

	TECHNICAL SPECIFICATION	Nº: I-ET-3010.00-5510-760-PPT-001
	CLIENT: SRGE	SHEET: 1 of 24
	JOB: -	
	AREA: -	
TIC	OWNER TELECOMMUNICATIONS SYSTEMS REQUIREMENTS AT CONSTRUCTION SITE	EXTERNAL
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1. SUBJECT

- 1.1. To present the minimum telecommunications systems requirements to be supplied, installed and configured by SELLER required for all BUYER telecommunication demanded services in each office at Engineering Site, Hull Construction, Modules Construction and Integration yards.
- 1.2. The whole scope of supply listed and demanded herein shall be considered for each SELLER's sites, except for items 7.1.2, 7.1.4, 7.2.1, 7.3.1 (subitems c to e), 7.5.1 and 7.5.4, whose quantities shall be distributed among the different sites. This distribution will depend on SELLER's execution plan, for this reason, shall be negotiated later with BUYER.

2. ABBREVIATIONS AND DEFINITIONS

2.1. Acronyms:

4G	Fourth Generation	LTE	Long Term Evolution
ABNT2	Associação Brasileira de Normas Técnicas number 2 (Brazil)	mAh	Mili Ampere.hora
AC	Alternate Current	Mbps	Mega bits per second
AP	Access Point	MHz	MEGAHERTZ
BER	bit error rate	MODEM	Modulator/Demodulator
CD	Compact Disk	NOC	Network Operational Center
COM	Communcation serial port	PoE	Power Over Ethernet
CPU	Central Processing Unit	PTT	Push To Talk
DB	Database	RAID	Redundant Array of Inexpensive Disks
DC	Direct Current	RAM	Read Access Memory
DDR	Double-Data-Rate	ROM	Read Only Memory
DVD	Digital Versatile Disc	RPM	Rotation per second
ECC	Error-correcting code	SAS	Serial Attached SCSI
FPSO	Floating Production Storage and Offloading	SATA	Serial Advanced Technology Attachment
GB	GIGA BYTE	SFP	Small Factor Part
HCL	Hardware compatibility list	SIM	Subscriber identity module
HD	High definition	SIP	Session Initiation Protocol
HDD	Hard Disk Drive	SSD	Solid State Drives
HDMI	High-Definition Multimedia Interface	U	Unit of Messurement for racks
Hz	Hertz	UDIMM	Unbuffered Dual Inline Memory Module
IEEE	Institute of Electric and Electronic Engineers	UPS	Unninterruptible Power Supply
IEPL	International Ethernet Private Line	UTP	Unshielded Twisted Pair
IP	Internet Protocol	V	Volt
IPv4	Internet Protocol version 4	VAC	Volts in Alternate Current
IT	Information Technology	VGA	Video Graphics Array
KVA	Kilo Volta-Ampere	Wi-Fi	Wireless Fidelity
LAN	Local Area Network	WLAN	Wireless Local Area Network
LED	Light-Emitting Diode		



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2.2. Definitions:

BUYER	It is defined as the purchaser of the FPSO.
PETROBRAS	It is used to refer to BUYER.
SELLER	It is defined as the responsible for supply the FPSO.
OWNER	It is used to refer to owner of shipyard on which the FPSO and/or its modules will be built.

3. GENERAL REQUIREMENTS

3.1. Infrastructures shall be understood as all mechanical devices, equipment, cables and contracts used as a background to support the final services used by the final users. As examples of infrastructures, it can be listed: local structured cabling, power outlets, data outlets, data equipment, cabinets, printers, notebooks, computers, monitors, TVs, CCTV cameras, servers, mobile devices, data circuit.

3.2. The infrastructure and services to be provided shall take into account the service types according to the scenarios of SELLER strategy for project development and yards locations, whose type will be chosen for each site by BUYER after strategy to be informed and understood:

3.2.1. Types of infrastructure:

- a. Complete solution: it means that the whole infrastructure required herein shall be provided in case BUYER PRIVATE LINK be chosen so that Petrobras can securely access its corporate Brazilian network from office and FPSO (Commissioning phase).
- b. Partial solution: it means that SELLER shall provide just an internet access so that Petrobras can securely access its corporate Brazilian network from office.
- c. Common infrastructures: it means that SELLER shall provide the infrastructures herein required even for Complete solution or Partial solution not mattering which one will be chosen.

3.2.2. BUYER PRIVATE LINK shall always be provided for Commissioning phase.

3.2.3. Seller WIFI on board the vessel during Construction and Assembly and Commissioning phases shall always be provided since the beginning of work. It will be also acceptable mobile signal from Local Mobile Cellular Operator coverage to be reinforced all over the vessel so that data and voice communication can be done through this network.

3.2.4. In case of partial solution be chosen and its performance is not according to the requirements set in item 6.1, BUYER may request SELLER to provide the complete solution instead.

3.3. The SELLER shall comply with the requirements of the codes, standards, statutory instruments and regulations of the country of the shipyard / yard.

3.4. The equipment, materials, installation, and testing shall be in accordance with the applicable requirements of the latest edition and supplements of the standards, codes, and recommended practice of the following organizations:

- a. International Organization for Standardization (ISO)
- b. Electronic Industries Association (EIA)
- c. National Electronic Manufacturers Association (NEMA)
- d. Institute of Electrical and Electronics Engineer (IEEE)

- e. American National Standards Institute (ANSI)
- f. International Electrotechnical Commission (IEC)
- g. Local Laws and Regulations

3.5. The implementation of all facilities described in this technical specification shall be completed together with the mobilization of the construction site.

