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PRELIMINARY

## 1 OBJECTIVE

The purpose of this document is to guide those responsible for the basic and detailed design in order to comply with the current Ergonomics legislation and the internal rules of PETROBRAS.

## 2 INTRODUCTION

The Basic Project will be implemented to enable the implementation of Ergonomics principles in this project in order to improve working conditions, minimize the need for corrections during operation and consequently reduce costs and time wastage.

## 3 RULES AND REGULATIONS

The following Rules and Regulations shall be considered for the Project development and Ergonomics Report:

- NR-11 – Transporte, Movimentação, Armazenagem e Manuseio de Materiais;
- NR-12 – Segurança no Trabalho em Máquinas e Equipamentos;
- NR-17 – Ergonomia;
- Manual de Aplicação da NR-17;
- NR-30 Anexo II - Plataformas e Instalações de Apoio;
- NR-35 – Trabalho em altura;
- ABS Guidance Notes for the Application of Ergonomics to Marine Systems;
- DR-ENGP-1.12-R.0 - Diretrizes para Engenharia de Confiabilidade, Desenvolvimento da Estratégia de Manutenção e de Inspeção;
- DR-ENGP-M-II-P1-6.1 – Critérios Gerais para Arquitetura de Unidades de Produção;
- NHO-11 - Avaliação dos níveis de iluminação em ambientes internos de trabalho;
- NBR IEC 61892-2 - Unidades marítimas fixas e móveis — Instalações elétricas Parte 2: Projeto de sistemas elétricos;
- NBR 13966 - Móveis para escritório - Mesas - Classificação e características físicas dimensionais e requisitos e métodos de ensaio;
- NI-2860 - Basic ergonomic criteria for furniture.

## 4 SCOPE

This document is oriented to the application of ergonomics to the design of the hull including basic guidelines for the following environments:

- Control room (CCR);
- Galley, messroom and storage areas;
- Hospital;
- Laundry
- Activities of physical room;.
- Workshops

## 5 ZONING

The allocation of the different compartments by the different floors of the accommodation module is carried out mainly by architecture. The principles that guide zoning in this project were:

- Separation of work areas from those areas of rest and leisure, in order to avoid mutual annoyances;
- Hospital located in a way that favors fast patient care
- The location of the academy should prioritize avoiding noises for cabin environments;
- Restaurant, galley and provisions rooms should be close and preferably on the same level. Access facilities between these environments are required. Similarly, facilities for unloading the ranch should be provided;
- Easy access from the control room to the process plant.

## 6 GENERAL CONDITIONS

### 6.1 LAYOUT

#### 6.1.1 Location, access and flow:

The location of the various compartments should take into account the interrelationship among sectors, the need to visualize the area of operation for some environments and the ease of access and / or communication required between some environments.

The accesses must be located and sized considering the number of people that must circulate by the place and the necessity of passage of equipment and large and / or heavy pieces that can demand a specific transport system, to be defined to each project.

#### 6.1.2 Dimensioning and layout:

It is necessary to take into account the number of operators provided in the shifts, the equipment and furniture necessary for each compartment, in the various phases of the PEU, as well as the communication and / or privacy needs between the teams.

Appropriate circulations should be provided considering the movement of persons and loads of each sector and the possibility of using transport cars or other transport system for large and / or heavy materials.

It is necessary to provide a place for the protection of PPE (helmets, boots, etc.) of employees, close to the accesses of the environments.

The number of helmet hooks should be sufficient for employees in the industry and outside employees who go to the environment.

## 6.2 WET AREAS

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

For the design of the drainage system, the slopes predicted for each PEU must be checked, as the slope / heeling changes occur frequently.

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

Solutions must be provided to allow the grilles to be perfectly evenly tilted so that they do not loosen and / or cause bumps, which hinder the movement of trolleys and can cause people to stumble and fall.

The opening of the grilles should be dimensioned according to the width of the wheels of the specified trolleys, and vice versa, in order to prevent the wheels from gripping the grilles

The interference of the drainage system in the structure must be anticipated, with openings in the decks and metal beams.

## 6.3 FURNITURE AND EQUIPMENTS

In order to fit the working environment of a UEP, furniture and equipment must comply with some general principles:

- It is recommended to provide furniture and equipment with adjustments whenever possible, especially in the workstations of prolonged use.
- Materials must be resistant to the marine environment.
- Surfaces should be as thin as possible to avoid reflections.
- The furniture and equipment should provide for fixing to the floor to avoid movement from the unit.
- Cabinets, shelves and tables should have stops, locks and latches to avoid falling objects and openings of doors and drawers, resulting from these possible movements.

