emergency Response Base and Safety Store,
- Reception/ Briefing,
- Private rooms (Cabins),
- Engine Room,
- Helideck.

In addition to these compartments, the following systems are also included in this document:

- Offloading,
- Pull-in.

The following abbreviations shall be observed:

- POB: People on Board,
- FPSO: Floating Production Storage Offloading Unit
- EWA: Ergonomic Work Analysis

ZONING

Allocation of different compartments to different accommodation module levels was carried out by architecture discipline. The principles that guided zoning in this project were:

1. Separation of work areas from rest and leisure areas, to avoid mutual annoyances,
2. Hospital located in a way that facilitates fast access to helideck,
3. The location of the gymnasium should prioritize avoiding noises for cabins,
4. Galley, messroom, and provision stores should be close and preferably on the same level. Easy access between these compartments is required. Facilities should be provided for receiving and storing provisions,
5. Easy access from the control room to the process plant (only one deck above

production plant),
6. Deck distribution with concentration of similar functions.

GENERAL CONDITION

LAYOUT

Location, access, and flow

The location of several compartments considered the interrelationship among sectors and the ease of access and/or communication required between some rooms.

Accesses were located and sized considering the number of people circulating and the necessity of passage of equipment and large and/or heavy pieces that can demand a specific handling system to be defined in each project.

Dimensioning and layout

The number of operators in the shifts and shifts changes, the equipment and furniture required for each compartment in the several phases of the platform commissioning and operation, and the communication and / or privacy needs between teams were considered in the design.

Appropriate circulations considered people and loads movements of each sector and the possibility of using transport carts or other transport systems for large and/or heavy materials.

Personal protection equipment (helmets, boots, etc.) close to the rooms' accesses were foreseen.

A 2 - 3 years commissioning stage was considered. Adaptations of one of the two meeting rooms and of the library were foreseen for additional teams observed in this phase to mitigate the impact on work and cohabitation of these and other teams.

WET AREAS REQUISITES

All spaces with wet areas or spaces that need floor washing shall be provided with drainage systems (grates) on the floor and taps distributed for washing. Among these places are the food sector, laundry, bathrooms, and locker rooms, etc.

For the drainage system design, slopes foreseen in each FPSO shall be checked once the slope / heeling changes occur frequently.

The drainage system shall be based on the distribution of collecting gutters fitted with grates and drains positioned at opposite ends, according to the intended slopes.

Solutions shall be provided to allow the grilles' perfect leveling so that it does not get loose and / or cause bumps, which can hinder the movement of trolleys and cause people to stumble and fall.

Grilles opening and the width of specified trolley wheels shall be compatible to prevent the wheels from gripping on the grilles.

The drainage system interference in the structure shall be anticipated, providing openings on the decks and metal beams.

FURNITURE AND EQUIPMENT REQUISITES

Furniture and equipment shall comply with some general principles:

- Materials shall comply with I-ET-3010.2Q-1350-190-P4X-001 - ACCOMMODATION ARCHITECTURE MATERIALS AND EQUIPMENT SPECIFICATION
- Surfaces shall avoid reflections.
- Furniture and equipment shall be fixed to the floor or have brakes to avoid damage caused by movement from the unit's heeling. The anchoring system and the production storage process influence the production unit movement.
- Cabinets, shelves, and tables shall have stops, locks, and latches to avoid falling objects and openings of doors and drawers resulting from these possible movements.

Chairs

Workplace chairs:

- Shall follow standards according to the nature of the activities carried out. It can be divided into 5 possible groups: (i) office chairs, (ii) visitor chairs, (iii) meeting chairs, (iv) chairs for control room operators and radio room, or (v) workshops and warehouse stools.
- Appendix I, II, III, and IV of this present technical specification models for chairs that meet the standards.
- Places where the activities require chairs with different specificities from those mentioned, will be addressed in the respective specific architecture documents.
- Chairs used in workstations shall meet the minimum requirements described in NR-17:
  a) adjustable height to worker height and the nature of the function performed,
  b) little or no conformation at seat base,
  c) rounded front edge,
  d) the shape of the backrest shall be slightly adapted to the body to protect the lower back.

Office Chairs

Office activities generally occur with the use of a computerized workplace for extended periods.

- Adjustable height for a worker to use the computer with elbows at an angle around 90 degrees and close to the body,
- Height-adjustable armrest,
- Medium backrest with height adjustment, allowing thoracolumbar support and inclination adjustment, due to the use of the workstation for long periods.
- Seat depth shall also be adjustable to adapt the chair to the population's anthropometric variations.
- Chairs with casters or fixed base (Figure 1) shall be evaluated according to the location and the platform, depending on the level of unit inclination. On more unstable platforms, sometimes chairs with casters can cause problems because of their easy displacement.

Figure 1. Office chair base with casters and fixed, respectively.

- Chairs with casters shall contain locks. The casters and locks shall be resistant to stress, frequent use, and floor finishing material (elevations in the floor, for example).
- All chairs shall have a base that is compatible with the floor covering of the room they are in, whether the chair is with caster or fixed.

Meeting Chairs

Chairs used for meetings that can take longer periods of the day. Platform meeting rooms are also used as a support point for laptop use by non-resident workers, such as auditors or members of support teams from base. Therefore, it is recommended:

- Adjustable height for worker to use the computer with elbows at an angle around 90 degrees and close to the body.
- Height-adjustable armrest
- Medium backrest with height adjustment, allowing thoracolumbar support and inclination adjustment, due to the use of the workstation for long periods.

Visitor Chairs

Visitor chairs are used for small meetings or attendance for a short time, so it does not require a computerized post. Thus, the adjustment of seat height, backrest, armrest, and seat depth adjustment are unnecessary.

Control Room, Radio Room, Coordinators and OIM Chairs

Activities in these rooms require the analysis/visualization of data on different monitors and panels. Also, sometimes users perform uninterrupted work sat on the chair, especially in the radio room. For this reason, chairs shall have the same characteristics of the office chair, with the following differences:

- High backrest with headrest,
- Shall have casters with locks to allow movement on the office countertop.

Workshops and Warehouse Stools

Stools are used on high countertops (900 mm high or more), where precision activities and / or prolonged periods for postural variation are performed. It usually occurs in workshops and in the warehouse.

- Stools shall allow adjusting seat height and shall have a footrest.

Workbenches or countertops

Minimum horizontal countertop dimensions (length x width) shall consider:

- The type of work performed (microcomputer work, laptop work, precision work, light work, heavy work, work with or on equipment and parts, etc.),
- Arm's reaching needs and forearms supporting (figure 2),
- All equipment planned for the activity,
- Space for the use of paper (reading and writing).

The height of bench shall take into account:

- The type of work performed (microcomputer work, laptop work, precision work, light work, heavy work, work with or on equipment and parts, etc.),
- How work is performed, whether sitting or standing and, if sitting, at what height (low or high chair),
- Workstations with tables / countertops with a usual height between 720mm and 750mm,
- Adequate room for moving legs under the countertop. A minimum free depth of 450 mm at the knees level and 700 mm at the feet level shall be foreseen, measured from the front edge. Minimum free height for knees of 650mm shall be foreseen.

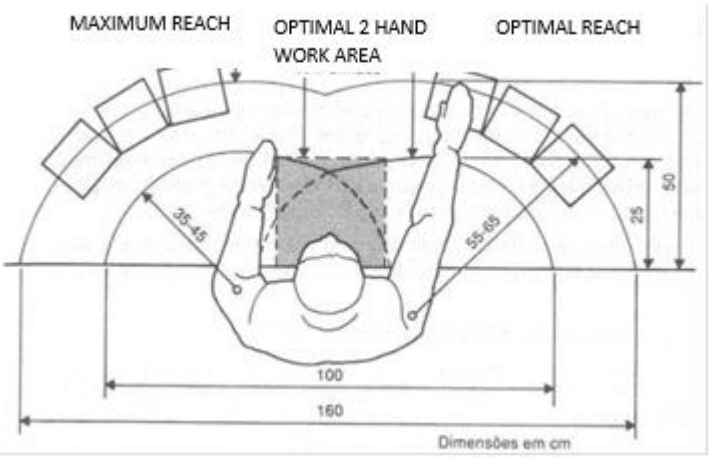

Figure 2. Workstation arm reach dimensions (IIDA, 1990).

Shelves and cabinets

Shelves and cabinets shall be provided with:

- Doors with locks, so they do not open with the platform movement,
- Barriers to avoid falling objects, sized according to the size and heights of these objects.

Meeting Tables shall:

- Be sized according to the number of employees and the possibility of grouping themselves for a meeting,
- Have height between 720 and 750 mm,
- Provide space to accommodate the material being consulted during a specific period to avoid falls due to FPSO movement,
- Be resilient enough for people to lean on them while standing on their feet at the meetings.

THERMAL COMFORT

The criteria shall comply with NR-17 and NR-37.

General specifications on thermal comfort are issued by the HVAC discipline and can be found in HVAC Technical Specification.

The air supply shall not be led directly onto the workstations and places where people are present (chairs, beds, counters, etc.).

Specific recommendations for specific areas will be presented in the respective chapters.

LIGHTING

The criteria shall be in accordance with NR-17, NR-37 and NHO-11.

General lighting specifications are issued by the electrical discipline and can be found in I-ET-3010.00-5140-700-P4X-001, SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS, I-DE-3010.00-5140-700-P4X-001 - LIGHTING INSTALLATION TYPICAL DETAILS, and I-ET-3010.00-5140-700-P4X-008- SPECIFICATION FOR LIGHTING AND ELECTRICAL SIGNALLING FOR OFFSHORE UNITS.

Specific recommendations will be presented for specific areas in respective chapters.

ACOUSTIC

Measures shall be implemented so that the maximum noise level complies with NR-17 and NR-37.

The criteria for project are described in I-ET-3010.00-1200-300-P4X-001, NOISE AND VIBRATION CONTROL REQUIREMENTS.

Specific recommendations will be presented for certain areas in respective chapters.

During the detailed design, a noise and vibration report shall be issued, in different phases, with information and recommendations for treating any anomalies that may be encountered.

OPERATIONAL SPACES

Platforms have a control room for monitoring and operating the various systems, also called Central Control Room (CCR).

For this ET, CCR's minimum team is considered, based on previous projects and analysis in reference situations: P1 operation technicians, Production Supervisor (SUPROD), E1 stability technician, automation technician, and metering inspector.

The maintenance team also perform activities on the control countertop, which may be continuous or sporadic.

For operating spaces, a workplace for the development of administrative activities by other technicians, such as data analysis of technical documents and discussions, are considered.

INITIAL INPUTS

In the design of the control room, the following aspects were considered:

- The central control room has three distinct but integrated places: (i) Central Control Room – Operating area (CCR-OA), (ii) Central Control Room Equipment Room (CCR-EA), and (iii) Central Control Room – Automation and Turbomachinery Room (CCR-ATR),
- The possibility of transforming the control room in the future into a remote room with onshore monitoring and control shall be considered by the project, as well as its impact on the work. For this reason, the provision of videoconferencing devices and other equipment is necessary for remote communication.
- Equipment and systems provided for control rooms (automation, control, and monitoring, emergency buttons, communication systems, etc.) are mentioned in document I-DE-3010.2Q-1200-800-P4X-001 - CENTRAL CONTROL ROOM LAYOUT) and its referred documents.

Design of CCR-OA room, considered the following aspects:

- Adjacency to Coordination Office, OIM Office;
- Being close to Radio Room, Telecom Lower Room and Permit Room;
- Being of fast access to Production Plant, being close to the exit and only one deck above Production Plant main access.

LAYOUT, FURNITURE, AND EQUIPMENT

As described above, the control room is composed of 3 integrated environments but separated by partitions: an equipment room (CCR-EA), an automation and turbomachinery room (CCR-ATR), and a monitoring and control room itself, as shown in the picture below (Figure 3).