4. MAINTENANCE REQUIREMENTS

- 4.1. All equipment supplied in this scope, for BUYER use, shall be maintained by SELLER;
- 4.2. In complete solution, all data equipment supplied for BUYER use, will be managed remotely by BUYER' NOC. Every maintenance activity shall be informed to BUYER in advance.
- 4.3. SELLER shall provide maintenance and repair services and eventual replacement for the following facilities and equipment, including, but not limited to circuit link, data equipment, personal computers (hardware only), printers, plotters, tablets, TVs, radio and telephone systems.
- 4.4. SELLER shall provide at least 01 (one) IT technician to be responsible to support services listed below:
 - 4.4.1. Software installation in any computer destined to buyer use;
 - 4.4.2. Printer and plotter installation and configuration;
 - 4.4.3. Software support;
 - 4.4.4. Network LAN point Installation or relocation;
 - 4.4.5. Portable radios configuration.
- 4.5. The time to repair shall **be 4 (four) hours for critical devices and 8 (eight) hours for non-critical** devices. These times shall be counted from the failure reporting time.
- 4.6. Defective HD required to be replaced on desktop, high performance and notebook computers, tablets and servers provided by SELLER and approved by BUYER must be given to PETROBRAS to be made unusable in accordance with PETROBRAS' Information Security Policy or even to be destroyed.
- 4.7. At the end of agreement, a technician from PETROBRAS will schedule a date to witness the removal and the physical destruction by SELLER of all HD from every desktop, high performance and notebook computers, and servers data, in accordance with PETROBRAS' Information Security Policy.
- 4.8. If tablets' HD cannot be removed to be destroyed, at the end of agreement, they shall be delivered to PETROBRAS.

5. COMPLETE SOLUTION

5.1. BUYER PRIVATE LINK

- 5.1.1. SELLER shall provide, for BUYER voice and data communication exclusive use, a data private circuit with the following characteristics.



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- a. International Ethernet Private Line – IEPL type - High speed data communication links to connect the BUYER office at shipyard / yard to BUYER corporate network at BUYER head office at Rio de Janeiro, RJ, Brazil.
- b. Bandwidth: 1 Gbps.
- c. The circuit shall have availability equal or greater than 99.8% per month.
- d. The circuit shall present bit error rate (BER) better than 10⁻⁹.
- e. Circuit shall present maximum end-to-end Round Trip Time delay of 350 ms.
- f. Fixed public IP address.

- 5.1.2. SELLER shall be responsible for contracting the circuit provider including all costs regarding to this service during all period of the FPSO construction and integration.
- 5.1.3. The circuit shall be connected to BUYER Router via IP interface
- 5.1.4. SELLER shall provide all hardware and software, optic fiber cables, routers, switches, firewall, among others.
- 5.1.5. When applicable the interconnection among the several buildings or containers in the same optic fiber link shall be connected using a small local switch at each access node and a medium-size switch at the other end;
- 5.1.6. The circuit to be installed shall have capacity to use Quality-Of-Service, where there will be traffic multicast through switches and routers. The link shall allow the use of the protocol 802.1x, besides other future implementations;
- 5.1.7. All costs and billing derived from such implementation shall be borne by SELLER within the Agreement Lump Sum Price.
- 5.1.8. Until the SELLER provides the Private Link described in this specification, it shall be provisionally provided to BUYER staff, 4G/LTE modems with internet access.

5.2. BUYER DATA EQUIPMENT

5.2.1. SWITCHES

- a. SELLER shall provide, install and configure switches CISCO Model C9300-48P or superior by the time of purchasing with 04 (four) SFP interfaces for BUYER exclusive use.
- b. The quantity of switches shall be dimensioned to connect all LAN sockets plus 20% as spare.
- c. SELLER shall provide 04 (four) SFP GLC-SX-MM for each switch;
- d. SELLER shall provide 04 (four) Fiber optic pig tail LC/PC with 3 meters;
- e. SELLER shall provide 300 (three hundred) CAT6 patch cords of 02 (two) meters;
- f. SELLER will be responsible for equipment basic configuration with all parameters provided by BUYER during the detailed design.
- g. SELLER will be responsible to make interconnection between patch panels and switches under BUYER supervision.



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5.2.2. ROUTER

- a. SELLER shall provide, install and configure 01 (one) CISCO ISR4431/K9 or superior by the time of purchasing for BUYER exclusive use, with the specs shown in Table 01.
- b. In case of end of life of the model proposed, SELLER shall submit to BUYER the new model to be approved.
- c. SELLER will be responsible for equipment basic configuration with all parameters provided by BUYER during the detailed design.

Product	Description	Quantity
ISR4431/K9	Cisco ISR 4431 (4GE,3NIM,8G FLASH,4G DRAM, IPB) with UC License	1
SL-44-UC-K9	Unified Communication License for Cisco ISR 4400 Series	1
CAB-E1-PRI	E1- ISDN PRI Cable, 10 Feet	2
MEM-4400-4GU8G	4G to 8G DRAM Upgrade (4G+4G) for Cisco ISR 4400	1
CAB-SS-V35MT	V.35 Cable, DTE Male to Smart Serial, 10 Feet	2
MEM-FLSH-8U16G	8G to 16G eUSB Flash Memory Upgrade for Cisco ISR 4430	1
NIM-2MFT-T1/E1	2 port Multiflex Trunk Voice/Clear-channel Data T1/E1 Module	1
NIM-2T	2-Port Serial WAN Interface card	1
PVDM4-128	128-channel DSP module	1
PWR-4430-AC/2	AC Power Supply (Secondary PS) for Cisco ISR 4430	1
CAB-C13-ACB	AC Power Cord (Brazil), C13, NBR 14136, 2.1M	2
CAB-CONSOLE-RJ45	Console Cable 6ft with RJ45 and DB9F	1
CAB-CONSOLE-USB	Console Cable 6ft with USB Type A and mini-B	1
SISR4400UK9-166	Cisco ISR 4400 Series IOS XE Universal	1
NIM-4E/M	4-Port Network Interface Module - Ear and Mouth	1
GLC-SX-MMD	Cisco GLC-LH-SMD 1000BASE-LX/LH SFP transceiver	2

Table 01: Router Specs

5.2.3. FIREWALL

- a. It shall be provided, installed and configured 02 (two) Next Generation Firewall **FORTINET 80F family** or superior with all permanent VPN and Security Licenses required.
- b. In case of end of life of the model proposed, SELLER shall submit the new model to BUYER for approval.