### 6.3.1 Chairs

The chairs must have:

- Lateral and lumbar support.
- Devices (latches) that ensure that it does not move in case of slope of the PEU.
- Easy-to-handle latches.
- Easy to move.
- Casters and locks resistant to stress and frequent use.
- Casters suitable for floor finish material.

- Adjustable height of the seat, backrest and armrest, and for long-term workstations, eg control room and radio room, adjustment of seat depth should also be provided.
- Adjustable head restraint for control room workstations.
- For workstations with tables and benches of usual size between 700mm and 740mm, the seats should allow the height of the seat to be adjustable between 350 and 470 mm, allowing the feet to rest on the floor.
- For workstations with high tables / benches, the chairs should allow the height of the seat to be adjustable and should have a footrest.
- Seat and back material with high coefficient of friction.

### 6.3.2 Workbench

The minimum horizontal dimensions of the bench (length x width) should consider:

- The type of work performed (working with microcomputer, working with lap top, precision work, light work, heavy work, work with or on equipment and parts etc.).
- Need for reaching and supporting forearms.
- All the equipment planned for the activity.
- Space for using paper (reading and writing).

The height of the bench should take into account:

- The type of work performed (working with microcomputer, precision work, light work, heavy work, work with or on equipment and parts etc.).
- How work is performed, whether sitting or standing, and sitting at what height (low or high chair).
- The need for forearm support.
- The positioning of the elbows to perform the task.
- The space for moving the legs under the workbench.
- The need for reinforcement to support the top structure.

### 6.3.3 Shelves and cabinets

Shelves and cabinets shall be provided with:

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

### 6.3.4 Meeting tables

Meeting tables should:

- To be sized according to the number of employees and the possibility of grouping themselves for a meeting.
- Height between 700 and 740 mm.

- Provide space to accommodate the material being consulted during a certain period, in order to avoid falls when the PEU is moved.
- Being resilient enough for people to lean on them, because in many situations of use, meetings occur with the operators standing, and these end up leaning on the tables when the meeting goes on.

## 6.4 THERMAL COMFORT

The criteria for the design of HVAC systems are described in I-ET-3010.1M-5250-300-P4X-001.

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

## 6.5 LIGHTING

The criteria for the lighting design are described in I-ET-3010.1M-5140-700-P4X-001, SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS and I-DE-3010.1M-5140-700-P4X-001 - LIGHTING INSTALLATION TYPICAL DETAILS.

## 6.6 ACOUSTIC

Measures shall be implemented so that the maximum noise level complies with NR-17 and guideline DR-ENGP-M-I-1.8-R.4 REQUIREMENTS FOR NOISE CONTROL / REQUIREMENTS FOR NOISE CONTROL.

The criteria for the project are described in I-ET-3010.1M-1200-300-P4X-001 E 002, SPECIFICATION FOR.

During the preparation of the project, a Noise and vibration report will be issued, in different phases, with information and recommendations for the treatment of any anomalies that may be encountered.

## 7 CONTROL ROOM (CCR)

### 7.1 CONDITIONING AND PROJECT VARIABLES

In the design of the control room the following aspects should be considered:

- The design of this unit provides for the use of remote control room onshore
- Number of operators provided in the control room on shift
- Expected equipment and systems (automation, monitoring, fire fighting, emergency, communication, etc.).
- Relative location of the process plant and other compartments related to the control room.



## 7.2 LAYOUT

### 7.2.1 Location, accesses and flows:

The central control room should be located in a safe area, in a position that allows the compromise between:

- Access to the plant quickly and without obstacles, in case of emergencies.
- The visualization of the main production / operation area, the flare, the cargo handling area and the vessels that dock with the PEU, which can facilitate the anticipation of events for the production teams and the vessel

### 7.2.2 Sizing and layout:

The central control room should have three distinct environments, but integrated

- Operation;
- Equipment;
- Automation room.

The equipment room should be contiguous to the operating room, and should be interconnected.

The CPUs of the control system (ECOS) stations must be located in the equipment room (restrictions on cable length and runway must be considered).