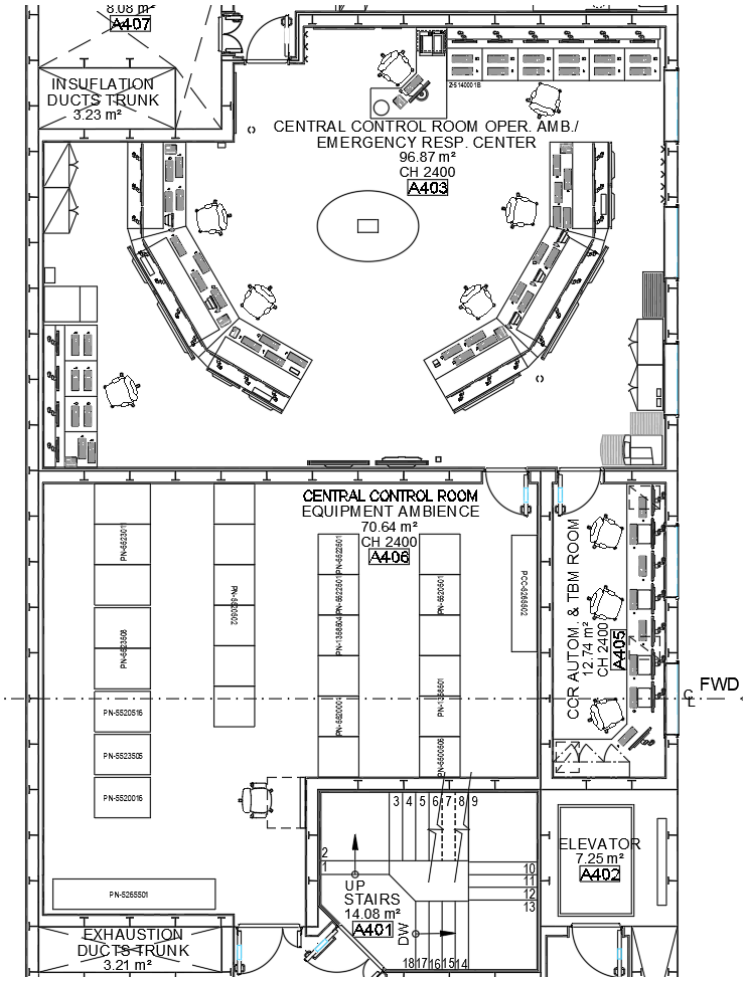

Figure 3. Room distribution adopted for the Central Control Room

The following items show recommendations for the layout, furniture, and equipment of the 3 control room environments:

CCR-OA

The control room itself shall be in a safe area, in a position that allows:

- Quick access to production plant for emergency cases.
- Mitigation of access and transit of people inside the room for activities other than CCR-OA main subject (there is a parallel corridor to exit Accommodation Model to avoid transit of people inside of CCR).
- Circadian Rhythm regulation with windows that allow the visualization of the external area, with ingress of natural light,
- The relative position between the different workstations was related to the communication needs between users,
- The existence of a dedicated workstation for the production supervisor (SUPROD) with visualization of the operation workstations integrated inside de CCR-OA room:
  - The SUPROD activity needs greater integration with production operators,

therefore the visualization to the production operation bench is foreseen,
  - The SUPROD activity needs a whiteboard, which is located on the wall behind his desk.

- A space for team interactions/ short meetings is foreseen. This area will be used for discussions of special maneuvers, shift exchanges, Emergency Operational Response (EOR), among others.
- This area is constituted by a table for opening documents and an electronic board. It shall also be provided cabinets for life jackets, bench with emergency procedures, announcement radio, emergency plans and documentation
  - For the storage of life jackets, consider the minimum quantity required by SOLAS and/ or Safety Plan for CCR.
- CCR consoles were designed to receive extra chairs for operators during emergencies, shift exchange and training. The estimation is to have two workposts for the production team and one workpost for the ballast team, and up to two extra chairs for each console,
- During the detailing phase of the project, the CONTRACTOR shall evaluate ergonomic studies about works on CCR and validate the layout of all areas of CCR and the quantity and dimensions of all furniture and position of screens. The final layout shall be approved by PETROBRAS.
- The supply of technical furniture for CCR-ATR, CCR-EA, and CCR-OA shall be done only after validating consoles layout, quantities of equipment as monitors, radios, keyboards, computer peripherals, automation, and telecom accessories. The final information of technical furniture shall be issued to be approved by PETROBRAS.
- Central Control Room furniture shall be provided by specialized IT furniture manufacturer and shall comply with all automation and control specifications described in the document “AUTOMATION AND CONTROL SYSTEM - SCOPE DEFINITION”.
- The technical furniture shall allow alterations and have easy assembly or disassembly.
- The assembly of the technical furniture shall be accomplished without the need for either welding or carpentry work.
- It is necessary to provide screens for CFTV system with the possibility to monitor different platform’ TV cameras. Compatibility of screen size and eyesight operator limits shall be considered in CFTV screen distribution and design,
- To facilitate the external area's monitoring, CCTV system should allow mobile cameras and the approximation of views (zoom),
- Minimum CCR console depth shall be 1000 mm, and the height of the bench shall be between 720 and 750 mm. It shall be provided enough free room to allow legs movement during operator's displacement (concerning table structure and supports).
- Monitors shall be attached to the workbenches through supports that allow height adjustment and inclination adjustment as well as angle according to the eye direction positioning,
- Each workpost shall allow the installation of different monitors, CCTV, and PI (allowing the presentation of several graphs with control variables' trends),
- Devices to store drawings and maps that are consulted during the operation

shall be provided.

- If emergency buttons are used, these shall be placed in their own workbench and with a protective cap;
- The number of frames, panels, and other devices attached to the walls of the control room shall be verified in each project.
- The position of each of these elements shall be studied for proper visualization by operators, according to the use frequency of each type of information.
- The position of each of these elements shall be studied in a way not to interfere with walls' acoustic treatment,
- Chairs in this room shall have durability and comfort. They shall be swivel chairs with armrests, high backrest, and have a headrest, height adjustments for the seat, backrest, and arms, as specified in the table below. Those specifications are found in document I-ET-3010.2QE-1350-190-P4X-001 – ACCOMMODATION ARCHITECTURE MATERIALS AND EQUIPMENT SPECIFICATION.

Table 1. Specifications for CCR Operator's Chair

Dimensions/Parts	Specifications
Total chair width:	Approximately 700 mm.
Total chair depth:	Variation of approximately from 580 to 635 mm.
Total chair height:	Variation of approximately from 970 to 1100 mm.
Seat height from the floor:	Approximately from 405 to 535 mm.
Seat depth:	Approximately from 390 to 500 mm.
Seat width:	Approximately 485 mm.
Width between armrests:	Approximately from 380 to 500 mm.
Height of armrests from the floor:	Approximately from 585 to 815 mm.
Height of armrests from the seat:	Approximately from 180 to 280 mm.
Backrest width:	Approximately 480 mm.
Armrest width:	90mm on the largest part
Backrest inclination angle:	From 96º to 120º.
Inclination angle of front seat edge:	From -3º to 2º.
Headrest height adjustment range:	Approximately 100 mm.
Headrest depth adjustment range:	Approximately 63 mm.
Variation in lumbar support height:	Approximately 115 mm.
Armrest retraction:	Approximately 75 mm.
Variation of armrest pivot angle:	27º when rotating inward or outward.
Seat:	• Height pneumatically adjustable between approximately 405 mm and 535 mm, width of approximately 495 mm,

	• Adjustable depth between approximately 390 mm and 470 mm, • The front edge's passive angle shall allow for tilting the front seat edge by approximately 40 mm. This feature will relieve pressure behind the thighs and grant appropriate blood circulation to the user's legs and feet. • Seat boundaries shall allow lateral movement.
Backrest:	• Height from the seat of approximately 600 mm, • Approximately width of 480 mm, • Height adjustable lumbar support between approximately 160mm and 255 mm, • Polyethylene terephthalate (PET) seat cushion, • Inclination system based on user's weight, without manual adjustment, and with adjustable and upholstered headrest. • Backrest boundaries shall allow lateral movement.
Mechanisms:	• Controls shall be visible and easily accessible from a seated position on both sides of the chair. No tools shall be needed to make adjustments. • Reclining in the range of 20 degrees, • Angle between seat and backrest shall vary between approximately 100 and 115 degrees.
Armrests:	• With height, width, pivot, and depth adjustments. • Height adjustment: between approximately 190 mm and 290 mm, • Width adjustment of approximately 60 mm per armrest, • Pivot angle Adjustment: 30 degrees, • Depth adjustment of approximately: 75 mm. • Minimum distance between arms: 300mm, when armrests are pivoted inwards.
Base:	• Resistant steel covered with molded polypropylene cover, • Double casters in rigid nylon. Diameter of 65 mm. • Spare parts shall be available for replacement, such as seat cushion and / or backrest, armrest and / or headrest, casters, pneumatic cylinder.

Automation and Turbomachinery Room (CCR-ATR)

CCR-ATR shall:

- Be adjacent to CCR-OA,
- Have proper consoles for the installation of control system stations,
- Have supports for the monitors, attached to the countertops, that allows height, angle and direction of eyesight adjustments.
- Have a white board;
- It is convenient that operators have contact to natural light so regulation of circadian rhythm is improved.

Equipment room

- Provide space for racks and other equipment considering necessary distances for circulation, maintenance, and ventilation,
- Provide a retractile workstation / workbench to facilitate maintenance activities. This is not a full-time workspace, but support for maintenance activities
    - Minimum width of the table to be provided: 1000 mm. Minimum depth: 600 mm, Height: 750 mm;
- The equipment room shall be contiguous and interconnected to the operating room,
- This area shall have a cargo handling door that allows cabinets and racks transportation.

RADIO ROOM AND TELECOM ROOM

The radio room has panels with VHF and UHF communication radios, emergency communication systems, and internal communication with the entire platform. The radio room is also responsible for receiving phone calls.

The telecommunication room shall have an area with a workstation for the telecom technician and an area for the equipment.

INITIAL INPUTS

The radio room is located near to the Central Control Room.

It is adjacent to Telecom Lower Room to allow the telecom technician to intervene quickly in case of equipment malfunction in the radio room. However, radio and telecom rooms are separated into two distinct rooms.

The technician's table for maintenance support shall be inside the room. It is understood that use of this work post is eventual and for short periods of time.

LAYOUT, FURNITURE, AND EQUIPMENT

The design of the radio room shall consider the equipment provided for each FPSO.

The layout of the Radio Room shall take into account the location of the equipment used by the operator. The distribution of these equipment shall facilitate the visualization of information and anthropometric measures. Adjustments according to the final equipment geometry shall be made during Detail Design.

Workbenches shall include radios (UHF, VHF), chargers, telephone (hotline and extension), satellite communication equipment, weather and platform movement information (pitch, roll and river). Adequate room to accommodate legs are also required in these workbenches during the operator's movement (concerning table structure), according to item 6.3.2.

It is also necessary to provide a workstation with a microcomputer and printer. This workstation can be integrated with the radios and satellite communication workbench.

The operator remains sit for most of his workday (12 hours). The chair shall be provided with casters and latches to facilitate the operator's movement. These locks shall be resistant, as explained previously in item 6, and the different parts of the chair shall have adjustments, as shown in table 1.
Provide the installation of cabinets and files for storing documents and reports and cabinet for storing PPE with hooks on the wall to hang helmets.

Telecom battery room should be provided with unlevel shelves to give batteries reach in multiple rows and stops in the shelves.

GALLEY, MESSROOM AND PROVISION STORES

Galley, messroom, barbecue area, provision stores, cold storage, gallon store, coffee points and garbage disposal deposit establish a set, referred to as "food sector", and constitute a functionally interrelated system.

The food sector is located in a compatible level, as the laydown area to facilitate food handling. The specific location is associated with the means of receiving and transporting food.

The food sector shall have appropriate conditions for keeping hygiene and avoiding food degradation / contamination risk. The food sector design seeks to solve cross flow problems between people and between people and supplies, such as food unloading area x storerooms, kitchen x storerooms, kitchen x messroom, internal (personnel) flow x public flow, dirty x clean.

Means for cargo handling of food shall be studied in a specific EWA assessment, considering purchased equipment in Detail Design phase.

Unit coffee points are also related to the food sector. The number may vary according to unit size and messroom scheme of operation. Still, there is usually a coffee point near the control room and another near the messroom (when the messroom itself does not work as a coffee point before and after mealtimes).

INITIAL INPUTS

The "food sector" is in contiguous areas to facilitate the integration between the operations of storage, preparation, and food supply to people on board.