5.2.4. BUYER SERVER

- a. SELLER shall provide and install 01 (one) SERVER, for BUYER exclusive use, with the following specifications (for each server):

a)	Central Processing Unit (CPU)	2x processors (12) twelve-core from AMD EPYC, Intel Xeon Scalable or better
b)	Memory (Random Access Memory - RAM)	256 GB, installed - DDR4 UDIMM 2666 Mhz or better Expansible until 512 GB or better, all memories modules for 16 GB – DDR4, or better
c)	SAS RAID Controller	Array controller SAS 12 Gb, SATA 6 Gb, capable of implementing RAID 0, 1, 5, 10, or better; 2 (two) SAS 2.5" or SSD 2,5" Hard Disk Drives, Hot-Swap, 10k RPM, 600GB or better
d)	Internal Storage Capability	Useful capability 14 TB – Hard Disk Drives on RAID 5



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|---|---|
| e) Display Adapter | Integrated Graphics Controller – 1024 x 768 minimal resolution |
| f) Operational System | Compatible to Windows Server, Red Hat Enterprise Linux and Vmware ESXi |
| g) Interfaces | 4x USB 3.0, 1x HDMI, 1x SVGA (DB-15 connector), 1x COM Port (RS-232 – DB-9) |
| h) Network Interface | 4x Ethernet (RJ-45), Gigabit Ethernet – 1000 Mbps Remote control interface (iLO Remote) and manufacture software license to complete management |
| i) I/O Expansion Slot | Minimum of 2 (two) PCIe 3.0 or better available with x8 lanes or higher; |
| j) Dimensions | 19" rack-mountable servers, 2U maximum height |
| k) Storage Connection | 10Gb Ethernet network adapter with 4 ports (quad port) over twisted pair. Card for connection between the Automation DMZ and the Storage |
| l) Power supply | 1 (one) AC power supply hot-plug, 110 ~ 220V, 50 ~ 60Hz redundant with 01 (one) DC -48 VDC power supply |
| m) Accessories | Sliding rails and cable management arm (Rear organizer arms)
1 (one) optical drive, capable to read CD-ROM and DVD-ROM; |
| n) The servers shall be certified by Microsoft (HCL), Red Hat and VMware for the following products at delivery time: | |
| i. | Windows Server (operating system compatible with the last two major versions); |
| ii. | Red Hat Enterprise Linux (operating system compatible with the last two major versions); |
| iii. | VMware ESXi (operating system compatible with the last three major versions of ESXi). |

5.3. BUYER LAN NETWORKS

- 5.3.1. SELLER shall provide to BUYER a dedicate Local Area Network (LAN) in accordance with the requirements of ANSI/EIA/TIA 568-B2-1 and ISO 11801 for CAT 6 multimedia (voice and data) communications for BUYER exclusive use.
- 5.3.2. The network shall be designed in a star topology and cover all BUYER Offices.
- 5.3.3. All LAN outlets and cables shall be properly labeled to be distinguished from shipyard / yard network.
- 5.3.4. The LAN Network shall cover the following areas:
 - a. 02 points to each BUYER' working desk in BUYER' offices;
 - b. 01 point in BUYER' office for each printer;
 - c. 04 points in BUYER' meeting room (used as Videoconference Room);
 - d. 01 point for each BUYER access point for WLAN.
- 5.3.5. All individual LAN cables from RJ 45 outlets shall be wired to the patch panels installed in BUYER network rack.
- 5.3.6. BUYER Structured Cabling Network shall be certified and an evidential report shall be submitted to BUYER.

5.4. CLOSED RACKS FOR VOICE AND DATA NETWORK

- 5.4.1. SELLER shall supply and install 01 (one) Rack for BUYER equipment.
- 5.4.2. Rack shall be closed, 19 inches standard, 44U height, minimum depth of 1000 mm (internal dimensions) and 800 mm of useful width (internal dimensions).
- 5.4.3. Rack shall have AC universal standard sockets 19 inches standard and fan;
- 5.4.4. The following equipment shall be installed in this rack:
 - a. Ethernet Switches
 - b. 01 (one) Router
 - c. Circuit MODEM
 - d. Firewalls
 - e. 01 (one) WLAN controller
 - f. UTP path panels
 - g. Optical patch panel
 - h. 01 (one) BUYER server
 - i. UPS
 - j. UPS battery

5.4.5. Proposed drawing for BUYER telecommunication rack:



Figure 01: Proposed drawing for BUYER telecommunication rack



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5.5. BUYER TELEPHONE SYSTEM

- 5.5.1. BUYER telephone system shall be based on IP telephony. SELLER shall provide the following telephone kit for BUYER telephony solution:
- 5.5.2. UNIFY TELEPHONES
 - a. SELLER shall provide 80 (eighty) **CP-200-SIP model telephone sets** manufactured by UNIFY:
 - b. In case of end of life of the model proposed, SELLER shall submit to BUYER the new model to be approved.
- 5.5.3. BUYER will be responsible for these equipment configurations.