In operation room:

- The area must be free from obstructions to movements and views (pillars, steps, etc.), avoiding interference in operation, especially in emergency situations.
- Provide windows that allow the visualization of the external area, especially the main production / operation area, the flare, the cargo handling area and the vessels that dock
- The relative position between the different sectors must be observed in order to position them according to the communication needs.
- Provide a workstation exclusively for the production / operation supervisor (SUPROD) with visualization for the operating benches. In the workstation of the SUPROD, provision should be made for the station of the control system, as well as a corporate microcomputer Plant Information (PI)
- The operating environment must contain at least 3 work posts (2 operation, 1 boat).
- Provide spaces for meetings. These areas should be used in situations of need for discussions of special maneuvers between the operation teams and supervisors, shift exchanges, among others.
- The sizing of the workstations (operating consoles) should consider the needs in terms of the quantity of monitors in the control system, radios, the equipment needed by each operator per operation team and the use of a workstation for more than an operator in situations of specific and emergency maneuvers.

In equipment room:

- Provide space for racks and other equipment in order to guarantee the necessary distances for circulation, maintenance and ventilation.
- Provide a workstation / workbench for automation in order to facilitate maintenance activities. This is not a fixed work post, but a support for maintenance activities.

In automation Room:

- Provide 2 workstations and benches for the installation of control system stations.
- Provide lockable lockers for equipment and documents.

A large number of frames, panels and other devices are attached to the walls of the control room. The position of each of these elements should be studied for proper visualization by the operators and in a way not to prejudice the acoustic treatment provided for the walls.

The minimum depth of the bench should be 1000 mm and the height of the bench should be between 700 and 740 mm. Adequate free front space should be provided for the passage of the legs during the movement of the operator (in relation to the structure of the table).

The table provided for the meeting spaces should provide for consultation of manuals and plants and have devices that prevent the fall of the materials in use in case of slope of the PEU

Plant guarding devices and maps that are consulted during the operation should be provided.

In the case of the use of emergency buttons, these must be located in their own consoles and with a protective cap.

### **7.3 EQUIPMENTS**

Frequent-use monitors should be positioned on the table. Superimposed monitors are only allowed for occasional use. All monitors must have height adjustment.

## **8 GALLEY, MESSROO, AND STORAGE AREAS**

The galley, messroom and storage areas are an integrated system, located in contiguous spaces in order to facilitate the integration between the operations of storage, preparation and food supply to people on board.

## 8.1 CONDITIONING AND PROJECT VARIABLES

The following aspects should be considered in the food sector design:

- Number of meals to be served;
- Scheme of rotation of classes for meals;
- Diversity and complexity of the menu;
- UEP supply system and frequency;
- Place of arrival of the ranch;
- Adopted operating system - with food preparation just before serving; with advance preparation; with the use of pre-processed foods or with the provision of ready-made and frozen dishes;

## 8.2 LAYOUT

### 8.2.1 Location, accesses and flows:

The areas that make up the food sector (galley, bakery, cafeteria and provisions) should be designed in an integrated way considering their interconnected functioning.

The design of the galley should allow and favor the adequate flow of genders, people, waste, clean material and dirty material, necessary to promote healthy and safe food. Areas can not serve as a passageway for people and genera and there should be no flow of dirty areas to clean areas or crossings of genera and waste.

The location of this set of environments should consider the arrival of the ranch on the same deck. Consideration should also be given to the location of the garbage disposal to avoid cross-contamination and to be close to the kitchen

If obstacles can not be avoided, transposing ramps with adequate slope must be designed.

The following compartments should be located near the power sector to facilitate and minimize displacement:

- Male and female toilets , adjacent to the refectory.
- The installation of sinks for hand hygiene inside or near the dining room should be provided with a faucet with automatic or non-manual closing and a safe system for hand drying.
- Provide an exclusive area to store gallons of mineral water near the container's receiving area.
- Coffee shop should be close to the messroom and another to the CCR, it shall have sink for hand hygiene nearby, benches of adequate material support, drainage point for correct sanitation (floor) and electricity (refrigerator, coffee maker).

The cross flow of people should be avoided in all environments between clean and dirty area.

Provide windows for the kitchen, bakery and cafeteria areas, so as to allow perception of the external environment (day / night, sun / rain etc.) and avoid the feeling of confinement.

Messroom:

- Signaling should be provided to direct the flows of people, inputs and waste at the entrance and exit, as well as access to the ramp and the return area of the dishes.
- The refueling flow in the cafeteria hall should not be crossed with the flow of people using the cafeteria.
- The circulation between tables and chairs, and between chairs and bulkheads should allow free access of people to all tables.

8.2.2 Furniture, equipment, devices and installations:

Equipment lists will be issued by the LMS.