The following aspects were considered in the food sector design:

- Number of meals to be served, consistent with the maximum unit's POB,
- Galley design allowing the work activity in specific areas for meat pre-preparation, cooking, salad preparation, bakery, and dishwashing,
- The necessary storage capacity in the provision stores considering the expected foodstuffs delivery frequency of the platform,
- Scheme of rotation of classes for meals,
- Diversity and complexity of the menu,
- Place of the arrival of the provisions and the cargo handling between laydown, food container parking space, and
- Despite favorable trends to pre-processed food usage, this technical specification favored preparation with fresh ingredients due to quality and health issues. Thus, the use of pre-processed food or the provision of pre-made frozen dishes are not considered herein.

In addition to the topics above, the project shall be based on NR-37 and all applicable health codes.

LAYOUT, FURNITURE, AND EQUIPMENT

Equipment list is determined in I-ET-3000.00-1350-940-1JD-005 - BASIC INFORMATION FOR HEALTH COMPARTMENTS.

The food sector is composed of the following places: galley, messroom, barbecue area, provision stores, cold storage, gallon store, coffee points, and deposit for garbage disposal.

The areas of the food sector are located on the same floor, interconnected.

The following compartments are located near the food sector to facilitate and minimize displacement and to follow the rules:

- Toilets for the exclusive use of sector employees, in an area adjacent to the

galley, in a corridor for sector employees access only,
- Toilets (male and female), adjacent to the messroom,
- Catering office in an area adjacent to the galley,
- The barbecue area allocated in the exclusive and external area, with bench and sink, adjacent to the food sector, covered and with protection in the case of adverse weather conditions,
- Exclusive area to store mineral water gallons near the provisions store area.

Due to the large flow of people and the cargo handling, special attention shall be given to access doors' concerning ramps, door width, accessories, and opening mechanisms.

Detail Design shall foresee flush to floor doors sills and ramps compatible to Detail Design Cargo handling for all areas. In the case of obstacles, fixed or mobile ramps shall be provided according to cargo handling equipment specific requisites.

Provide quick and unobstructed access (steps, sills, pipes, etc.) between:

- External area and provision stores,
- Galley and provision stores,
- Messroom and barbecue area, outside the kitchen area,
- Galley and messroom.

People crossing flow shall be avoided between clean and dirty areas.

GALLEY

Galley design includes the following areas:

- Main area - cooking area (central) and preparation of food (peripheral) in an integrated way,
- Bakery - exclusive area and partially excluded from the main area,
- Washing - washing of dishes, cutlery, glassware, pots, bowls and utensils, and garbage cans (organic, Tetra Pak®, plastics, and paper) that allows segregated flow concerning clean areas of the central part,
- Barbecue area with protection from sun and bad weather, and with good smoke dispersion condition.

The following aspects shall be considered in kitchen design:

- Grilles shall be provided in the drainage system, near workbenches, washing areas, barbecue, and bakery,

Figure 4. Grilles used for draining water from kitchen floor.

- Provide one or more sinks for hand washing, one of which is close to the access of the main galley area, with liquid soap, antiseptic product, and hand-drying device,
- Mixers/faucets shall have devices that can be operated without hands by workers (activated by sensors, arms, or foot actuation),
- Provide a place to keep disposable hair nets near the kitchen access,
- Workbenches shall have free space for feet accommodation and dimensions in such a way as to facilitate activities to be performed. All workbenches shall have plastic film holders, plastic gloves, antiseptic products, and a place to store a set of knives,
- Sink dimensions (width, depth, and length) shall be designed to allow the washing of products and containers used in the activities' development, according to the analysis performed in the Detail Design phase. Taps shall be rotating (mobile spout), equipped with mixers (hot and cold water), and with height compatible with the use of each tank. In the sink for large utensils, it is required taps with flexible and retractable cable concerning the bench,
- Cabinets and shelves shall have removable safety bars and adjustable heights.
- Clean dishes storage cabinets shall have doors to prevent contamination due to proximity to dirty dishwashing areas,
- Cabinets with drawers shall be provided for storing cutlery and utensils,
- All trash bins shall have handles, latches, lids, and pedals. Their positioning shall facilitate the disposal of residues and avoid disturbing galley flows. Sizing and capacity shall be adequate to avoid the accumulation of organic residue in the galley area,
- Scales shall be provided to weigh waste to be discarded by food disposer,
- Provide two support wheeled carts with locks, to transport dishes, hot pots, plastic storage containers, and other necessary tools,
- Spaces may be needed in these trolleys to attach food trays with ready-made food,
- Food preparation areas shall be independent for different types of food (red meat, poultry, fish, vegetables, etc.),
- During the detailing project, an installation plan shall be issued covering electrical,

hydraulic, and exhaust installations of the various equipment,

- Salivary protection shall be provided for:
  - Galley distribution counter (cold and thermal),
  - Messroom service counter.

Cooking Area

The following aspects are considered when designing the cooking area:

- Provide support benches for pans, plastic storage containers, crates, and / or utensils near the cooking area (stove, hotplate, boiler, etc.).
- It is required that the hood is installed at a certain height as to avoid the risk of head clash and improper postures
- Provide refrigerators (which can be in the internal galley area) for:
  - Kitchen pre-prepared products,
  - Bakery pre-prepared products,
  - Ready-made desserts,
  - Pre-prepared meals.

Figure 5. Refrigerators used by the bakery and other kitchen areas.

- The combined oven shall be installed close to the chef's worktop,
- Equipment shall be provided in quantity according to the POB. For example, for a POB of 240 people, it is suggested:
  - Stove with 6 burners and oven, combined oven, plate, and boiler.
- Provide bar for utensils on countertops, drawers, magnetized support for knives and shelves with stops.

Food preparation area

- The chef counter's position shall allow food ramp view (facilitating the control) and be close to the cooking island (stove and grill).

- The food preparation area countertops (red meat, poultry, fish, vegetables, etc.) shall be segregated and independent from each other. At the same time, they shall be close because the preparation is done by the same person.

Figure 6. Countertops used for preparing red meat.

- Each preparation area shall have a specific chopping board for each type of food (meat or vegetables) in resistant and easy-to-clean material and shelves next to the counter for placing daily use ingredients.
- Provide a refrigerator for each area or near them to meet sanitary requirements related to this activity (Figure 7). The refrigerator can be the same for the three types of meat (red meat, poultry, and fish), as long as it has separate compartments with independent doors.

Figure 7. Refrigerators on food preparation area.

- This area shall have defrosting equipment.

Washing and pre-preparation of vegetable area

Area for washing and preparation of vegetables and cold cuts, which is used by the galley helper:

- Provide support countertops and sinks with elevated tap and deep vats to allow washing large trays

Figure 8. Vegetables washing e preparation counter and sink.

- The preparation of dairy and cereal may be done on this counter.
- Vegetable cutting equipment shall be installed near the sink and on a stand. The height of the stand shall allow access / reach to equipment during use.
- Removed

Bakery

- Bread, cakes, pastries, and pasta require exclusive areas due to their own equipment and specific temperature and humidity requirements for bread preparation.
- Workbenches shall be provided near the oven. These benches (Figure 9) shall have faucets and sinks with enough depth to allow washing big trays.

Figure 9. Bakery workbench and sink.

- Provide a pasta cylinder on the side of the bench and enough space to open dough.
- Provide vertical oven, apart from kitchen oven, allowing the use of trays, with a minimum capacity for 10 trays.
- Provide cabinet with door for bread fermentation and support carts for trays storage with minimum dimensions of 700 mm x 500 mm (pasta rest). These places serve to store empty trays and accommodate ready-made bread and cakes while cooling.
- Provide shelves next to countertops to keep daily use ingredients and drawers to store utensils.

- Air conditioning and / or mechanical exhaustion shall be provided according to the ceiling height.
- More sensitive fruits and vegetables can be stored in a dry food store or the horticulture chamber.

The following equipment shall be provided at the bakery for a POB of 240 people:

- Two dough mixers, with a minimum capacity of 20 liters (mixer). Or a mixer with spare parts,
- Industrial dough mixer,
- Cylinder,
- Modeler,
- Combined oven.

Provide countertops in the bakery for shaping and resting the breads, pizzas and other doughs prepared in the bakery. Bakery racks for trays shall be provided under the benches to expand the tray storage area.

Washing area

Project shall consider the sequence of tasks and operations for utensils residue removal by users and return after use, washing dishes, glassware, and cutlery in a dishwasher, their return to messroom, collecting and washing of pans, grinding of organic waste.

Provide separated support counters: "dirty area" (before washing) x "clean area" (after washing).

The dimensions of sinks (width, depth, and length) for washing pans, dishes and other kitchenware shall be defined according to the work analysis performed in the detailed design.

Taps shall have movable spouts and, in the case of sinks for washing large dimension utensils, provide pull down spray faucets.

The shelves located above the sink projection, where tall taps shower type, with flexible, retractable and splash cable are installed, shall be splitted (so there is no obstacle above the sink).

<u>Dishwashing area</u>

- Provide a large food waste disposer near the dirty dishes return counter (main disposer).
- Provide a support bench with two sinks, near the dirty dishes return area, one of them shall equipped with an industrial food waste disposer for smaller waste.
- Provide industrial dishwashers, with dispenser for detergent and rinse aid.
- The countertops in such area shall be interconnected and continuous, allowing the plastic storage container to be filled with dishes and moved from the sink to the

washing machine.

- Acquire or manufacture a support, preferably made of stainless steel, for use inside the sink, to reduce its depth during dishwashing. The support shall be mobile to allow washing larger containers whenever necessary and shall have holes to allow water drainage.

Figure 10. Sink with support.

Pans washing area

- The pans washing counter shall have two sinks that can be shared with dishwashing area (Figure 11).

Figure 11. Sinks for pan washing

- One of the sinks shall be deep enough to wash large pans.
- Provide cabinets with doors, shelves, and removable protection bars to keep clean pans and utensils.
- Provide support workbenches near the oven. These workbenches shall contain deep sinks to allow large trays washing.

Barbecue area

Platform design contains a barbecue area adjacent to the messroom, so that meals

can take place in the messroom.

The barbecue area shall meet the following aspects:

- The barbecue shall be dimensioned according to the number of simultaneous meals to be provided during lunchtime.
- The barbecue shall be allocated in an exclusive and external area, in a leisure area, or adjacent to the food sector, preferably with direct access.
- Provide countertop and sink, with cover and side protection for adverse weather conditions (Figure 12).

Figure 12. Barbecue adjacent to the messroom, coverage and side protection are needed.

- Provide room only for grill plates.
- Depending on the barbecue location, devices shall be planned for moving materials such as meat, drinks, and utensils, especially when the barbecue area in the leisure area is far from the kitchen.

MESSROOM AND COFFEE POINTS

The messroom project includes the following areas:

- Tables area - with capacity for minimum one-third (1/3) of the POB,
- Food ramp - with a cold area (salads) separated and anterior to the hot area, followed by barbecue meat area,
- Drink counter for drinks,
- Countertop with complements (salt, toothpicks, spices, sugar, sweetener, honey, etc.) and appliances used for snacks preparation (toaster, sandwich maker, grill, etc.) with lockers with keys on the bottom to store unused equipment,
- Counters with support for plates, cutlery, glasses, and cups,
- Utensils' return area with segregated waste dumps,
- Helmets' storage area, on the outside near the entrance, with capacity for 50% of the number of seats provided in the messroom.

The following aspects shall be considered in the messroom project:

- Signaling shall be provided to direct the flows of people, provisions, and waste, at the entrance and exit of messroom, as well as at access to the ramp and at the

dish returning area.

- The replenishing flow in the messroom shall not be crossed with the flow of people using the messroom.
- Circulation between tables and chairs and between chairs and bulkheads shall allow people free access to all tables.
- Hand hygiene sinks shall be installed near the messroom and shall have non-manual opening and closing features, in addition to a safe drying hands system (Figure 13).

Figure 13. Sinks for hand hygiene in the messroom.

- Messroom is a Muster Station in the rescue plan, therefore cabinets for life jackets are foreseen next to the compartment.
- The ceiling height shall avoid confinement feeling and provide space for possible passage of air conditioning ducts.