5.6. BUYER WIRELESS LAN – WLAN

- 5.6.1. SELLER shall provide, install and configure a Wireless Local Area Network (WLAN) for BUYER exclusive use in the shipyard / yard, standard IEEE 802.11ac wave 2, with coverage in the following areas:
 - a. BUYER offices at the shipyard / yard;
 - b. BUYER meeting room at the shipyard / yard.
- 5.6.2. The WLAN shall be composed of the following equipment and comply with the following requirements:
 - a. **APs (Access Points)**
 - i. APs (Access Points) shall be Cisco Catalyst 9100 Access Points or superior with Cisco DNA Essentials with subscription term for 04 years;
 - ii. APs (Access Points) shall be connected to BUYER switches and powered by PoE (Power over Ethernet) or PoE+;
 - iii. Coverage shall be dimensioned to enable data rates of at minimum 24Mbps at any location inside BUYER' offices.
 - iv. SELLER will be responsible for equipment basic configuration with all parameters provided by BUYER during the detailed design.
 - v. Aps (Access Points) model shall be compatible with Cisco WLAN controller supplied via local registration (lightweight mode).
 - b. **WLAN Controller**
 - i. WLAN Controller shall be C9800-L-C-K9 Series Wireless Controller with Cisco DNA Essentials for up to 50 Cisco access points, and 19" rack mounted kit.
 - ii. SELLER will be responsible for equipment basic configuration with all parameters provided by BUYER during the detailed design.
 - iii. The firmware version required for this equipment to be connected in the BUYER NETWORK will be informed by BUYER during the detailed design.

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5.6.3. In case of end of life of the model proposed, SELLER shall submit the new model to BUYER for approval.

5.7. BUYER VIDEOCONFERENCE SYSTEM (LARGE MEETING ROOM)

5.7.1. SELLER shall supply and install the following equipment in each 20 (twenty) people meeting room, complying with BUYER' videoconference network:

5.7.2. 01 (one) YEALINK MVC860 Room Kit Solution for MICROSOFT TEAMS ROOM or a more recent model, with accessories and licenses in order to allow content sharing;

5.7.3. The kit shall include:

- a. 01 (one) mCore mini-PC (Windows IoT)
- b. 01 (one) UVC86 camera with TV mount kit and wall mount kit
- c. 01 (one) mTouch II touch panel (on the table), including content sharing cable (HDMI adapter)
- d. 01 (one) Yealink remote control
- e. 01 (one) VCM34 microphone (on the table)
- f. 02 (two) mSpeaker II soundbars (below TVs)
- g. 01 (one) 4-port PoE (802.3af) switch – Yealink RCH40 or similar
- h. 01 (one) 5 meters USB 3.0 cable type A male to B male (camera x mCore)
- i. 03 (three) 3 meters pre-made CAT5e cables
- j. 01 (one) UVC86 x switch
- k. 02 (two) Soundbars x switch
- l. 02 (two) 10m pre-made CAT5e cables
- m. 01 (one) mTouch x mCore
- n. 01 (one) VCM34 x switch
- o. 02 (two) 3m HDMI 3.0 cable (TVs x mCore)
- p. 02 (two) 65" OLED TVs wall mounted side by side with HDMI-IN interfaces.

5.7.4. BUYER will be responsible for this equipment configuration.

5.7.5. Following the videoconference room design proposal.



5.8. BUYER VIDEOCONFERENCE SYSTEM (SMALL MEETING ROOM)

- 5.8.1. Additionally, SELLER shall supply and install 04 (four) others videoconference systems in a small meeting room, as follow:
- 5.8.2. 01 (one) YEALINK MVC-S40 Room Kit Solution for MICROSOFT TEAMS ROOM or a more recent model, with accessories and licenses in order to allow content sharing;
- 5.8.3. The kit shall include:
 - a. mCore mini-PC (Windows IoT)
 - b. UVC S40 camera with TV mount kit
 - c. mTouch II touch panel, including content sharing cable (HDMI adapter) and wall mount (to be attached to the cart)
 - d. 1x Yealink remote control
 - e. 1x 5m USB 3.0 cable type A male to B male (camera x mCore)
 - f. 1x 5m pre-made CAT5e cable (mTouch x mCore)
 - g. 1x 3m HDMI 3.0 cable (TV x mCore)
- 5.8.4. BUYER will be responsible for this equipment configuration.

5.9. TELECOMMUNICATION LOCKABLE ROOM

- 5.9.1. SELLER shall provide an exclusive room for installation of BUYER' telecommunication equipment, with the following characteristics:
 - a. Access control;
 - b. A proper air-conditioned;
 - c. Smoke detectors;
 - d. Fire fighting equipment (fire extinguisher) appropriate for electronic equipment;
 - e. Adequate size for installation of all equipment required in this technical specification;
 - f. All Ethernet cables of BUYER LAN network shall be terminated inside this room;
 - g. The fiber optic cable interconnecting the FPSO and BUYER office at the shipyard / yard shall be terminated inside this room.
- 5.9.2. This room shall be located at a reasonable distance from any source of electromagnetic noise, mechanical vibrations and away from any humidity source. The location and final layout of this room shall be approved by BUYER IT & Telecommunication sector.
- 5.9.3. In this room shall be installed the following:
 - a. 01 (one) Rack for BUYER exclusive use;
 - b. UPS;
 - c. Battery bank;
 - d. 220 VAC Switchboard.



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5.10. UPS

5.10.1. CONTRACTOR shall provide and install an UPS 19-inch rack mounted in order to feed the BUYER equipment, with the following specs:

- a. Capacity: 5 KVA
- b. Bank Battery autonomy: 30 minutes at full load.

5.11. SITE CLASSIFICATION

- 5.11.1. In case of Complete Solution to be chosen, all verification points listed on annex 1 shall be attended.
- 5.11.2. A description remark shall be done and also evidence shall be presented for each required item.
- 5.11.3. Based on site classification verification list responses from Annex 1, Petrobras will advise if site is secure to Corporate Network to be activated.
- 5.11.4. In case some are not attended, it shall be formally allowed by PETROBRAS.