All spaces, including the kitchen, dining room and store rooms, must be provided with drainage systems (grates) on the floor, in order to allow washing of the environment and avoid accumulation of water. Provide adequate slope toward the grates for proper drainage of water. The drains must be siphoned and have grilles with a closing system.

Exhaust, refrigeration or other system openings must have millimeter and removable screens to facilitate periodic sanitization.

The electrical installations must be built-in and the doors must have automatic closing.

Consider fire-fighting systems and their installation and access requirements in the layout of kitchen areas (for example, fire extinguisher installation).

## **8.3 GALLEY**

8.3.1 General considerations

Provide one or more sinks in a strategic position for handwashing, one of which is close to the access of the main kitchen area.

Mixers / taps should have devices that can be closed without the use of hands by workers (use of sensors, levers or foot actuation).

Provide a place to store disposable caps next to kitchen access.

The dimensions of the benches should be made in such a way as to facilitate the activities to be performed and providing free space to accommodate the feet.

All workbenches must have plastic film holders, plastic gloves, antiseptic products and a place to store a set of knives.

The dimensions of the sinks (width, depth and length) should be designed to allow the washing of products and containers used in the development of each activity. The taps in general must be rotating (mobile spout), equipped with mixers (hot and cold water) and with height compatible with the use of each tank

Support racks, located above countertops, should be positioned so as to allow easy access.

Cabinets and shelves must have removable safety bars and adjustable heights to prevent drops in utensils from the UEP's balance sheet.

All trash cans should be in stainless steel, have handle straps, clasps, lids and pedals. Its positioning should be studied in order to facilitate the disposal of residues and to avoid disturbing the flows of the kitchen. Sizing and capacity should be adequate in order to avoid accumulation of organic residue in the kitchen area.

Scales should be provided to weigh the waste to be disposed of by the disposer.

Provide two support cars to carry dishes, hot pots, monoblocs and other necessary tools with wheel locks.

Spaces may be needed in these cars to couple the gastronorm basins with ready food.

Due to the complexity of the facilities in this area (hot and cold water, forced electricity, ventilation and exhaust, air conditioning, where possible in certain locations), a structural footing greater than that normally used on platforms may be required.

The areas of preparation of the different foods (meat - red and poultry - fish, vegetables etc.) must be independent of each other.

During the detailing project, a facility plan should be issued contemplating electrical, hydraulic and depletion installations of the various equipment.

### 8.3.2 Reception area

This area must have a tank with hose for pre-washing of the genera before entering the storage area. In this area will be generated waste that needs to be discarded.

### 8.3.3 Cooking area

Provide support benches for pans, monoblocs and / or utensils near the cooking island.

It is recommended that the hood be installed at a height that avoids headaches and improper postures, but that meets the requirements of the HVAC discipline and has internal lighting.

#### 8.3.4 Area of washing and pre-preparation of vegetables and cold

Pre-preparation areas should not be provided on the side of the distribution counter.

The vegetable cutting equipment should be installed near the sink and on a stand. The height of this stand must allow access / reach to this equipment during its use

Provide a refrigerator in order to meet the sanitary requirements related to this activity.

Dairy and cereal preparation can be done on this bench

Vegetables and vegetables should have their own refrigerator.

#### 8.3.5 Pre-prepared meat (red and poultry)

Provide a specific board to cut meat, in resistant material and of easy hygiene, and shelves next to the bench for the placement of ingredients of daily use.

Provide a refrigerator in order to meet the sanitary requirements related to this activity.

The meat and fish preparation areas must be heated.

#### 8.3.6 Fish preparation area

Provide specific board to cut fish, in resistant material and of easy hygiene, and shelves next to the bench for the placement of ingredients of daily use.

Provide a refrigerator in order to meet the sanitary requirements related to this activity.

Meat and fish preparation tables should be independent, but close, since the preparation is done by the same person.

The refrigerator for fish and meat can be the same as long as it has two compartments with independent doors.

#### 8.3.7 Bakery

Breads, cakes, pastries and pastas require exclusive area due to the use of their own equipment and specific temperature and humidity requirements for breads.

Provide two countertops near the oven and the dough mixer.

The dough cylinder should be easy to handle, without requiring effort from the operator, and should be installed next to the bench.

Provide a stainless steel top (minimum 1200 mm length) to open masses.

Provide closet with locking and support cars for storage of trays with minimum dimensions of 700 mm x 500 mm. (pasta rest). These places serve to store empty trays and to leave the breads and cakes after ready until they cool.