In terms of finishing, it is recommended:

- Use of resistant flooring, washable material, light-colored with minimum joints, to ensure proper cleaning and sanitation,
- Provide adequate slope toward the grates for proper water drainage, considering also the unit trim,
- The use of resistant and washable material on wall surfaces to ensure proper cleaning and sanitation.
- Provide washbasins with liquid soap, antiseptic product, paper towel, and trash can near the accesses. Mixers / taps shall have hands-free drive mechanisms.
- Tables shall have a height of 750 mm.
- Tables and chairs shall be sized to comfortably accommodate people and not interfere in circulation spaces.
- Provide protruding edges on tables to prevent dishes from falling in case of FPSO movement.

Provide countertops for:

- Support for beverages that will be consumed during meals and the use of juices and other machines, when available.
- Provide freezer and refrigerators for ice cream, desserts (sweets and fruits), ham, cheese, and butter to be consumed during meals, and for beverages (juices, dairy

products, and soft drinks).

- Observe that some of these devices require a place for food containers (water gallons, refrigerant syrup, etc.).
- Support for ice machines to ensure easy access and adequate height for inserting the water gallon.
- Lockers with keys shall be foreseen underneath countertops to store equipment when not in use.

Coffee Points

Coffee points shall be distributed according to the project demands, but at least one of these points shall be provided in circulation adjacent to the central control room.

Coffee point shall include: refrigerator (for fruits, juices, and yogurts), drinking fountains, waste disposer bins, counter for fast snacks preparation with sink and area for cookie jars, coffee and hot water (machine or bottles).

Coffee points are places where quick snacks, such as coffee, fruit, and yogurt, are available throughout the day.

Afternoon snacks, at a fixed time, can be available both at coffee points and in the messroom, depending on the strategy used by the platform.

PROVISION STORE

Provision store design includes the following areas:

- Dry provision room.
- Cold chamber, divided into:
  - Cold chamber: With (i) a freezing area for red meat, poultry, fish, ice cream, fruit pulps, and frozen vegetables, and (ii) an area for fruits, vegetables, and dairy products, with a mild temperature and ventilation.
  - Antechamber: With (i) defrost area, and (ii) PPE accommodation area.
- Water gallons storage,
- Garbage disposal deposit.

Provide refrigerators (can be located in the kitchen) for products:

- Kitchen pre-prepared food,
- Bakery pre-prepared food,
- Ready-made desserts,
- Messroom pre-prepared food.

In provision rooms, spaces shall allow people and carts circulation (for provision moving) in addition to items storage.

A cart or trolley shall be provided to transport the products stored inside boxes, to facilitate the flow carrying weights inside the dry provision store, cold provision store and manipulation area.

The pre-wash of received items can be done either in the external area or in the internal area. If the external area is used for this activity, the area shall be near the entrance, where a hose connected to the dry storage tank can be used.

It is recommended to install a steel plate on the deck near the provision store entrance, where food supply can be hosed, so that the water does not fall directly on the decks below during washing, as well as waste residues. Drainage for this area also needs to be evaluated. A hose shall be foreseen. This external area close to the provision store area entrance shall have at least 20m^2, for handling and transfer of food/materials.

For waste generated during washing of provisions, a garbage container shall be provided and placed outside near the entrance door.

To assist in the washing of received items, a stainless-steel bench near the provision store entrance is foreseen. Sink size shall allow washing typical plastic containers. Pre-rinse type shower faucet with flexible and retractable duct shall be foreseen.

Dry Provision Room

Dry provision room keep several types of provisions, such as rice, beans, cookies, sugar and salt sachets, disposables, and other industrialized products.

Provide support countertops and shelves with adjustable heights and made of anticorrosive material. Their arrangement shall allow for the movement of workers during material handling.

Provide shelves suitable for the dimensions of the monoblocs, preferably with adjustable heights.

Cold Chamber and Antechamber

The cold chamber shall be specified by the HVAC discipline.

The design of this area shall consider the following aspects:

- Provide space for frozen, pre-prepared food and products that require refrigeration and / or being defrosted.
- Provide flat plate and grill type shelves (both types) in the refrigerated area. In reference situations, the option for grilled shelves allows better ventilation for items that can rot (vegetables and fruits) and favors the perception of the rotting

of an item, before losing a large amount of similar items stored on the same shelf. Other items that do not rot easily are stored on plate metal shelves.

- Provide shelves suitable for the dimensions of the monoblocs, preferably with adjustable heights.
- The height of the last shelf shall allow placing the monoblocs without sealing the insufflation.
- Provide countertop with sink and specific equipment in the defrost area.
- Provide service faucet for cleaning the chambers, which may be located near the antechamber door.
- When there is no defrosted area in the storage area, defrosting equipment shall be provided in the galley for each type of food.
- Defrosting area shall have a countertop with a sink and specific equipment for this purpose. Temperature shall be controlled around 5º C.
- Provide a place in the antechamber for keeping suitable PPE to enter the cold rooms.
- Provide an emergency button and a device for internally open the chambers in case of door locking with a worker inside (NR-37).
- Provide central release hold back devices for the doors to stay open when moving loads.
- Floor lowering to avoid unevenness compared to other floors after thermal insulation installation inside the chambers shall be foreseen.

Cold chamber requires more attention to preventive maintenance since a problem in the room causes the loss of all stock.

Water Gallons Storage

The water storage area shall be designed to store full and empty gallons protected from sun light and weather as follows:

- Dimensions of one gallon of 20 liters: 270mm in diameter by 500mm in height, kept in crates of 300mm x 300mm x 500mm,
- Provide a lift for supplying gallons of 20 liters to all floors of the superstructure, including the main deck, where workshops and storage rooms are located.
- A trolley or cart shall be able to transport of drinking water gallons (full of water) from the storage place to the consumption points. To reach different levels the lift shall be used.
- On a platform with 240 workers on board and mineral water replenishment every 5 days, a space with a stock capacity of approximately 334 gallons, 240 bottles of 1.5 liters, and 688 bottles of 0.5 liters is required. Confirm with SMS.
- In the main gallons' storage area, provide pallets as an elevated floor, just to provide distance to the floor and to facilitate the storage (drinking water area).
- In the main gallons' storage area, check access for circulation of gallons (oldest consumed first), providing access to first use the gallons that have been stored the longest and that are usually at the bottom of the storage area.

- Gallon storage can be divided into more than one warehouse, depending on the project.
- Empty water gallons: check access to use the platform cart. Check the transport of this cargo for disembarkation in the outside area.

Garbage Room

- A weather-protected area shall be provided for the temporary food sector waste placement.
- This area shall provide space for collectors, besides facilities and space for collectors and dumpsters sanitizing.
- If the collection / disposal of organic waste is not undertaken daily, it is necessary to provide refrigeration for this area.

HOSPITAL

The following types of care characterize the hospital of a platform: outpatient care, emergency care, and annual medical consultation.

INITIAL INPUTS

The following aspects shall be considered in the hospital project:

- In each project, the possibilities of moving the patient on a stretcher shall be analyzed, considering the existence of stairs and their dimensions.
- It is necessary to simulate the rotation of the stretcher carried manually by people, when these accesses' path changes direction (L-shaped corridors, intermediate ramp's landings, and others), to verify if there is clearance for this maneuver. This verification shall privilege the stretcher's manual handling by at least 4 people. Where it is not possible to do this procedure with 4 persons, the free space for the stretcher's manual handling by 2 people shall be checked.
- On routes where the stretcher can only be carried by 2 people, due to space limitations, it is recommended to provide foldable wheeled stretcher or an auxiliary trolley for transporting the stretcher, due to the excess weight to be transported and for patient safety.
- Infirmary installed near the helideck allows for faster patient displacement to the helideck in more severe and less frequent cases when a transfer is required.
- Separation of internal compartments, without obstacles on the floor: Waiting room, clinic, treatment room with resting area, emergency room, private bathroom, purge area.

LAYOUT, FURNITURE, AND EQUIPMENT

At least two accesses shall be provided:

- Internal access to the accommodation module by the waiting room - for common use,
- External access to the process area through the treatment room, with double door - for accidents, emergencies, and removals.
- Separation between rooms shall be provided using doors, especially between the rest area and other areas, to allow simultaneous and independent use of different areas, whenever possible.

It is recommended that the hospital have the following internal compartments:

- Waiting room,
- Clinic,
- Treatment/Emergency room (including resting area),
- Private toilet,
- Purge area.

The following aspects shall be considered in the hospital design:

- The access to the hospital shall be fast and unobstructed, using ramps instead of steps where is possible.
- Where obstacles are unavoidable in the access route between the process area and the hospital, appropriate transposing ramps shall be provided to transport stretchers. As reference, the minimum width recommended by ANVISA (RDC-50) stairs and ramps where the stretcher circulates for an onshore hospital is 1500 mm. This width shall be used for the ramp access to the helideck.
- Is also recommended that at least the stairs outside the accommodation module meets this requirement.
- An external area shall be provided for the disposal of hospital waste with and without contamination, where the waste will be stored until it is removed from the platform.
- Provide an area for the placement of oxygen cylinders in the external area and adjacent to the hospital. This area shall have the necessary devices to allow cylinders movement or replacement.
- Provide a cabinet, identified as a health cabinet near the helideck to keep stretcher, O2 cylinder, and first aid kit.
- For the dimensioning of hospital compartments, it shall be considered the equipment and furniture required for the types of care provided and adequate circulation spaces for transportation on stretchers.
- Provide windows to provide natural lighting.
- If no cabins are designed on the hospital floor, provide a bedroom for a nurse as close as possible to it - in case of emergency calls.

- The location of the telephone booths shall be in a place away from the hospital.
- Provide a place to store the material for cleaning the rooms.
- The equipment list is issued by SMS or a responsible agency.

Waiting room

In the waiting room, it's recommended to have:

- Sofas or chairs,
- Support desk,
- Framework for health warnings, notifications, and campaigns,
- A system that allows the patient to know that the health professional is in attendance and to allows the health professional to know that there is a patient in the waiting room (for example, a bell).

Clinic

This space shall provide consultation and examination (periodical) areas, as well as a computerized workstation with computer and internet access:

- A workstation: table with shelves, a microcomputer with intranet and internet access, for permanent use,
- Multifunctional printer and paper shredder,
- Cabinets for safe document storage and health campaign bulletins,
- Telephone – Using a cordless telephone allows the healthcare professional to move around the different hospital environments during medical care.
- Stretcher (for periodic examinations),
- Sink mechanism triggered with feet or by a sensor used for hand hygiene.

An office chair shall be provided for the health professional, and a visitor chair with armrests shall be provided for the patient.

The clinic room shall contain equipment according to the SMS or equivalent discipline list.

Treatment/Emergency Room

Telemedicine equipment should preferably be in a rack with casters that can be locked if the equipment has to be moved so that the doctor can view the patient from a certain angle. In addition to this telemedicine equipment, the treatment / emergency room shall contain:

- Service stretcher 700mm wide and adjustable height,
- Portable respiratory assistance equipment (“ambu” type with reservoir bag),
- Auxiliary table,
- Emergency cart,

- Telephone - provide corded and cordless telephone. Using a cordless telephone is important to assist emergency medical care by telemedicine. However, it is also necessary to use a corded telephone considering the risk of discharging in an emergency.
- Places for collectors of sharp material shall be provided. Also, special closed trash cans for contaminated waste shall be provided,
- Sink for hand hygiene activated by feet or sensor,
- Cabinets locked with keys with areas for medicines in use and stocked, sized according to the number of medicines planned for the unit,
- Cabinet locked with keys for controlled drugs (psychotropic),
- Cabinets locked with keys for various materials and equipment,
- Stretcher shall have fixed lighting at the headboard, a mobile parabolic reflector with a magnifying glass, and support for disposable paper roll utilization,
- Stretcher shall have casters with locks to avoid undesirable displacements, but allow the displacement between hospital areas,
- Refrigerator with separate freezer for packaging vaccines and other medicines,
- Provide a bathing area for burns or chemical accident treatment and a wheelchair adaptable for bathing,
- Provide for a stainless steel workbench with sink for medicine preparation,
- Provide space for storing offshore and rigid transport stretchers,
- Provide space for storing equipment backpacks for emergency medical care.

The treatment / emergency room shall contain equipment according to the SMS list.