6. PARTIAL SOLUTION

6.1. INTERNET ACCESS

- 6.1.1. SELLER shall provide an Internet access with bandwidth of 1 Gbps throughput available for each site for BUYER exclusive use.
- 6.1.2. Each PETROBRAS cabled LAN point shall access internet with a speed of at least 500 Mbps.
- 6.1.3. Until the SELLER provides the Internet Access described in this specification, it shall be provisionally provided to BUYER staff, 4G/LTE modems with internet access.
- 6.1.4. PETROBRAS uses a Virtual Private Network (VPN) to access corporate services in Brazil, whose availability cannot be impacted by local internet access policies.

6.2. BUYER LAN NETWORKS

- 6.2.1. SELLER shall provide to BUYER a dedicate Local Area Network (LAN) in accordance with the requirements of ANSI/EIA/TIA 568-B2-1 and ISO 11801 for CAT 6 multimedia (voice and data) communications for BUYER exclusive use.
- 6.2.2. The network shall be designed in a star topology and cover all BUYER Offices.
- 6.2.3. All LAN outlets and cables shall be properly labeled to be distinguished from shipyard / yard network.
- 6.2.4. The LAN Network shall cover the following areas:
 - a. 01 point to each BUYER' working desk in BUYER' offices;
 - b. 01 point in BUYER' office for each printer;
 - c. 04 points in BUYER' meeting room (used as Videoconference Room);
- 6.2.5. All individual LAN cables from RJ 45 outlets shall be wired to the patch panels installed in BUYER network rack.

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6.3. WIFI AT THE OFFICES

- 6.3.1. BUYER requests that all offices including the working desk and meeting rooms be covered by WiFi signal.
- 6.3.2. Each PETROBRAS WIFI device shall access internet with a speed of at least 72 Mbps at air interface.

6.4. VIDECONFERENCING SYSTEM (LARGE MEETING ROOM)

- 6.4.1. SELLER shall provide and install an MTR – Microsoft Teams Solution in each 20 (twenty) people meeting room with a Microsoft Office 365 account for TEAMS access.
- 6.4.2. The video conferencing equipment must have two TVs connected to the system, one external camera, microphone on the table and a tablet for system control.
- 6.4.3. Following the videoconference layout proposal:



6.5. VIDECONFERENCING SYSTEM (SMALL MEETING ROOM)

- 6.5.1. SELLER shall provide and install an MTR – Microsoft Teams Solution in at least 04 (four) others small meeting rooms with a Microsoft Office 365 account for TEAMS access.
- 6.5.2. The video conferencing equipment must have 01 (one) TV, 01 (one) camera and 01 (one) microphone connected to the system.

7. COMMON INFRASTRUCTURES FOR COMPLETE OR PARTIAL SOLUTION

7.1. IT EQUIPMENT

- 7.1.1. SELLER shall provide the following IT equipment/service for BUYER exclusive use:
- 7.1.2. **Printers**
 - a. Quantity: 07 (seven) printers;
 - b. Medium Multifunction Printer, copier and scanner;
 - c. Color LaserJet/LED Printing technology;
 - d. Standard 500 sheets capacity, at least;

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- e. Paper Feed size A4 (210 x 297 mm) and A3 (297 x 420 mm);
- f. Copy Resolution 600 x 600 dpi;
- g. Automatic two-sided printing (duplex);
- h. Scanning function;
- i. Network interface (LAN): RJ-45, Ethernet standard, TCP/IP V4 compatible (IPv4).
- j. The replacement of paper and laser toner cartridge during the contract will be SELLER responsibility.

7.1.3. Plotter (Printing Service)

- a. SELLER shall provide printing services to print documents with size bigger than paper feed size of the printers specified in item 7.1.2. SELLER shall attend BUYER's request before 2 hours after BUYER communicates the need of the printing service.
- b. The replacement of paper and laser toner cartridge will be SELLER's responsibility.
- c. Printing shall be in black, white and color (CMYK).

7.1.4. Notebook Computer

Quantity: 40 (forty) notebooks with the following requirements and basic characteristics:

- a. Central Processing Unit (CPU): Intel Core i9 released in the last 18 months or better latest generation.
- b. Memory (Random Access Memory - RAM): 32 GB - DDR4 UDIMM 2666 Mhz or better
- c. Screen / Display: 17.0", Full HD (1920 x 1080),
- d. Display Adapter: 2048 MB - Intel HD Graphics 530 - Integrated Graphics Controller
- e. Hard Disk: type SSD – 512 GB or better. 1x SATA 2.5" or 1x M.2 PCIe NVMe to SSD
- f. Operational System: Windows 11 PROFESSIONAL (64 bits) or the latest
- g. Interfaces: Bluetooth, 3x USB 3.0, 1x HDMI, 1x Audio (Line out)
- h. Network Interface: 1x Ethernet (RJ-45), Gigabit Ethernet – 10/100/1000 Mbps, or better, and Wireless 802.11n, 802.11an, 802.11ac
- i. Battery: Li-ion, 4-cell or better
- j. Weight: 2.5 kg or less
- k. Features: Web camera (HD), microphone, speakers, Keyboard (ABNT2 standard)
- l. Accessories: Keyboard (ABNT2 standard) and Mouse – optic
- m. Power: AC – 100 ~ 240V / 50 ~ 60 Hz

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7.1.5. Desktop Computer

Quantity: 20 (twenty) desktops for each workstation, with the following requirements and basic characteristics:

- a. Central Processing Unit (CPU): Intel Core i9 released in the last 18 months or better latest generation.
- b. Memory (Random Access Memory - RAM): 32 GB - DDR4 UDIMM 2666 Mhz or better
- c. Display Adapter: 2048 MB - Intel HD Graphics 530 - Integrated Graphics Controller
- d. Hard Disk: type SSD – 512 GB or better
- e. Operational System: Windows 11 PROFESSIONAL (64 bits) or the latest
- f. Interfaces: 4x USB 3.0, 1x Headphone (Line Out), 1x DC in, 1x HDMI, 1x VGA, 1x COM Port, 1x Audio (Line out)
- g. Network Interface: 1x Ethernet (RJ-45), Gigabit Ethernet – 10/100/1000 Mbps
- h. Accessories: Keyboard (ABNT2 standard) and Mouse – optic
- i. Monitor: LED, size 24in, HDMI interface
- j. Power: AC – 100 ~ 240V / 50 ~ 60 Hz

7.1.6. High performance computer for 3D applications

- a. Quantity:
 - 03 (three) for Topside Engineering Office,
 - 03 (three) for Hull Engineering Office,
 - 02 (two) for Hull Construction Shipyard,
 - 03 (three) for Integration Shipyard and
 - 01 (one) for each Modules Construction Yard.
- b. It is a device with, at least, all following requirements below:
- c. Central Processing Unit (CPU): Intel Core i9 (released in the last 18 months or better latest generation) eight core or better; clock of 2,2 Ghz; cache 8 MB.
- d. Memory (Random Access Memory - RAM): 128 GB - DDR4 UDIMM 2666 MHz or better
- e. Graphics card designed for 3D intensive applications that meets the following requirements:
 - i. 32-bit plus RGBA pixel buffer
 - ii. Hardware OpenGL 2.1 support
 - iii. Hardware Z buffer: 24 bit or higher
 - iv. 256 MB RAM
 - v. 8-bit stencil buffer
 - vi. Hardware Alpha blending support
 - vii. Graphics acceleration set to full

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- viii. Hardware Anti-aliasing support recommended
- ix. Latest available drivers should be installed
- f. Hard Disk: type SSD – 01TB or better
- g. Operational System: Windows 11 PROFESSIONAL (64 bits) or latter
- h. Interfaces: 4x USB 3.0, 1x Headphone (Line Out), 1x DC in, 1x HDMI, 1x VGA, 1x COM Port, 1x Audio (Line out)
- i. Network Interface: 1x Ethernet (RJ-45), Gigabit Ethernet – 10/100/1000 Mbps
- j. Accessories: Keyboard (ABNT2 standard) and Mouse – optic
- k. Monitor: LED, minimum size 24in, HDMI interface
- l. Power: AC – 100 ~ 240V / 50 ~ 60 Hz

7.1.7. **WORKSTATION MONITORS**

Regardless of the user's choice between notebook or desktop, a 24" monitor, mouse and keyboard must be provided for each workstation.

7.1.8. **Tablets (WINDOWS or IOS)**

- a. Quantity: 50 (fifty) tablets for BUYER representatives
- b. Operational System: windows 10 or better
- c. Memory (Random Access Memory - RAM): 16 GB or better
- d. Network Interface Wi-Fi 802.11 a/b/g/n/ac (2.4 GHz + 5 GHz)
- e. Internal Storage: SSD SATA – 128 GB or better
- f. Display Dimensions: At least 8.0"
- g. Screen / Display: 1280x800 pixels (WXGA)
- h. Touch screen, also with gloves / in wet conditions & snow
- i. Central Processing Unit (CPU): Octa-core – 1.66 Ghz clock or better
- j. Interfaces: USB 2.0 or better
- k. Micro SIM card slot
- l. Adapter: AC 100 to 240 V
- m. Connectivity: 4G / LTE and Wi-Fi
- n. Bluetooth® 4.2 incl. BLE (Bluetooth Low Energy)
- o. Camera: 8.0 Megapixels rear and 5.0 Megapixels front
- p. Internal Battery: Li-Ion battery with 4000 mAh,
- q. Accessories: protective casing, screen protector and shoulder strap

7.1.9. **High performance computer for NDT image storage**

- a. Quantity:
 - 01 (one) for Hull Construction Shipyard,

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- 01 (one) for Integration Shipyard and
- 01 (one) for each Modules Construction Yard
- b. It is a device with, at least, all following minimum requirements below:
- c. Central Processing Unit (CPU): Intel® Xeon® CPU E5-2620 v3 @ 2.40GHz x 12
- d. Graphics card GPU: Geforce GTX Titan X 12GB
- e. Memory (Random Access Memory - RAM): 2 TeraBytes
- f. Operational System: Linux Ubuntu 16.04 (or later)
- g. Interfaces: 4x USB 3.0, 1x Headphone (Line Out), 1x DC in, 1x HDMI, 1x VGA, 1x COM Port, 1x Audio (Line out)
- h. Network Interface: 1x Ethernet (RJ-45), Gigabit Ethernet – 10/100/1000 Mbps
- i. Accessories: Keyboard (ABNT2 standard) and Mouse – optic
- j. Monitor: LED, minimum size 24in, HDMI interface, minimum resolution 1280x960 pixels
- k. Power: AC – 100 ~ 240V / 50 ~ 60 Hz

7.2. TV MONITOR

- 7.2.1. For Hull Construction Shipyard and Integration Shipyard:
 - a. SELLER shall provide 05 (five) TV monitors with minimum screen of 65 inches to be installed in places defined by BUYER representative manager to be used as an information panel.
 - b. SELLER shall provide 01 (one) TV monitors with minimum screen of 65 inches to be installed in each Piping Integrated Team lockable room connected to the computer to 3D model navigation.
- 7.2.2. For Topside Engineering Office, Hull Engineering Office and for each Modules Construction Yard, SELLER shall provide 01 (one) TV monitor with minimum screen of 65 inches to be installed in a place defined by BUYER representative manager to be used as an information panel.
- 7.2.3. SELLER will be responsible to supply devices like pen drives or DVD players to reproduce the messages.
- 7.2.4. SELLER will be responsible for all cables and accessories required to install the TV monitors