Provide shelves next to countertops, to put ingredients for everyday use and drawers to store utensils

The mixer and other equipment must be installed on supports to be at a suitable height for handling.

### 8.3.8 Washing

For this area project, the sequence of tasks and operations

Provide separation of support benches: "dirty area" (before washing) x "clean area" (after washing).

The dimensions of the sinks (width, depth and length) should be designed to allow the washing of the pots, dishes and other materials used in the development of each activity.

The taps must have mobile taps and, in the case of sinks for washing utensils with large dimensions, provide showers with flexible and retractable cable in relation to the bench, of the squirt type

Provide a large shredder close to the outside area where most organic waste will be discarded, according top equipment list.

Provide a support stand near the place of return of the dishes, with two sinks, being a sink equipped with industrial crusher.

Provide industrial dishwashers, having soap and blotters.

The countertops in the area must be interconnected and continuous, allowing the monoblock to be filled with the dishes from the sink to the washing machine.

The pans wash stand should have two sinks. One of them must have a minimum depth of 400 mm and other dimensions that allow the washing of large pots (about 800 mm in diameter each pan). This sink should be equipped with a shower with flexible and retractable, splash-type cable.

It is recommended to provide cupboards without doors, with shelves and removable protection bars to keep pots and utensils clean.

## 8.4 MESSROOM

Provide a rounded slope at the edges of the tables in order to avoid falling dishes in the slope of the PEU.

Provide a place to hang the helmets, next to the cafeteria, outside

Provide supports that hold dishes, cutlery and cups protected

The food ramp should have room for cold dishes (4 salads), hot dishes (2 types of rice, soup, beans, 2 kinds of meat and 2 types of garnish) in this sequence

The counters should have a protective barrier against consumer action.

Provide one freezer and two refrigerators for ice cream, desserts, ham, cheese and butter and for beverages.

The Table Area - should accommodate about one-half ( $\frac{1}{2}$ ) of the working population (POB) of the total number of employees per shift. Predicting the area of 1.5sqm per user.

Between the refectory and the kitchen, direct to the dishwashing area, should have area for return of utensils, preferably with bins built into the workbench.

Chairs:

- Must have seat dimensions (height, width and depth) appropriate to the anthropometric measurements of workers.
- Your feet must be specified so as not to interfere with circulation spaces.
- They should be washable and stackable.

Predict benches for:

- Support of beverages that will be consumed during meals and the use of juices and other machines, when available.
- Observe that some of these devices require a place for food containers (water gallons, refrigerant syrup, etc.).
- Support for equipment such as industrial grill, ice machine etc.
- Benches should have lockers with keys at the bottom to store equipment when not in use.

### 8.4.1 Provision room

It is essential to avoid obstacles (steps, sills, and other unevenness) to the maximum in the entrance of the loft. In the event that obstacles can not be avoided, transposing ramps should be designed with a slope suitable for easy movement of the device available for transporting the ranch.



#### 8.4.2 Sorting and sanitizing area

Provide an area with support benches and sink and / or tank, clean and protected, where the separation and sanitization of products and packaging can be made upon receipt of the ranch. RDC 216 requires that areas of food reception be protected.

#### 8.4.3 Dry provision room

Provide support benches and shelves with anticorrosive material, with adjustable heights. About 10% of shelves should be barred for ventilation (for sprouting grains). With its own areas to store various types of provisions (size, weight, packaging).

Air conditioning or exhaustion as specified by the HVAC discipline.

#### 8.4.4 Water store

This area should house full and empty gallons and should be protected from the elements and light.

It should have bench and base with side opening, adapted to wash the bottles with shower.

The calculation of the water gallon storage area should consider stacking to the 3rd row or some method of stacking the gallons should be provided in order to minimize stress during storage and handling.

#### 8.4.5 Clean material store

Provision should be made for the area for the deposit of cleaning material with a tank for washing the utensils used for cleaning.

#### 8.4.6 Waste Diposal

A weather protected area should be provided for the temporary placement of waste from the food sector until it is treated and / or removed from the PEU

If organic waste is deposited and if the final collection / disposal is not daily, refrigeration should be provided for this area to avoid rapid decomposition, which may lead to contamination and odors.

This location should provide space for collectors and sanitation of collectors and dumpsters.

## 9 HOSPITAL

The following types of care characterize the hospital of a UEP: outpatient care, urgency care and emergency care.