About the resting area:

- The number of hospital beds and boxes shall be sized according to the occupancy rate of the unit, being at least two,
- Hospital beds shall be accessible on both sides, each one allocated in a separate, visually insulated box. Curtains of washable material may be used,
- Each hospital bed shall have a fixed headlamp,
- Hospital beds shall be automated, avoiding crank drive, requiring less effort for its operation,
- Hospital beds shall be fixed or blocked to prevent undesirable movement,
- Each hospital bed shall have a side table,
- Provide bell in each bed, to call the health professional,
- Prevent special closed trashcans for contaminated waste (sharp objects, infected material, etc.),
- Provide a way to facilitate observation of patients in the resting room (window, cameras, etc.),
- Provide lockers with keys for patients' personal belongings,
- Provide closet to store clean bed and bath clothes,
- Sensor-operated sink for hands hygiene.

<u>Sanitary room</u>

- It shall be close to the treatment / emergency and resting areas, be easy to

use for patients. The gap between the sanitary room and hospital floor shall be as smaller as possible,
- Shall be provided with bars of support in the areas of toilet and shower,
- Lighting and the sink faucet shall be activated without hand usage (presence sensor and sensor or pedal).
- Doors and internal space width shall consider wheelchairs' entrance and maneuvers.
- Bathroom floor shall use non-slip material.

Purge area

- Provide a container for packing dirty laundry and to be sent to the laundry room,
- A separated sink only for purge is foreseen to meet RDC 50. (RDC 50: *"Utility or purge area - environment intended for cleaning, disinfection and storage of materials and clothing used in patient care and temporary storage of waste. It shall be equipped with a sink and/or washing spout and sink with flush valve and 75mm sewer pipe in them plus a common sink.)"*
- To avoid risks of biological contamination the purge area shall be separated from the rest of the room.
- Provide special closed trash bins for contaminated waste and common waste separately.

Hospital external area

In addition to the hospital area, the team uses some platform areas to maintain items of support equipment for patient care and transportation.

LAUNDRY

In the laundry area, there are daily activities of separating, washing, and drying clothes from the cabins (bed and bath) and the employees' clothes (uniforms and, eventually, personal clothes). There is also washing hospital clothes and gymnasium towels, but these are not daily routines.

INITIAL INPUTS

In the laundry design, the following aspects were considered:
- POB - to estimate the number of uniforms, beds, and bath clothes. It allows the correct definition of the number of machines,
- Periodicity of clothes changing (uniforms, bed and bath clothes of cabins, hospital, and gymnasium) - these data also allow the correct definition of the number of machines,
- Estimated types and quantities of machines - which influence the organization and spaces design, the planning of own structures (bases, benches, etc.), and the acoustic and thermal projects,

- Dirty clothes collection system, procedures, and distribution of clean clothing,
- Trolleys dimension [1000 (W) x 500 (D) x 900 (H) mm] allowing laundry carts to enter and operate, as well as the elevator entrance and exit.
- Considering an elevator's existence, an internal cargo handling system shall be considered, which may require spaces for maneuvering trolleys and larger dimensions for the doors.
- Procedures for washing clothes for personal use, which may or may not be laundry's responsibility and whether or not to be located in its boundaries.
- Eliminate tasks that require bending or twisting while handling materials. Use trolleys with adjustable height system.

LAYOUT, FURNITURE, AND EQUIPMENT

Location, accesses, and flows

- Laundry is divided into two distinct and physically separated areas: (i) reception, handling, storage area, and (ii) the washing and drying area.
- Laundry is located on a lower deck of the accommodation module to avoid propagating noise and vibrations to the cabins, offices, hospital, and other areas where acoustic comfort is essential.
- The laundry's main access routes shall be free of obstacles to the use of carts (steps, sills, pipes, etc.). Where the slope is unavoidable, ramps shall be provided for transposition with appropriate inclination for the use of trolleys.
- In the area for receiving, handling, and storing clothes, there shall be a separation for clothes received from the hospital.
- Elevator boxes, internally, shall have mechanical protection, to ensure that the transport of trolleys does not damage the internal lining.
- Workers shall see and reach all controls comfortably.

Its location allows the following accesses:

- Access to the cabins (internal access to the accommodation module) for the collection and distribution of clothes. This access shall consider that the movement between cabin floors and laundry is constant and shall occur even in case of elevator maintenance,
- Access to the external area for the arrival of consumer material, trash removal, entry and exit of machines, maintenance procedures, etc.

The laundry is divided into two places, as follows.

<u>Reception area, handling, and storage</u>

- Shall have space to accommodate furniture, devices, and equipment foreseen in equipment list provided by SMS or equivalent discipline,
- Shall include an area for trolley's circulation and parking,
- Hospital clothes shall be washed separated from other clothes, and also

cleaning cloths used in the cleaning of rooms.

About furniture and equipment:

- Dirty clothes and clean clothes are separated and stored in different resources.
- Table or countertop with stool or high chair for sorting clothes, taking notes, and folding clean clothes. The top shall have a smooth, easy cleaning finish,
- Cabinets to keep clean clothes (permanent or temporary stock, depending on the organization of the unit),
- Provide shelves inside laundry for storage the clean uniforms (people who put on uniforms to wash and disembark).
- Area for clothing trolleys,
- Bench for separating clothes before washing.
- Space for the use of telephone, radios, and cell phones, as well as electrical outlets for charging batteries in the laundry folding space.
- Drinking fountain.

The heights of workbenches shall be dimensioned to facilitate activities to be carried out while standing, providing free space for foot accommodation:

- Bench for separating clothes (clean or dirty clothes) - heights between 900 and 950 mm (with free space under the top – without shelves)
- Service desk - heights between 900 and 950 mm.
- Cabinets and shelves shall have removable guard bars to prevent falls of clothes, utensils, and cleaning materials in use caused by FPSO movement.
- Stainless steel metal cabinets, shelves and work benches should be made to be easily cleaned.
- The size of cabinets for keeping clean clothes, whether in the laundry room or on linen stores on the decks of cabins, shall take into account: the number of pieces per bed (2 to 3 sets), that bed and bath linen are numbered and stored per bed. When cabinets are provided in the laundry room, bed and bath linen storage is organized separately by floor.

<u>Washing and drying area</u>

- It shall be dimensioned according to the equipment provided in the equipment list issued by the LMS,
- It shall provide circulation space in front of equipment for placing and removing clothes with the use of a transport cart,
- Space shall be provided behind equipment for maintenance and heat dissipation,
- Chemicals' dosing: If the dosing pumps will be used attached to the machines together with the chemical receptacles, the maintenance space shall be studied in order to provide free access to the back of the washing machines without to jeopardize the hoses and connection linked to the equipment.

- Hospital clothes shall be washed separated from other types of clothes.
- It is recommended to provide a double door isolating the washing and drying area from the storage area of clean clothes to facilitate thermal and acoustic treatment of environments and the exposure of the employee who is most of the time of his/her working shift in the storage area.
- Doors shall be dimensioned to facilitate the movement of trolleys and provided with a display.
- The outer door of the laundry room shall be sized according to the size of equipment allowing their passage in case of maintenance or replacement.
- Provide drainage system for water drainage to allow cleaning and sanitation of the compartment and trolleys' movement.
- Grills' positioning shall take into account that the washing machine area is subject to leakage. The floor shall have a proper slope towards the grates, allowing adequate drainage of leaked water.
- Provide taps for floor washing.
- Provide an exclusive area for washing personal clothes by employees.

About Furniture and equipment:

- Equipment lists will be issued by the SMS.
- Laundry equipment shall meet the requirements of NR-12 for interlocking and emergency stops.
- Areas and facilities shall be adequate to the furniture, equipment, and devices provided for the production unit (platform) and shall be according to the SMS list.

The following items shall be provided for this area:

- Industrial washing machines,
- Industrial drying machines with total capacity proportional to the full capacity of washing machines, considering the weight of wet clothes,
- Centrifuge,
- Tank,
- Retractable clotheslines,
- Buckets and broom/mop holders,
- Countertops with cabinets to store consumables,
- Exclusive carts for handling dirty and clean clothes,
- Use of trolleys with a movable bottom is recommended to avoid uncomfortable postures by the employee. Special attention shall be given to the laundry wheeled car:
    - The trolley shall have its body in light alloy sheet, anodized or similar material (lightweight and durable structure);
    - Self-levelling platform with 2 side die-cast elements, complete with nylon rolls fit for sliding in light alloy rails, and 1 or 2 steel springs (depending on sizes). Carts shall be closed on the sides to prevent clothes from falling during transportation or handling.

- Strong non-twisting bottom iron frame
- 2 fixed and 2 swiveling wheels with non-marking grey rubber ring and zinc-plated brackets. Wheels with brakes.
- Wheels shall be large sized to avoid getting stuck in gutters.
- Carts shall be easily driven, with silent mechanism casters, with locks and edges protected from shock,
- Carts for clean clothes distribution on cabin decks shall produce as minimum noise as possible not to harm operators' rest.

- The laundry cart shall have a handle to avoid injuries.

Provide an exclusive area for self-service, for washing clothes for personal use by employees, with at least:

- Washing machine (1),
- Drying machine (1),
- Tank (1),
- Iron (1),
- Support countertop with space for ironing and with cabinets for storing consumer products.

It is necessary to specify, in a coordinated way, carts and grates, to prevent wheels from gripping on the grates grilles, and carts and vents on the garbage collection and distribution routes, including service elevator, so that the use of the carts is not limited by the width of doors.

The carts shall have easy maneuverability, casters with silent mechanisms, and latches and edges with protective covers.

Consider the postural aspects in machines supports dimensioning and their location in relation to the floor and the space in the surroundings necessary for the execution of the activities.

For cleaning the laundry, buckets, brooms and cleaning cloths are used. A specific tank is indicated for washing this material and a cabinet to store them properly.

OFFICES AND MEETING ROOMS

Platform offices are the places where units' management and administrative activities are carried out. These spaces are used by GEPLAT, coordinators, TLT, inspection technicians, contract inspectors, security technicians, commissioner, among others.

The number of rooms can vary among units, according to the number of stations provided.

Platform meeting rooms are used for meetings with or without video conferencing, in addition to being used as an office by non-resident professionals.

INITIAL INPUTS

Adequate design of offices and meeting rooms to:

- Organization of work developed throughout the project by its managers,
- The needs of integration onshore-offshore (videoconferences and other interactions at a distance),
- Different stages of the project (commissioning, start-up, nominal production) and platform life (maintenance campaigns and scheduled shutdowns).
- The architecture discipline will provide a plan that will need to be analyzed based on the interaction with future users and onboard ergonomic work analysis, which shall be performed by the company that will carry out the detailing phase.

LAYOUT, FURNITURE, AND EQUIPMENT

Office areas are required for:

- Platform manager,
- Shift coordinators. The option for open space type offices demands the need for small meeting rooms to harmonize collective and individual dimensions of work,
- Maintenance planners and inspection technicians,
- Safety technicians,
- Logistics and transport technician - TLT,
- Complementary maintenance teams.

In the office areas, it is necessary to install internet network points and electric power points (sockets) that are easily accessible and in sufficient numbers to use fixed and portable equipment (laptops and radios). It is also necessary to provide a space for storage of personal protection equipment close to the accesses of the offices and meeting rooms.

It is necessary to provide more than one meeting room with videoconference resources. This room is more and more used on platforms. Another alternative is to design other multipurpose spaces, eventually used as meeting rooms. For example, the briefing room or the games room can be adapted to hold meetings in moments when they are not being used for their main purposes. To have this adaptation flexibility, these rooms shall be previously thought for this purpose.

Technical Library:

Technical Library is integrated with office space. Due to digitalization of documentation shelfs foreseen were minimized.

Safety Office

Provide a bench, outside worktables, for battery chargers and for calibration and

charging of gas detection equipment.

Auditorium

The auditorium is a Muster Station. Therefore:

- Provide adequate lockers for storing life jackets.
- Predict -T card location, radios with battery chargers and other features for Muster Station.

Auditorium chairs with a retractable seat and retractable sideboard are recommended. Predict boards that suits right-handed and left-handed people.

LEISURE AREA (INCLUDING GYMNASIUM)

In a platform, “work” and “home” are inseparable dimensions. For this reason, the unit should provide comfort and habitability conditions for making this period of isolation on the high seas less stressful by including leisure and physical activity rooms.