7.3. IT SOFTWARE

- 7.3.1. SELLER shall provide the following software:
 - a. Windows 11 PROFESSIONAL (64 bits) or the latest for each computer;
 - b. Microsoft Office 365 or the latest for each computer;
 - c. 10 (ten) CAD 2D license;
 - d. 12 (twelve) 3D software license (Autodesk Navisworks Manage);



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- e. 10 (ten) ADOBE Acrobat Professional license;

7.4. SELLER TELEPHONE SYSTEM

- 7.4.1. SELLER shall provide in the BUYER offices at shipyard / yard 01 (one) extension for each working desk from shipyard / yard TELEPHONE SYSTEM.
- 7.4.2. All extensions shall be able to make local and internal calls to every person.
- 7.4.3. 40 (forty) lines shall be able to make intercity (including mobile) calls.
- 7.4.4. 14 (fourteen) lines shall be able to make international calls.
- 7.4.5. The expenditure on the accounts of the cell phones and telephone extensions available in the office shall be supported by SELLER under the LUMP SUM price.

7.5. MOBILE COMMUNICATIONS

- 7.5.1. SELLER shall provide 100 (one hundred) portable transceiver radios with battery for BUYER use, as described below:
 - a. The portable radios shall be approved by BUYER and shall be of the same brand, model and frequency range.
 - b. All radios, batteries and accessories shall be suitable for operation in industrial areas and in marine environment.
 - c. It shall be supplied 01 (one) spare battery for each portable radio.
 - d. It shall be supplied 01 (one) battery charger for each portable radio.
 - e. It shall be provided 01 (one) case for each portable radio.
 - f. SELLER will be responsible for acquire the local licensing requirements.
- 7.5.2. SELLER shall provide the same portable radio in the amount required to communicate with BUYER.
- 7.5.3. SELLER shall provide temporary radio repeaters infrastructure so that the portable transceiver radios can operate in all sunken decks, like in all Engine Room and forecastle decks, during Construction & Assembly and Commissioning phases.

7.6. FPSO CONNECTION

It shall be provided 02 (two) separated and independent circuits to connect the FPSO in the shipyard administrative building.

7.6.1. PETROBRAS CIRCUIT FOR COMMISSIONING ACTIVITIES

- 7.6.1.1 To provide Corporate Petrobras Network onboard FPSO for Commissioning purposes by the beginning of Commissioning phase, SELLER shall provide, for BUYER voice and data communication exclusive use, a data private circuit according to item 5.1.1.
- 7.6.1.2 Additionally, it shall be pulled a fiber optic cable with minimum of 04 (four) fibers from SELLER hired telecommunication infrastructure to FPSO telecommunication room to be connected to BUYER temporarily firewall.



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- 7.6.1.3 In case of SELLER chose the radio link connection in place of fiber optic, it shall be assured the free visibility and a radio link equipment able to at least 5GHz / 1Gbps connection.
- 7.6.1.4 The fiber optic cable at FPSO side shall be terminated in an internal optical distribution patch panel and connected to BUYER router available port.
- 7.6.1.5 Temporary firewall – It Shall be provided a temporary firewall to terminate the circuit inside the FPSO. This firewall shall have the following characteristics:
 - a. 01 (one) Next Generation Firewall **FORTINET 80F family** or superior with all permanent VPN and Security Licenses required.
 - b. In case of end of life of the model proposed, SELLER shall submit the new model to BUYER for approval.

7.6.2. **CIRCUIT FOR WIFI AND CCTV CONNECTION**

- 7.6.2.1. SELLER shall provide a dedicated circuit to connect the FPSO WIFI and CCTV temporary services.
- 7.6.2.2. It shall be pulled a fiber optic cable with minimum of 04 (four) fibers from SELLER shipyard office telecommunication room to FPSO.
- 7.6.2.3. In case of SELLER chose the radio link connection in place of fiber optic, it shall be assured the free visibility and a radio link equipment able to at least 500 Mbps connection.

7.7. **FPSO LEO (LOW EARTH ORBIT) SATELLITE SOLUTION**

- 7.7.1. SELLER shall provide, install and contract a LEO (Low Earth Orbit) Satellite service provider to FPSO during the commissioning phase in the shipyard integration.
- 7.7.2. The service shall guarantee at least a data packet of 5T per month.
- 7.7.3. The internet circuit shall be connected in the temporary firewall.

7.8. **FPSO WIFI COVERAGE**

- 7.8.1. SELLER shall provide WIFI coverage on the FPSO (Hull and Integration shipyard) on main deck, topside modules, accommodation and engine room, according to necessity of progress of construction, for data and voice purposes.
- 7.8.2. Such coverage shall be done as soon as there is any inspection work to be done by BUYER, on FPSO areas, who will previously inform SELLER to provide the coverage.
- 7.8.3. The coverage shall be done by means of SELLER Wi-Fi network.
- 7.8.4. To guarantee the SELLER Wi-Fi coverage on the FPSO it shall be installed temporary access points covering the required areas to be connected to SELLER Wi-Fi network.
- 7.8.5. Each PETROBRAS WIFI device shall access internet with a speed of at least 72 Mbps at air interface.



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7.9. FPSO PUBLIC CELL PHONE SERVICE COVERAGE

- 7.9.1. SELLER shall guarantee the coverage of the Public Cell Phone Service on the FPSO (Hull and Integration shipyard) on main deck, topside modules, accommodation and engine room, according to necessity of progress of construction, for data and voice purposes.
- 7.9.2. Such coverage shall be done as soon as there is any inspection work to be done by BUYER, on FPSO areas, who will previously inform SELLER to provide the coverage.
- 7.9.3. To guarantee the coverage of the Public Cell Phone Service, SELLER must install on the FPSO temporary Cell Phone Antenna Booster and repeaters.