## 9.1 CONDITIONING AND PROJECT VARIABLES

It is recommended that the following aspects be considered in the design of the ward:

- Relative position and access to the process area - due to travel with stretcher in accident / emergency situations.
- Relative position and access to the helideck - due to displacements with stretcher in situations of patient withdrawal.
- Separation of internal compartments: reception, care, rest and other areas of specialized care.

## 9.2 LAYOUT

### 9.2.1 Location, accesses and flows

The hospital should be located in a safe area near the helideck.

The access to the hospital and between the rooms that make up must be fast and without obstacles, using ramps instead of steps

Where obstacles are unavoidable in the access route between the process area and the hospital, appropriate transposing ramps must be provided for the transport of stretchers. The minimum width recommended by ANVISA (RDC-50) for ladders and ramps where the litter moves to hospitals on land, is 1500 mm.

There must be at least two accesses:

- Internal access to the accommodation module by the waiting room - for common use.
- External access to the process area through the emergency room, with double door - for accidents, emergencies, and removals.

### 9.2.2 Sizing and layout

For dimensioning the environments of the ward area, the equipment and furniture required for the types of care provided should be taken into account, as well as adequate circulation spaces for transportation on stretchers

It is recommended that the hospital have the following environments: waiting, care, rest, clinic room and bathroom, purge area, health waste storage

The bathroom and toilet doors should open out of the room. They must also be fitted with a lock, which allows easy opening in case of emergency

Prevent windows in order to provide natural lighting environments.

Space should be provided in the infirmary for the storage of transport beds (offshore and rigid).

Special closed trash cans should be provided for contaminated waste (sharp objects, infected material, etc.)

Provide a stainless steel bench with sink and for the preparation of medicines.

The stretchers must have support for the use of a disposable sheet (roll of paper).

Vaccine must be in a freezer compartment

Hospital should have a refrigerator with a separated freezer compartment of approximately 120 liter.

Provide a multifunction printer and a paper shredder.

Consider the space occupied by the emergency car, dressing car and the Telemedicine car in the definition of the layout of the emergency room.

Do not locate telephone booths near the ward.

### 9.2.3 Furniture, equipment, devices and installations:

The projected areas and facilities should be appropriate to the furniture, equipment and devices provided for each PEU, which should be checked at the beginning of each project.

Equipment lists will be issued by the LMS.

O número de camas hospitalares e boxes de atendimento deverão ser dimensionados conforme a taxa de ocupação da unidade, sendo no mínimo dois.

#### 9.2.3.1 Rest area:

In the rest area, the number of hospital beds and service boxes should be dimensioned according to the occupancy rate of the unit, being at least two.

The hospital beds must have access on both sides, each one allocated in an individual box, and curtains of washable material may be used.

Each hospital bed should have a fixed lighting at the bedside and a parabolic mobile reflector.

Hospital beds shall be secured or secured.

Each hospital bed should have a side table.

Provide a way to facilitate observation of patients in the rest room (window, cameras, etc.).

Locked cabinets should be provided for the custody of personal belongings.

Sink for hands hygiene with foot control or sensor-operated.

Provide area for the placement of oxygen cylinders in the external area and adjacent to the infirmary. This area must have the necessary devices to allow the movement or replacement of the cylinders.

#### 9.2.3.2 Clinic room:

The clinic room should contain equipment according to the LMS list:

- Videoconference equipment, preferably on a rack with casters that can be locked, in case it is necessary to move the equipment so that the doctor can visualize the patient from a certain angle;
- Hand sanitizer with foot opening or sensor actuated control;

The stretcher should have a fixed lighting at the bedside and a movable parabolic reflector with magnifying lens;

The stretcher should have castors with locks in order to avoid undesirable displacements and allow displacement of the stretcher;

Devices should be provided for the immediate treatment of burns and accidents with chemicals.

#### 9.2.3.3 Waste of health service:

All environments should be provided with trash cans, with separation for contaminated waste and simple waste.

Contaminated litter should be collected in special containers for this purpose.

Provide a closet identified as a health / closet in the vicinity of the helideck for the litter guard, O<sub>2</sub> case and first aid case.

## 10 LAUNDRY

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

## 10.1 LAYOUT

### 10.1.1 Location, accesses and flows

The laundry should be located in the, preferably on the lower decks, in order to avoid the propagation of noise and vibrations to the cabins, offices, hospital and other areas where acoustic comfort is essential.

Its location should allow the following accesses:

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

### 10.1.2 Sizing and layout

The laundry should be divided into two separate and physically separate environments:

- Reception area, handling and storage;
- Washing and drying area.

Equipment lists will be issued by the LMS.

