PETROBRAS	TECHNICAL SPECIFICATION	Nº: I-ET-3010.00-5514-76A-PPT-001	
	CLIENT: SRGE		SHEET: 1 of 27
	JOB: CLOSED-CIRCUIT (CCTV)		
	AREA: -		
TIC	TITLE: HULL CCTV SYSTEM		INTERNAL
			OI/CS

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1. SUBJECT

1.1 This technical specification describes the minimum requirements and basic characteristics for the supply of the Closed-Circuit Television System (CCTV), to be installed in PETROBRAS FPSO unit, covering: all equipment, materials, software, interconnection, documentation, configuration, tests and installation. These systems will be referred to along this specification as CCTV.

2. ABBREVIATIONS

ABNT	Associação Brasileira de Normas Técnicas (Brazilian Association of Technical Standards)
ANSI	American National Standards Institute
CCR	Central Control Room
CCTV	Closed Circuit TV
CPU	Central Processing Unit
DIO	Distribuidor Interno Óptico (Optical Distribution Drawer)
DVI	Digital Visual interface
EIA	Electronic Industries Alliance
EPTA-M	Estação Prestadora de Serviços de Telecomunicações e de Tráfego Aéreo, categoria-M (Telecommunications and Air Traffic Service Provider Station, category-M)
FTP	Foil Shielding Twisted Pair
HD	High Definition
HDMI	High-Definition Multimedia Interface
IEC	International Electrotechnical Commission
INMETRO	Instituto Nacional de Metrologia (National Institute of Metrology)
IP	Internet Protocol
IR	Infra-Red
LAN	Local Area Network
LED	Light-Emitting Diode
LSZH	Low Smoke Zero Halogen
NVR	Network Video Recorder
ONVIF	Open Network Video Interface Forum
PTZ	Pan Tilt Zoom
PoE	Power over Ethernet
TIA	Telecommunications Industry Association
UPS	Uninterruptible Power Supply
UV	Ultraviolet
VHF	Very High Frequency
VLAN	Virtual Local Area Network
VMS	Video Management Software
WAN	Wide Area Network
WDR	Wide Dynamic Range

3. REFERENCE DOCUMENTS, CODES AND STANDARDS

3.1 The detailed design shall be made, at least, in accordance with requirements of those International and National Standards listed below:

a. ABNT NBR 5410: Instalações Elétricas de Baixa Tensão.

b. ANSI/TIA-606-C: Administration Standard for Telecommunications Infrastructure.

c. ANSI /TIA-607-C: Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.

d. ANSI/TIA-568.0-D: Generic Telecommunications Cabling for Customer Premises.

e. ANSI/TIA-568.C-2: Balanced Twisted-Pair Telecommunications Cabling an Components.

f. ANSI/TIA-568.3-D: Optical Fiber Cabling Components.

g. IEC 61892 – Mobile and fixed offshore units – Electrical installations – All Parts.

h. IEC 60079 – Explosive Atmospheres – All Parts.

i. IEC 60092 – Electrical installations in ships – All Parts.

j. IEC 60228 – Conductors of insulated cables.

k. IEC 60331 – Fire-resisting characteristics of electric cables (and its updates).

l. IEC 60332 – Flame-retardant characteristics of electric cable (and its updates).

m. IEC 62444 – Cable glands for electrical installations.

n. IEC 60529 – Degrees of protection provided by enclosures (IP Code) – All Parts.

o. INMETRO/Portaria n° 115, March 21st 2022 and its annexes.

p. NR-10 – Segurança em Instalações e Serviços em Eletricidade.

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

r. NORMAM-27/DPC, latest revision (concerning helideck camera),

3.2 It shall be followed all others NR's – Normas Regulamentadoras (Regulatory Standards) from Ministério da Economia (Brazilian Ministry of Labor) applicable to this Technical Specification.

3.3 Electrical installations, equipment and materials shall comply with the requirements of IEC 60079, IEC 61892-1, IEC 61892-7 and Classification Society.

3.4 All equipment, installations and materials shall be of type approved and certified by international recognized laboratory and shall be in accordance with INMETRO Portaria n° 115, March 21st 2022 and its annexes.

3.5 Thermal cameras shall comply with the ordinance: Ministério da Defesa / Portaria nº 56 – COLOG, Jun 5th 2017, or any other updated one. Additionally, CONTRACTOR shall provide and submit all required forms filled in order to comply with Brazilian Army.

3.6 Classification Society

3.6.1. The detailed design shall be submitted to approval by Classification Society. The design and installation shall be in according with their requirements and comments.

4. GENERAL REQUIREMENTS

4.1 CONTRACTOR shall provide all the materials to install all equipment, accessories, cables and infrastructure that compose the CCTV system.

4.2 For PETROBRAS detailed design requirements, installation, configuration, tests training and commissioning CONTRACTOR shall comply with the Memorial Description I-MD-3010.00-5510-760-PPT-001 GENERAL CRITERIA FOR TELECOMMUNICATIONS DESIGN.

4.3 For documentations symbols, the Detailed Design shall comply with the Technical Specification: I-ET-3000.00-0000-940-P4X-002 – SYMBOLS FOR PRODUCTION UNITS DESIGN.