7.10. FPSO CCTV MONITORING SERVICE

- 7.10.1. SELLER shall provide a FPSO CCTV monitoring service to monitoring the main areas at FPSO.
- 7.10.2. It shall be installed cameras in the FPSO according to progress construction, covering, but not limited, the following areas:

7.10.3. Hull

- a. Fire pumps room
- b. Emergency and auxiliary generators room
- c. Normal and Essential panels room
- d. Engine room
- e. Accommodation access
- f. CCR
- g. FPSO stairs access
- h. Forecastle

7.10.4. Topside Modules

- a. 12 (twelve) cameras to be located as BUYER definition during the Integration phase.
- 7.10.5. The cameras shall be monitored by a trained team 24 (twenty-four) hours per day and 07 (seven) days per week and all suspicious activities shall be reported to SELLER and BUYER representative manager.
- 7.10.6. All cameras shall be recorded and the content storage for at least 30 (thirty) days.
- 7.10.7. BUYER may request the images at any time.
- 7.10.8. It shall be provided the BUYER a Web access to view the online images from the cameras through a login and password.

7.11. TECHNICAL SUPPORT AND AUGMENTED INSPECTION

7.11.1. Drone support

- a. When necessary, to support some inspections, BUYER can request to SELLER to provide a DRONE support.



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- b. This service will be requested to reduce time and increase safety in specific inspections.
- c. The inspection results shall be delivered to BUYER in digital media with all images and videos recorded during the inspection, since take-off until landing, or just certain parts highlighted by BUYER representative.
- d. The images and videos shall be delivered to BUYER in *.mp4 extension file and shall have at least FULL HD resolution (1080p).

7.11.2. The 360° pictures

- a. The 360° pictures shall have at least 4K resolution.

7.11.3. Smart Glasses

- a. SELLER shall provide software license that interfaces with the Smart Glass and make 10 licenses available to the BUYER.
- b. Software should allow the remote specialist to be able to control the smart glasses camera, zooming, taking photos, starting recordings etc.
- c. The Smart Glasses shall be safe to use in the field, that does not compromise the worker`s movement, does not compromise the field of sight and not impair the worker`s hearing capabilities. Additionally, the Smart Glasses shall be lightweight and hands-free, both from a carrying perspective and from a command input/output perspective.
- d. Smart glass shall have its camera with minimum of 12 MP.

8. ANNEX 1: CLASSIFICATION SITE VERIFICATION LIST

8.1. For each item listed to be checked and submitted to PETROBRAS, it shall be presented the following remarks:

- 8.1.1. Situation: it shall be clarified if the item is fully attended; partially attended; not attended; not applicable
- 8.1.2. Description: it shall be clarified any observations regarding how the item was implemented or how it is expected to be implemented and the deadline.
- 8.1.3. Evidence: it shall be listed the document number or minutes of meeting report attesting the item implementation.

8.2. Follow the verification list to be applied:

8.2.1. Grouping: A.1 - Physical Security

1. There must be some means of controlling physical access to the location or building where PETROBRAS users will be.
2. All persons must use a visible form of identification compatible with PETROBRAS' requirements (badge), allowing to distinguish employees, contractors and visitors.
3. The identification and arrival and departure times of visitors and the department to which they will go (destination) must be recorded.
4. Closed-circuit TV must monitor access to the location(s) and records must be kept for at least fifteen days.
5. There must be surveillance during operation.
6. Security perimeters (walls, gates, doors with access control or receptionists) must be clearly defined (containment around physical property or workplace).
7. Access to IT equipment rooms must be restricted and controlled and all connectivity equipment must be contained in this environment.
8. There must be a specific rack for telecommunications equipment, with a key.
9. The custody of the key of restricted areas, equipment rooms and safes that contain backup media must be in the possession of the person in charge PETROBRAS.
10. Equipment such as workstations, printers, copiers and fax machines must be located in restricted areas to prevent unauthorized access.
11. If there is a third-party local network, it must be isolated from the PETROBRAS network.
12. Access to electrical or optical patch panels must be controlled and restricted to authorized IT personnel.



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- 13. Voice and data network cabling must be protected from interception or damage.
- 14. The cabling passage must be properly separated from those of third parties, in ducts, general cabling boxes and/or small paths ducts.
- 15. The arrival of external cabling to the building must be protected and difficult to intercept.

8.2.2. Grouping: A.2 - Service Management

- 16. It is desirable for at least one PETROBRAS employee to remain during the work shift. If this is not possible, audits and routine visits must be carried out by a PETROBRAS employee within a maximum interval of 2 (two) weeks.
- 17. Managers must ensure that PETROBRAS' information security procedures are applied in their areas of responsibility.

8.2.3. Grouping: A.3 - Media Handling

- 18. Documents and media, when discarded, must be disposed of in a paper shredder, following the guidelines of the Standard Directive for the Identification of the Degree of Secrecy and the Treatment of Corporate Information.

8.2.4. Grouping: A.4 - Safety, Use and Maintenance of Equipment

- 19. Only people authorized by PETROBRAS should carry out repairs and services on the equipment.
- 20. Workstations, servers, switches and routers must be restricted to services provided to PETROBRAS.
- 21. The microcomputers must be in the PETROBRAS configuration standard, using the standard image provided by the company.
- 22. Equipment switches or routers must be used exclusively by PETROBRAS.
- 23. PBX extensions must be password controlled.
- 24. The microcomputers must be exclusively used by PETROBRAS.
- 25. Only equipment managed by PETROBRAS must have contact with PETROBRAS Corporate Network.