Must have adequate space to house furniture, devices and equipment provided.

Must provide area for circulation and parking of transport carts.

It should provide for separation of clothing from the ward of other clothing.

#### 10.1.2.1 Manipulation and storage area

The area of manipulation and storage must have furniture according to the architectural specifications

The heights of workbenches should be dimensioned so as to facilitate the activities to be carried out standing, and providing free space for foot accommodation.

- For laundry room table - heights between 720 and 750 mm;
- For the service desk - heights between 1000 and 1150 mm.

Cabinets and shelves must have removable guard bars to prevent falls of clothing, utensils and cleaning materials in use by the PIU movement.

- Stainless steel metal cabinets make cleaning easy and can be cleaned after washing.

Prediction of drainage system for water flow in order to allow proper cleaning and sanitation and the movement of trolleys.

#### 10.1.2.2 Washing and drying area

It must be dimensioned according to the number of equipment for placing and removing clothes with the aid of a cart.

It must provide circulation space for maintenance of equipment.

Hospital clothes shall be washed separated from other types of clothes.

The doors must be dimensioned for the easy passage of the garment trolleys (minimum width 1200 mm) and provided with a display.

The door to the outside of the laundry room should be sized according to the size of the equipment

Provide exclusive laundry area for personal use, where each employee can access and wash their clothes, without interfering with the routine of the laundry.

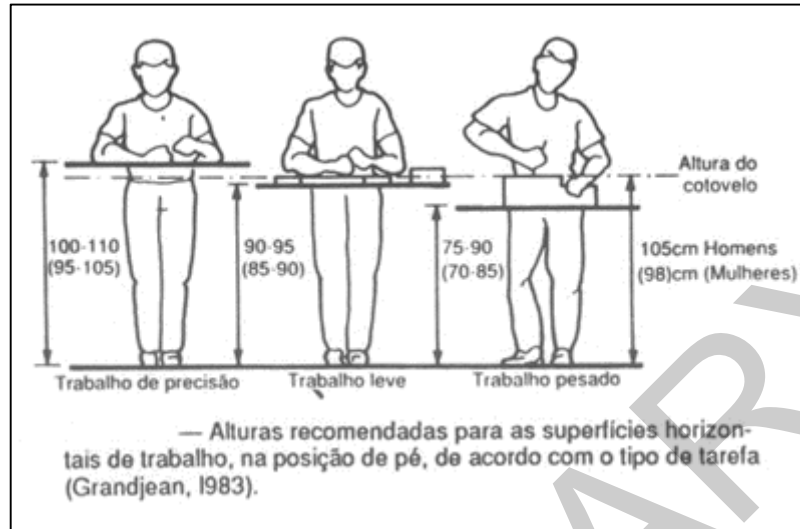
This area may or may not be located in the laundry, depending on the organization planned for each unit.

To consider postural aspects in the dimensioning of the supports of the machines and their locations in relation to the floor, besides the space in return necessary for the perfect execution of the tasks of the laundry

The cars should have easy maneuverability, castors with silent mechanisms and latches and edges with protective covers.

It is necessary to specify, in a coordinated way, trolleys and grates, in order to prevent the wheels from catching on the grilles, and trolleys and vents on the garbage collection and distribution routes, including service lift, so that the use of the trolleys does not be limited by the width of the doors.

Laundry equipment shall meets the requirements of NR 12 for interlocking and emergency stop.



Recommended height for horizontal surface of work

## 11 ACTIVITIES OF PHYSICAL ROOM

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

### 11.1 LAYOUT

#### 11.1.1 Sizing and layout

An area for equipment and an exercise area in the ground should be provided.

There should be mattresses and dumbbells of varying weights

It should be sized according to the number of gym equipment compatible with the number of users of the facility.

The equipment of the gym should be located so as to guarantee the minimum areas (according to the manufacturer's instructions) required for its use, as well as for the comfort of the users.

Must provide area for circulation and maintenance of equipment.

The mirrors should be strategically located next to the training spaces with elevators and shiners and next to the equipment / areas of the gym where exercises are performed that require specific postural attention.

For the floor of the gym, a "floating floor" must be adopted, capable of absorbing the noises emitted at low frequency, being covered by the specified decorative floor, according to noise report.

Sound insulation must be adopted in order to guarantee noise levels in accordance with current legislation.

The gym must be supplied by power points, data and signal to the TV.

Preferably should have large windows installed in the compartment.