INITIAL INPUTS

Leisure areas aim to offer living environments to make the confinement period less stressful. Leisure environments include a games room (with videogames, tables for playing cards, etc.), a place for recreational internet access with computers, cinema, and TV.

Whenever possible, leisure and living areas shall be designed in an integrated way to increase their utilization rate and the interaction between employees.

Leisure rooms are located away from cabins due to noise. Acoustic protections are needed.

LAYOUT, FURNITURE, AND EQUIPMENT

Gymnasium

It is the area dedicated to the activities of physical conditioning and health promotion of workers on board the platform.

The following aspects shall be considered in gymnasium design:

- An area for equipment and an exercise area in the ground shall be provided,
- The equipment list will be defined by SMS or equivalent discipline.
- Is shall have an area dimensioned according to the quantity of equipment and estimated number of users,
- The equipment of the gymnasium shall be located to guarantee the minimum

areas (according to the manufacturer's instructions) required for its use and maintenance,

- The physical activity room shall be supplied by power points, data, and signal for TV installation,
- Mirrors shall be strategically located near training spaces that require specific postural attention,
- Sound insulation system shall be adopted to guarantee the non- propagation of noise,
- It is desirable to install windows to make the compartment more pleasant.
- Provide space for clean and used towels and for hand sanitizing dispensers.

Living room

This area is a living space for social contact. It shall have room for interaction and socialization, using games, tables, and musical instruments. Some game suggestions are a pool table, gaming table, table tennis, video game, table games card, musical equipment, among others.

Theater and TV room

It shall be sized according to the number of users.

Internet room

In this compartment, users have access to internet through computers, which is considered one of the main ways of communicating employees with family and friends onshore.
As mentioned, recreational microcomputers can be installed in the game room, creating an integrated leisure environment.
Having or not a wi-fi system available to users of the platform does influence the dimensioning of the recreational internet room according to the requirements of NR-37.

WORKSHOP

The work activities of maintenance teams occur most of the time in the process area. The workshops are support spaces for repair activities that cannot be performed in the area and for the administrative and control activities related to complete reports, scheduling activities, etc.

INITIAL INPUTS

It shall be considered the following aspects in the workshop design:

- Maintenance system planned for the unit considering local staff, service providers, area for storage of tools and spare parts,
- Types of materials, machines, tools, and instruments estimated for these compartments - which influence the organization and design of the spaces, the planning of own structures (bases, benches, etc.),
- Precision requirements of specific activities (example: calibration) that require controlled environments in terms of noise, vibration, lighting, and HVAC requirements,
- Cargo handling system intended for the transport of large and / or heavy parts, which may require maneuvering spaces, double-height ceilings, and / or doors with larger dimensions than expected,
- Provide nearby and integrated workshops, warehouse, and tool shop,
- Provide a location for the installation of a PSV workshop.
- Provide ceiling bulkheads/ linings to avoid the accumulation of dust or dirt of difficult cleaning.

ANALYSIS TO BE PERFORMED DURING DETAILING DESIGN

Analysis of items transportation to the workshops

For routes at different levels, means for transfers of loads (equipment and parts) shall be provided and shall avoid accesses by vertical ladders. However, the workshop's location on the main deck is a relevant factor in the interface for equipment maintenance of the process plan.

In cargo areas integrated with workshop through monorails, the equipment's arrangement shall allow ease of maneuver into the range of hoists to reduce and / or eliminate the number of maneuvers with horizontal displacements.

The layout of the internal circulation of the workshops shall allow the moving of equipment and operators. The location of the machinery and equipment of the workshops shall have its surroundings free for the operator's movement and handling of equipment and parts that will be processed (avoid machinery located along the walls and / or columns).

All equipment inside the workshop shall be assisted by the internal means of handling devices. It is necessary to provide the installation of means that facilitate the transfer from the monorail to the workshop equipment. It is also necessary that the hoists work in adequate height to avoid clashes with workshop equipment.

LAYOUT, FURNITURE, AND EQUIPMENT

Maintenance workshops (mechanical, electrical, and instrumentation), tool shop, warehouse, and other areas related to maintenance, such as painting area, paint store, among others, shall be designed in an integrated way since the

interdependence of activities of the teams working in these compartments.

The workshops' location is in the transition area between the accommodation module and the process area, integrated with easy access to other compartments related to maintenance coordination.

For this location, safety issues were considered, seeking a compromise between the ideal location and the least dangerous location.

Provide maintenance cabinets near large machines for storing frequently used equipment and tools.

The following aspects shall be considered in workshop design:

- The designed areas and facilities (compressed air, water, electricity, 127 / 220V) shall be adequate to the furniture, equipment, and devices provided.
- Workshop equipment lists are issued by O&M team (or equivalent discipline).
- Provide an area for equipment painting with a deposit for paints and other painting materials near the mechanical workshop.
- Workshops doors (single or double door, trapdoor or hatch) shall have sufficient dimension to allow the displacement of large equipment between external and internal area. Handling devices shall be designed according to the maintenance demands I-ET-3010.2Q-5266-630-P4X-002 - HULL MECHANICAL HANDLING PROCEDURES.
- A study of specific cargo handling shall be done for these areas.
- Provide easy transfer of load between the external and internal area (example: monorail with removable section).
- Kick plates (300 mm height) and trolley protection plates (800 mm height) in brushed stainless steel shall be provided for hinged doors in traffic areas to protect the doors from passage of workers that need to pass through the doors using carts and to prevent damage to the doors that may be caused with the passage of workers using trolleys.
- Provide system and facilities for internal cargo handling and physical arrangement of equipment that allows the placement of the parts to be worked on the equipment or workshop benches.
- Spaces shall be sized for the equipment provided for each of these compartments.
- Provide office space with workstations for each workshop in sufficient numbers to meet the needs of teams.
- Office area shall allow visualization of the workshop, but at the same time, ensure acoustic protection.
- Provide radio charging stations in all workshops' offices.
- If there is a workstation inside the workshops, NR-17 shall be followed.
- It's recommended that all workshop doors have a display.
- In all workshops, there shall be an area for bags, toolboxes, and helmets, equipment, and materials (screws, nuts, etc.), garbage cans, as well as belts for work in height.

- Provide benches for the allocation of frequently used equipment.
- Cabinets shall be provided for the storage of equipment and tools of general use.
- The workshop floor shall use non-slip paint.
- In the office, it is recommended to provide cabinets and files near workstations for the storage of folders and documents.
- Office and electrical and instrumentation workshops shall be air-conditioned.
- Provide network point installation for the control system (PI) screen.
- At least one printer shall be provided in workshops for certificates and manuals printing.

Mechanical workshop

- Provide two workstations total, one for the SUMEC and one for the technician.
- Layout of the mechanical workshop shall include an area for washing equipment and tools with tanks, liquid soap, and hand drying devices. This list is found in document I-ET-3010.2Q-1200-695-P4X-001 - WORKSHOP EQUIPMENT AND TOOL LIST.
- Near this area shall be located cabinet to store pumps, greases, and other equipment.
- In front of the lathe, a fiber platform with a non-slip finish shall be installed on the floor. The height of this platform will depend on the height of the equipment, and its purpose is to facilitate the reach of the operator and allow adequate postures.
- The lathe shall be positioned so that the monorail is closer to the head of the equipment, facilitating the exchange of plate and fixing of the parts.
- The benches provided shall support machines (e.g., inductive heater and ultrasound) and tools. One bench shall be located close to the lathe
- Near the lathe, a cabinet to store lathe tools and equipment shall be provided.
- Workbenches shall have shelves and a place to keep and handle toolboxes.
- Access space between equipment and bulkhead shall be evaluated according to vendor geometry by Ergonomics Detail Design, specially for sawing machine and the hydraulic press.
- For the movement of the hydraulic press, a load handling device shall be provided.
- Workshop’s layout shall include a drainage system at various points to reduce the effort and time spent in cleaning.
- For the maintenance of equipment that cannot be inserted in the workbench, a covered floor (e.g., rubber floor) next to the workbench shall be provided. It helps to protect the equipment from damage while accommodated on the floor.
- Provide infrastructure and space for 3D printers facilities (one 3D printer in the office and another one in the workshop space).
- Install two grinding wheels, one for the exclusive use of machining process, close to the milling cutter and the drill.

Instrumentation workshop

The instrumentation workshop is responsible for instrument repairs, testing, and certification procedures in a calibration laboratory with controlled environment.

Provide specific space, with air conditioning, for calibration activities of measuring instruments to comply with legal requirements.

In the instrumentation workshop:

- Provide workbenches, calibration bench, cabinets for equipment, cabinets for documents and files for suspended folder,
- At the side of the calibration bench shall be provided the installation of a microcomputer dedicated to the issuance of certificates,
- Next to the test benches shall be provided a microcomputer dedicated to making adjustments and set points of instruments,
- Provide Cabinets for individual toolboxes of employees while on their time off,
- Provide Shelves to store individual toolboxes of workers on board.

Electrical workshop

In addition to the interaction with other workshops, tool shop, and warehouse, the electrical maintenance workshop also interacts with the panel room to maintain circuit breakers.

The Electrical workshop shall be provided with:

- Cabinets for storing robust materials,
- Monorail access to the test bench,
- Space for battery allocation next to the "chubby" battery charging set to reduce the need for unnecessary travel,
- Compressed air point near the test bench.

The washing area shall be isolated from the electrical equipment.
It is recommended to install a partition to guarantee that the water from the tank does not wet the equipment.

Welding workshop

It's recommended the welding workshop be built in an open location, with facilitated material access, air renovation, and access to other workshops.

Provide external space to store sheets and pipe.

Preferably look for a sequence that attempts to place the plates and tubes yard, welding shop, treatment and painting, and painting shop.

Fiscal Metering Room

It is preferably placed next to the welding workshop, with an area of approximately 25 m².

WAREHOUSE AND TOOL SHOP

The warehouse area is a storage area where objects and materials are temporarily stored, which will gradually be distributed to various sectors of the company as they become necessary for consumption and / or maintenance.

The main objectives of the warehouse project are to ensure conditions for the conservation of materials and supplies.

Material warehouses / storage environments can be located in different platform areas, including along the topside. Therefore, the warehouse environments are wider than those described in this specification, which refers only to warehouses located in the accommodation module.

INITIAL INPUTS

The following aspects shall be considered in the warehouse design, including the tool shop:

Maintenance system planned for the unit: local staff and stocks (shipped) and / or service providers - which is related to the organization and demand of storage spaces.

- Types of materials, supplies, tools, and instruments estimated for storage over the life of FPSO - which influence the organization and design of storage spaces, as well as the provision of air conditioning in some areas. The variety of items and their quantities may vary over FPSO's lifespan,
- Dimensions and weight of materials, supplies, tools, and instruments to be stocked - which will influence the type of furniture intended for storage and its compartmentation,
- System designed to transport materials, supplies, tools, and instruments to the warehouse - especially items of large size and / or weight, which may require the use of transportation trolleys.

If a hand trolley is to be used, its wheels shall be made of solid rubber. Wheels with air chamber shall be avoided because the chamber will burst with heavy objects. Height and speed of transportation shall be assessed during Detail Design phase for choosing means of mechanized cargo handling. Using an adequate hand trolley can be more efficient than a mechanized trolley, because the last one is higher and moves slower.

LAYOUT, FURNITURE, AND EQUIPMENT

The warehouse areas, as well as the tool shop, is divided into specific areas designed for this purpose and located near the workshops.

- Consideration shall be given to the relative position of the cargo handling area.

Appropriate access and loading system shall be provided, considering that large and / or heavy parts can be stored.

Storage areas are divided into the following environments:

- Reception - area for screening / conference of materials and area for public service, through a service desk (independent),
- Office - where the warehouse's technicians are located, and where administrative and control activities will be carried out,
- Tool shop - where tools and instruments for replacement and / or borrowing are stored,
- Consumable stock,
- Inventory of computer supplies and electronic parts,
- Deposit of materials and equipment.

However, the reception shall be physically separated from the office, keeping the view and access to the service desk to the public, since they are the warehouse and the technicians that make the public attendance and administrative work of control.

Appropriate flows shall be considered, considering the movement of the materials of each sector and the possibility of using cargo handling systems and / or transport cars for large and / or heavy materials.