## **12 WORKSHOP**

Workshop work (mechanics, electrical and instrumentation) is closely related to maintenance activities. The work activities of maintenance teams occur most of the time in the process area, and the workshops are support spaces for repair activities that can not be performed in the area and for the administrative and control activities related to completing reports , scheduling of activities, etc.

### **12.1 CONDITIONING AND PROJECT VARIABLES**

It is recommended that the following aspects be considered in the workshop design:

- Maintenance system planned for the unit: equipment and local stocks and / or service providers
- 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.), the acoustic design and the air conditioning prediction in some areas;
- Precision requirements of certain activities (mechanical machining, calibration ...) that require controlled environments in terms of noise, vibration, illumination and temperature
- 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;
- Relative positioning of workshops and warehouse, considering easy access for people and equipment.

### **12.2 LAYOUT**

#### **12.2.1 Location, accesses and flows**

Maintenance workshops (mechanical, electrical and instrumentation), tooling, warehouse and other areas related to maintenance, such as painting area, paint depot, boiler, among others, must be designed in an integrated way, since the interdependence of activities of the teams working in these environments in the process area or 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, security issues have to be considered, seeking a compromise between the ideal location and the least dangerous location

It is necessary to provide an office with enough computerized workstations to meet the comply with NR-17 workshops, attached to each of the workshops.

Provide close to the mechanic's workshop, area for painting equipment with deposit for paints and other painting materials.

The accesses of the workshops, in particular the accesses from the external area to the workshops, must foresee the necessity of the displacement of large equipment inside the machine shop and vice versa.

#### 12.2.2 Sizing and layout

The spaces must be dimensioned for the equipment provided for each of these compartments, according to the project and the technical specifications for the sector.

The workshop equipment lists will be issued by the LMS.

The office area should allow the visualization of other environments, but at the same time, ensure acoustic protection between the office and other environments, the climate and the minimum level of lighting of the office, according to current legislation.

All workshop doors must have porthole.

The sizing of the access door ( simple or double) to the mechanical workshop must allow for the movement of large equipment. It is recommended a study of cargo handling specific for these areas.

The layout of the mechanical workshop should include an area for washing parts and tools with tank and a washing machine.

#### 12.2.3 Furniture, equipment, devices and installations

All workshop equipment lists will be issued by the LMS.

Connection must be provided for compressed air, water, electricity, 110 / 220V.

In all workshops there should be spaces for trash cans, tool bags and helmets, as well as equipment.

Smaller equipment can be stored inside cabinets.

Cabinets should be provided for the storage of general purpose equipment and tools.

The workshop floor should be non-slip.

In the office should be provided the placement of closets near the workstations for the storage of folders and documents.

The office and electrical and instrumentation workshops must have air-conditioned.

### 12.3 MECHANICAL WORKSHOP

Benches should be provided to support machines and tools, one of which is close to the lathe.

In front of the lathe must be installed, on the floor, a frp platform with non-slip finish. The height of this platform will depend on the height of the lathe and its purpose is to facilitate the reach of the operator and to allow adequate postures.

Near the lathe must be provided cabinet for guarding the tools and equipment of the lathe.

Benches, in addition to drawers, must have a place for placing and handling toolboxes.

Next to the part washing tank, liquid soap and hand drying devices should be installed. Next to this area should be located wardrobe to guard bombs, greases and other equipment.

The tool shop should be attached to this workshop.

### 12.4 INSTRUMENTATION WORKSHOP

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

Provide specific space, with air conditioning, and the part for calibration activities of tax measurement instruments to comply with regulatory requirements.

In the instrumentation workshop:

- Workbenches, bench for calibration, cabinets for equipment, cabinets for documents and files for suspended folder should be provided;
- At the side of the calibration bench should be provided the installation of microcomputer dedicated to the issuance of certificates;
- A microcomputer dedicated to making adjustments and set points of instruments should be provided near the test benches.

### 12.5 ELECTRICAL WORKSHOP

In addition to the interaction of workshops, tooling and warehouse, the electrical workshop also interacts with the panel room for maintenance of the circuit breakers.

### 12.6 WELDING WORKSHOPS AND BOILER WORKSHOP

It should be constructed in an open location, facilitating material access and facilitating air renewal and with access to other workshops.

Provide external space for sheet and pipe guarding.

Preferably look for a sequence that tries to place the yard of plates and tubes, boiler shop, treatment and painting and paint shop.

### 12.7 PSV CALIBRATION WORKSHOP

Preferably attaches the caldeiraria.com workshop. area of approximately 25 m<sup>2</sup>.

PRELIMINARY