When receiving loads in the areas outside the warehouse, the use of PPE is necessary and adequate space shall be provided for the storage of PPE near the workstations.

Verify external doors sill height (warehouse & main deck) and provide ramp if necessary.

Pipes shall be avoided over stock areas.

The spaces shall be sized with a forecast for growth in the number of items stocked throughout FPSO's life cycle and during maintenance shutdowns.

In the office, workstations shall be sized to the usage of microcomputers, free space for papers (writing and reading), and telephone. Provision shall be made for: a common use printer, cabinets, and files to store documents and reports.

In the storage areas, it is recommended to use shelves with the easy adjustment of

height, drawers of various sizes to store small parts, and sliding files with brakes to optimize storage space.

- Consideration shall be given to the materials' dimensions and weight to be stored in each warehouse environment.

Protectors shall be installed on the bottom of the columns to prevent forklift damage to the racks, absorb impacts and reduce the risk of falling and breaking materials.

Benches for verification of equipment received shall be provided in the warehouses to allow the organization of materials.

EMERGENCY RESPONSE BASE AND SAFETY STORE

The unit brigade room, known as ERB, is the place where fire brigade workers' PPE and materials are found.

This room contains cabinets for material storage, spaces for hanging the PPE set, and a bench to assist in dressing.

The safety store is the place used for storage of breathing air cylinders, fire extinguishers and main deck rescue equipment, for the refilling cylinders' pump and inspection of materials.

It is also used as an alternative Emergency Response Base, if by any chance accident occurs close to the ERB in B Deck, so storage of a few firefighting clothes is to be foreseen.

The rooms shall be in an easily accessible location to allow for quick responses to emergencies whenever the brigade is requested.

INITIAL INPUTS

- Removed
- The brigade room shall have sufficient space to store the personal protective equipment of the brigade team and allow fast preparation of the brigade to act in emergencies.
- The brigade room shall be close to the access to the process area.
- An alternative Muster Station shall be provided for the brigade in the process area to speed up emergency care or in cases when there are constraints to access the Muster Station at the accommodation module.
- A bench to recharge the air cylinders shall be provided nearby.

LAYOUT, FURNITURE, AND EQUIPMENT

- Provide cabinets or hooks that allow the brigade's PPE availability in organized and fast access to use. The PPE used are: set of approach, helmet, boots, and gloves.
- Provide benches to allow brigades to sit down to wear or remove PPE.
- Provide a place to hang the seat belts and lanterns used to rescue work in height and confined space.
- Provide a place for storing suitcases of autonomous set, containing fixed wall niches, having easy access, and being ready for use.
- Provide closed closets to store equipment like gas detectors, squirt guns, flashlights, masks, etc.
- Provide a radio battery recharging station.

Safety Store

Provide space for:

- Compressor and cylinder charging station. It shall be foreseen a bench to recharge the cylinders. The space shall be a minimum of 2,00m2.
- Closed lockers (squirts, wrenches, tools, ...);
- Support desk;
- Flashlight;
- Gas charger for gas detector;
- Spare clothes and equipment.
- Workbench for separating and inspection of material, especially the equipment with ropes.

RECEPTION

The main function of the reception is to control the boarding and landing of the working population of the platform. The main activity performed during the day is a briefing that takes place after arrival and before departure of aircraft.

When there is no aircraft arrival or departure, the reception can also be used for short presentations between teams, safety meetings (DDS), among others.

INITIAL INPUTS

It is located near the helideck.

In accordance with current standard (NORMAM 223/DPC), the reception shall provide an area for baggage inspection and storage. The area for luggage inspection would be private. The area for luggage storage shall be provided with shelves, inside of a lockable area.

LAYOUT, FURNITURE, AND EQUIPMENT

It shall provide all the facilities for conducting a briefing, such as chairs, whiteboard, TV or projection screens, microcomputer, cabinets (to store documents, boarding passes, and other materials distributed on arrival onboard), scale, coffee point, among others.

Space shall be provided for passenger luggage while arriving at the platform or waiting for a flight.

The reception can be designed for multi-use in periods when there is no arrival of aircraft. During the day can be thought of as a workplace for small meetings and leisure activities and integration of the population on board.

Upper part of the receptionist's balcony shall have a glazed partition, to provide security of documents stored at the reception.

Receptionist area shall be lockable.

Provide a whiteboard and an Information board on the reception’s wall.

CABINS

The cabins aim to promote rest and tranquility of those who are off work, not disturbing the working staff.

Cabins can be occupied by different shift operators ("shift cabins") or not. In "shift cabins", there are people sleeping day and night, and resources shall be considered so that the use of one occupant does not interfere with another occupant resting.

In general, cabins are concentrated on floors (decks) and / or specific corridors for this purpose and are divided into female and male.

In summary, the following typologies of typical cabin arrangements can be identified and be combined:

- Simple cabins - used by an occupant who can work during the day or night shift.
- Multiple cabins - used by two or more occupants, who may or may not work the same shift.
- Female cabin (single or multiple) - occupied by one or more women, who may or may not work on the same shift.
- Male cabin (single or multiple) - occupied by one or more men, who may or may not work the same shift.

INITIAL INPUTS

The architecture discipline defines the number of cabins according to the POB.

LAYOUT, FURNITURE, AND EQUIPMENT

In addition to NR-37 requirements (published in December 2019), the following recommendations shall be evaluated:

- Using 2-bed cabins facilitates adjustments, when necessary, to meet the demand for more female spaces or use in emergency situations in which isolation is required. The use of double and quadruple boxes, for example, can be mixed.
- Supply a task lamp on the table and/or desk.
- Air insufflation shall not be directed directly on the beds or directed to surfaces where they reflect on them.
- Verify the possibility to foresee a tablet holder for each bed.
- Each bunk shall have a berth shelf. It is recommended to provide a retractable or folding support at the head of each bed, for placing a book, magazine, etc.
- The shelf shall be installed inside the bunk (on the bulkhead), with a minimum height of 600mm above the top of the mattress, and within the limit of the guardrail (side protection against fall).
- Wardrobes shall have, inside, shelves and mirror (attached to the back of door), completely closed by a single locking door, with 4 keys, at least.

The recommendations below were built from the analysis of reference situations but are covered by NR-37:

- For the upper beds, the installation of a side rail and handholds are required to help up and down the stairs. The handles for gripping and climbing the ladder shall have resistance. There shall be two handles for climbing.
- Access stairs to the upper bunk bed shall have steps that allow adequate foot support for preventing slipping and shall be slightly inclined to facilitate the climb. Steps shall be non-slip.
- Beds in multiple cabins shall guarantee privacy, either through the layout or through the use of curtains or similar.
- Individual reading light shall be installed, located so as not to disturb the other occupant(s) of the cabin, and electrical power outlet. The electrical switches for lighting shall be installed inside or close to each bunk.
- Places for hanging and drying towels (heated towel rails) shall be provided in rooms or bathrooms. Provide 2 electric towel rails of 10 bars each in the bathrooms. The question refers to drying at least 2 towels per cabin occupant. In the reference situations, it is observed that when all the dryer bars are occupied, the towels that are on top do not dry.
- Bathroom separation into 2 compartments (Figure 15) is suggested to be used concurrently: one for shower using and one for toilet and sink using.

Figure 15. The bathroom model divided into 2 compartments.

- In the shower area, a curtain (Figure 15) or other means of separation shall be provided to prevent water on the entire room floor.
- Beds / bunk beds' layout shall be based on the analysis of the advantages and disadvantages of each model.

OFFLOADING

Offloading consists on the oil transferring process from the unit to an offloading vessel. For this purpose, the vessel team carries out connection / mooring and disconnection / unmooring activity to the vessel. Besides, other activities occur at the offloading station, such as laboratory sample collection by the laboratory and / or marine team, and calibration and maintenance of the meterer by fiscal metering technicians at FMC.

INITIAL INPUTS

In offloading system design, the following aspects shall be considered:

- Installation of winch for messenger cable and guide cable.
- Access and adequate reach area for flushing and backflushing valves, as specified in the valve chapter of the document “ERGONOMICS REQUIREMENTS FOR TOPSIDE”.
- Control system for mooring cable reels and hose.
- Free deck area for cable routing in case the winch fails.
- An easy-to-access sample collection point, considering container transport.
- For FMS specifications, check the requirements in the document “ERGONOMICS REQUIREMENTS FOR TOPSIDE”.

LAYOUT, FURNITURE, AND EQUIPMENT

- Allow concomitant and independent use of winches for messenger cable and guide cable.
- The hawser reel winch control shall be positioned in a safe location away from

tensioned cables.

- Provide a closed cabin with a balcony for the mooring cable and hose control panel. The reels shall be viewed over their entire length, from the cable area to the offloading vessel.
- The control cabin shall allow 360° vision. Wide glass openings are recommended in the upper half of all bulkheads (above approximately 1000mm). The glass windows shall open to allow cleaning from inside, or be equipped with windshield wipers and a washing system operated from inside the cabin.
- Provide a mobile control system (joystick type), allowing operator positioning on the balcony or inside the cabin, according to the visual field and safety.
- Provide automatic locking of the hose reels.
- Provide seat in the control cabin for BCO (Ballast Control Operator) / nautical officer.
- Provide an emergency release device (from the hawser) attached to the drum itself, so secondary maneuvers are not needed (Figure 16).

Figure 16. Secondary maneuver for connecting the hawser to the emergency device

- Provide a location and devices for firing a shot for offloading vessel mooring from FPSO.
- 3-inch messenger cables usage is recommended. However, the winch and the space provided for plugs shall allow the reception of 4-inch cables.
- Provide lighting for viewing the mooring area, hawser and hose reels, and cables at sea.
- Avoid obstacles on the mooring path, providing clearance for mooring activities.
- Curved plates can be used to prevent glare, if necessary.
- Consider access for maintenance of luminaires.
- Enable obstacle-free access to the HPU panels of reels.
- Provide non-slip flooring on the way to the HPU control panels.
- Access to collection points shall preferably not use a vertical ladder to handle the containers.
- Provide 2 simple cabins (one Aft and one Fwd), shelter to crew member during

offloading operations, with door with one window and handle, side and front windows, adequate lighting, natural ventilation, (upper and lower openings) with supports for the floor anti-dumping and folding bench. Cabin must be resistant to the weather, to the conditions of exposure to process and a 30 years lifespan. It must also be fixed to the floor to prevent displacement in adverse conditions.

PULL-IN

Pull-in is the activity that connects the riser to the platform. A specific boat for this activity takes the riser to the platform. If it is necessary to repair a line or close a well, the reverse way is called a pull-out.

INITIAL INPUTS

- Provide auxiliary hoist with capacity for pull-in operations and moving parts on the riser balcony.
- There shall be an intersection area between the auxiliary hoist and the crane to allow the movement of parts for maintenance or loading and unloading areas.
- Provide monorail for cargo handling on the riser balcony deck (preparation and demobilization steps), considering the necessary area for handling large pieces.
- The resources to vertical cargo handling along the entire upper riser balcony shall be provided. It is recommended:
  - Check the minimum size for hatch openings, considering the size of the parts to be transported, such as shackles and spools, for example.
  - Provide resources for opening hatch covers, considering the weight and size of the cover, and the space to remove it.
  - Check the spacing between hatches to supply materials in all planned bellmouths.
  - Provide lifting eyes on the structure that covers the upper riser balcony.
  - Avoid obstacles on the vertical paths, providing clearance for handling activities.

LAYOUT, FURNITURE, AND EQUIPMENT

- Provide a free area to lay the parts after preparation (spool, dame spool, SDV, etc.) until the end of the process, allowing free circulation around the area where the riser is received. And provide cargo handling mechanisms to allow performing the maneuver (hoist communication with the monorail or reach area for the auxiliary hoist - in the case of hoists, the location of its installation shall be easily accessible, allowing its maintenance).
- Provide an area for circulation of workers, which also allows cargo

accommodation during material handling if necessary.

- Provide a closed cabin for the hoist control panel with artificial lighting.
- If the cabin does not have artificial ventilation, provide mechanisms to prevent natural lighting on the control panels and monitors.
- Provide a seat in the control cabin for the operator of the auxiliary hoist.
- Provide winch monitoring cameras with operator view in the control cabin.
- Provide access stairs, preferably fixed, inclined to the winch cabin to allow agility if abandonment is necessary, in case of emergency.
- Check the need for removable guardrails in cargo handling areas to perform pull in and pull out activities.
- Provide permanent access for cleaning and maintenance of methane gas detectors and fire detectors, if they are located in this area.
- If possible, provide a retractable walkway to access the troller with the auxiliary hoist (Figure 17).

Figure 17. Retractable walkway to access the troller

- Allow unobstructed access to the electrical panels of the hoist (Figure 18) in case escape is required during an emergency.

Figure 18. Obstructed access to the electrical panels of auxiliary hoist

- Check the need for removable guardrails in cargo handling areas to perform

pull in and pull out activities.

- The winch control cabin shall allow 270° vision. Wide glass openings are recommended in the upper half of three bulkheads (above approximately 1000mm).

ENGINE ROOM

FPSO engine rooms are the place where several crucial hull operation systems are located, among them: sewage treatment system, seawater collection, desalination, and treatment system, diesel treatment system, in addition to cooling and heating systems, and emergency pumps. It is an environment where various equipment which cause heat and noise are located.

The engine room's environment is mainly occupied by the maintenance team. The team is responsible for operating and maintaining part of the existing systems in the engine room. Operators' access is undertaken by stairs, including frequent displacements of operators carrying tools.

Systems, valves, filters, and panel distribution in the engine room determine the displacements needed during the various tasks and operating routines. This fact can be aggravated by systems distribution at different levels and their positioning of some under the room's bottom floor.

Parameters monitoring and well visual inspection are critical activities, as they require routine checks by operators in places with poor ventilation and low lighting, below bottom floor sheets. Sewage system maintenance is another critical activity. Dealing with this system requires specific procedures because of biological risks related to contact with waste.

- Valves are one of the main mechanisms used to control the process of a platform and utility systems in the engine room. To do so, the recommendations indicated in the document “ERGONOMICS REQUIREMENTS FOR TOPSIDE” shall be followed.

INITIAL INPUTS

When designing the engine room, the following aspects shall be considered:

- Foresee a maintenance system for this environment: preventive and corrective
- Types of materials, machines, and instruments estimated for these environments - which influences the organization and dimensioning of spaces and the provision of ventilation for air renewal and lighting.
- Cargo handling system designed to move large and / or heavy parts. It might require space for horizontal and vertical displacement.
- Signaling / visual communication system according to the document

"ERGONOMICS REQUIREMENTS FOR TOPSIDE",

- Stairway access according to the document "ERGONOMICS REQUIREMENTS FOR TOPSIDE".

LAYOUT, FURNITURE, AND EQUIPMENT

The following topics shall be considered:

- Provide support points for maintenance and operation of equipment in a safe place and with a defined escape route.
- Provide a material handling device for common use by operational teams.
- Provide communication between material handling equipment, both in vertical, especially between different floors (hoists, pulleys), and horizontal displacement (such as monorails, trolleys, pallet trucks).
- Provide access stairs near the subsystems located on the last level. For vertical ladders, provide support for accessing the floor.

Figure 19. Vertical ladder with support for accessing engine room's last level.

- Provide handles for removing floor plates above stairs.
- Study the location of equipment with the highest thermal loads on places that favor the location and operation of exhaust nozzles and air outputs for improving equipment performance and workers' comfort.
- Provide appropriate lighting for equipment inspection at all levels.
- Include circuit breakers for luminaires shutdown in case it is necessary to preserve their service life when the floor is not frequently accessed.
- Provide access means for maintaining luminaires and sensors, avoiding the need for industrial climbers. However, anchoring points for climbers shall be provided when access is not possible.
- Provide appropriate lighting near operation and maintenance workplaces. Particular attention shall be given to the most frequent activities, such as filter

changing, valve operation, and instrument reading.

- TAGs for equipment installed below the bottom floor shall be placed on floor gratings.

Figure 20. TAGs on floor gratings

- Install a washing point / sink for cleaning tools and filters.
- Provide levels and / or access steps around places where the filter changes occur so that the operator has a place to stand during these activities, reducing the risk of accidents and avoiding damage to equipment.
- Provide the use of a hoist or other devices that can assist large and heavy filter removal for cleaning and maintenance.

HELIDECK

Platform helideck is the area for helicopter landing and take-off operations for passengers or cargo's entry and exit. The main activities carried out in this environment are:

- Reception of aircraft with passengers.
- Reception of aircraft with cargo.
- Transporting a patient on a stretcher, using aircraft.

The work carried out on the helideck does not occur continuously. Each activity has several actors to perform it, such as ALPH (helicopter launch and landing assistant), radio operator, cargo handling team, security technician. Some of them are part of the fire brigade team.

INITIAL INPUTS

The following aspects are recommended to be considered in the helideck design:

- Cargo handling system designed to move cargos to/from the helideck,

- Displacement of passengers with luggage between reception and the helideck,
- Stairway access according to the document “ERGONOMICS REQUIREMENTS FOR TOPSIDE”,
- Patient removal by stretcher.

APPENDIX I – Office Chairs

For office workstations, including SUPROD, swivel chairs with armrests and wheels shall be used. And it is recommended to have a medium backseat.

The chair shall follow the ABNT 13962. The ISO 6940 Standard is also desirable.

Figure 23. Swivel armchair, medium backseat, with armrests

- Chair type: Swivel armchair, medium backseat, with adjustable height armrests.
- Casters: Polyamide six body (material with a low friction coefficient and abrasion resistance), double pulleys in natural nylon injected with independent movements, the vertical axis in SAE 12L14 steel with a diameter of 11 mm, fixed to the base through a pressure ring in steel.
- Base: Swivel, with a central tube, formed by five cast aluminum blades, without welds, with a polished aluminum finish.
- Central Column: In cast aluminum. Gas height adjustment, provided with shock-absorbing spring, with telescopic shielding. 2-to-1 synchronized seat and back tilt mechanism.
- Seat: In high-strength injected material, with a cast aluminum structure without welds. Easily removable cushion, with the rounded front edge, anatomically shaped, independent of the backrest, made of injected polyurethane foam with a minimum thickness of 4 cm. Depth adjustment in 5 positions. Density: 56 Kg/m^3 .
- Backrest: In high-strength injected material. Anatomically shaped, easily removable cushion made of injected polyurethane foam with a minimum thickness of 4 cm. Height adjustment in 5 positions (telescopic mechanism) and free float with adjustable tension that can be locked in any position millimeter. Density: 50 Kg/m^3
- Armrests: With die-cast aluminum core and polyamide armrests. Height and width adjustment in 6 different positions.
- Coating: Leather (natural or synthetic) or vinyl. Finishing and color to be defined with designers and inspection.
- Dimensions for a chair with medium backrest:

- From the floor to the top of the seat: 45 to 55 cm,
- From the floor to the top of the back: 99 to 106 cm,
- Seat depth: 40 to 45 cm,
- Seat width: 45 to 48 cm,
- Backrest height: 60 to 66 cm,
- Armrest length: 27 cm,
- Armrest width: 5 cm.

Spare parts shall be available for replacement, such as seat cushion and / or backrest, armrest and / or headrest, casters, adjustment mechanisms, etc.

APPENDIX II – Chairs for conference tables

For conference tables, fixed armchairs, with armrests, and without casters shall be used. It is recommended to have a medium backrest.

The chair shall follow the ABNT Report 13962. The ISO 6940 report is also desirable.

- Base: with free suspension, in cast aluminum, without welds, with a polished aluminum finish.
- Seat: In high-strength injected material, with a cast aluminum structure without welds. Easily removable cushion with the rounded front edge, anatomically shaped, independent of the backrest, made of injected polyurethane foam. Density: 56 Kg/m^3
- Backrest: In high-strength injected material. Anatomically shaped, easily removable cushion made of injected polyurethane foam. Density: 50 Kg/m^3
- Armrests: With die-cast aluminum core and polyamide armrests.
- Coating: Leather (natural or synthetic) or vinyl. Finishing and color to be defined with designers and inspection.
- Dimensions for a chair with medium backrest:
    - From the floor to the top of the seat: 45,
    - From the floor to the top of the back: 90 to 95 cm,
    - Seat depth: 45 to 48 cm,
    - Seat width: 45 to 48 cm,
    - Backrest height: 45 to 50 cm,
    - Armrest length: 27 cm,
    - Armrest width: 5 cm.

Spare parts shall be available for replacement, such as seat cushions and / or backrests, armrests, etc.

APPENDIX III – Chairs for visitors

For office visitors' usage, there shall be a fixed chair, without armrests. A medium backrest is recommended.

The chair shall follow the ABNT Report 13962. The ISO 6940 report is also desirable.

- Base: with free suspension, in cast aluminum, without welds, with a polished aluminum finish.
- Seat: In high-strength injected material, with a cast aluminum structure without welds. Easily removable cushion with the rounded front edge, anatomically shaped, independent of the backrest, made of injected polyurethane foam. Density: 56 Kg/m^3
- Backrest: In high-strength injected material. Anatomically shaped, easily removable cushion made of injected polyurethane foam. Density: 50 Kg/m^3
- Coating: Leather (natural or synthetic) or vinyl. Finishing and color to be defined with designers and inspection.
- Dimensions for a chair with medium backrest:
  - From the floor to the top of the seat: 45,
  - From the floor to the top of the back: 90 to 95 cm,
  - Seat depth: 45 to 48 cm,
  - Seat width: 45 to 48 cm,
  - Backrest height: 45 to 50 cm,

Spare parts shall be available for replacement, such as seat cushions and / or backrests, armrests, etc.

APPENDIX IV – Chairs for CCR operators and radio room

For the use of Control Room (CCR) and radio room operators, swivel seats with the specifications recommended below shall be provided:

- Product: Swivel chairs with armrests, high backrest, headrest, height adjustments for seat and backrest, and armrests.
- Seat: with adjustable height between approximately 405 mm and 535 mm, through pneumatic adjustment, width of approximately 495 mm, depth adjustable between approximately 390 mm and 470 mm, passive angle of the front edge allowing the inclination of the front edge of the seat by approximately 40mm to relieve pressure behind the thighs, allowing adequate blood circulation to the user's legs and feet. Seat contour shall allow lateral movement.
- Backrest: height from the seat of approximately 600 mm, width of approximately 480 mm, lumbar support adjustable in height between approximately 160 mm and 255 mm, polyethylene terephthalate (PET) cushion, tilt system based on user's weight, without need for manual adjustment, and with adjustable and upholstered headrest. The backrest contour shall allow lateral movement.
- Mechanisms: controls shall be visible and easily accessible from a seated position on both sides of the chair, adjustment making shall not need tools, reclining in the 20-degree range, the angle between seat and back shall vary between approximately 100 and 115 degrees.
- Armrests: with height, width, pivot, and depth adjustments. Height adjustment: between approximately 190 mm and 290 mm, width adjustment of approximately 60mm per armrest, pivot angle adjustment of 30 degrees, depth adjustment of approximately: 75 mm. Minimum distance between arms is 300mm when the armrests are pivoted inwards.
- Base: resistant steel covered with molded polypropylene cover, double casters in rigid nylon 65 mm in diameter.
- Dimensions:
    - Total chair width: approximately 700 mm,
    - Total depth of the chair: with a variation of approximately 580 to 635 mm,
    - Total height of the chair: with a variation of approximately 970 to 1100mm,
    - Height from seat to floor: approximately 405 to 535 mm,
    - Seat depth: approximately 390 to 500 mm,
    - Seat width: approximately 485 mm,
    - Width between armrests: approximately 380 to 500 mm,
    - Height of the armrests from the floor: approximately 585 to 815 mm,
    - Height of arms from the seat: approximately 180 to 280 mm,
    - Backrest width: approximately 480 mm,

- Armrest width: 90 mm at the widest part,
- Backrest inclination angle: from 96º to 120º,
- Inclination angle of seat's front edge: from -3º to 2º,
- Variation of headrest height adjustment: approximately 100 mm,
- Headrest depth adjustment range: approximately 63 mm,
- Height variation of lumbar support: approximately 115 mm,
- Armrest retraction: approximately 75 mm,
- Variation of armrests pivots angle: 27º when turning inward or outward.

Finishing and color to be defined with designers and inspection.

There shall be spare parts available for replacement, such as seat cushion and / or backrest, armrest and / or headrest, casters, pneumatic cylinder.