4.4 For equipment TAGs, the Detailed Design shall comply with the Technical Specification: I-ET-3000.00-1200-940-P4X-001 – TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.

4.5 All electrical requirements for telecom package shall be in accordance with I-ET-3010.00-5140-700-P4X-003 – ELETRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE, I-ET-3010.00-5140-700-P4X-001 - SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS, I-DE-3010.00-5140-700-P4X-003 - GROUNDING INSTALLATION TYPICAL DETAILS and I-ET-3010.00-5140-700-P4X-005 - REQUIREMENTS FOR HUMAN ENGINEERING DESIGN FOR ELECTRICAL SYSTEMS OF OFFSHORE UNITS.

4.6 Details of the EPTA-M system can be found in the Technical Specification I-ET-3010.00-5515-762-PPT-001- AERONAUTICAL COMMUNICATION SYSTEM.

4.7 For the telecommunication data equipment specification, the Detailed Design shall comply with the Technical Specification: I-ET-3010.00-5517-768-PPT-001– HULL DATA NETWORK.

4.8 For the cabling network used in the CCTV system, the Detailed Design shall comply with the Technical Specification: I-ET-3010.00-5517-768-PPT-002- HULL STRUCTURED CABLING NETWORK.

4.9 The Detailed Design shall comply with the CCTV one line diagram.

4.10 For the cameras positioning of the CCTV system, the Detailed Design shall comply with the CCTV arrangement all over the FPSO.

4.11 Equipment and accessories shall attend the ingress protection degree, protection type, classifications zone and groups established by IEC / ABNT.

4.12 CONTRACTOR shall supply all equipment, cables, accessories approved and certificated by Classifying Society and technical conformity with the International and National standardization organism: ABNT, IEC and INMETRO.

4.13 Equipment and accessories installed in industrial areas (outdoor or indoor) shall be suitably rugged and its external bodies shall be made in non-metallic material, suitable for harsh environments. The brackets, bolts, nuts, washers and any other fixing elements shall be made in stainless steel.

4.14 Equipment and materials shall be supplied in package suitable for long periods of storage and be protected against mechanical impact and adverse weather conditions.

4.15 Equipment and materials shall be supplied and installed with all threads, hinges, bolts, cover plugs, cable glands and flanges lubricated with anti-seize (loctite) or similar grease.

4.16 Equipment and materials shall be supplied with cable passage holes sealed with plastic plugs in the holes to be used and definitive plugs (made of the same material as equipment and accessories) in the reserve holes.

4.17 The equipment and accessories with external bodies made in aluminum alloy, in prior are prohibited. In case of difficulty for supplying some device with external body made with non-metallic materials, it will be necessary to submit any others available models for analysis of PETROBRAS.

4.18 It shall be avoided equipment and accessories with their external bodies built in aluminum alloy. Anything different shall be submitted to PETROBRAS approval. In case of approval, this alloy shall not contain in its composition more than 0.25% of copper and shall comply with the ASTM-B-179 standard (ANSI alloy 356.1).

4.19 In outdoor areas, exposed to marine atmosphere, CONTRACTOR shall beware to mitigate the galvanic corrosion of junction boxes supports, cameras supports and bolts. Galvanic insulation shall be implemented where contact between different metallic materials is necessary.

4.20 Electrical equipment installed in external (open) safe areas, foreseen to operating during emergency shutdown ESD-3 shall be certified for installation in hazardous areas Zone 2 Group IIA temperature T3, according to IEC 61892-1.

4.21 All external cameras shall be explosion proof, according with 6.4, even in places where there are no hazardous areas. This is because during an ESD-3 event they must remain operating. Then, they must be powered by uninterrupted electrical source.

4.22 Equipment shall have casing grounded. Grounding by simply supporting the casing on the steel structure of the FPSO shall not be deemed adequate.

4.23 Equipment, cables, boxes, materials and accessories for installation in the industrial areas (outdoor or indoor) of unit shall be specified and assembled taking into account the adverse operating conditions on FPSO such as:

a. Atmosphere with high content of humidity, salts hydrocarbons and other corrosive factors;

b. Environment subject to the presence of explosive gases shall be in accordance with Hazardous area classification;

c. Exposure to weather conditions (sun and rain) and maritime atmosphere;

d. Air temperature: From -10ºC up to +50ºC;

e. Air Humidity: 95%.

4.24 The junction boxes and cameras shall have the cable glands installed facing lateral sides and/or bottom side. Cable glands installed facing upward are not acceptable. It´s also not acceptable any opening facing the upward of the box, even if it is closed by cover plug.

4.25 In order to avoid humidity and water ingress inside the junction boxes, CONTRACTOR shall apply appropriate material in the screw thread, bolts, cable glands, cover plugs and joints, according to IEC 60079 and IEC 60529.

4.26 CONTRACTOR shall ensure by inspection of a qualified personnel that all equipment installations are according to the IEC/ABNT standards requested in this technical specification.

4.27 CONTRACTOR shall assure that all fixed external camera supports for fixing it, shall have azimuthal adjustable facilities, as illustrated in figure 1:

Figure 1: Example of support with azimuthal adjust.

5. SYSTEM DEFINITIONS

5.1 The CCTV IP system shall be provided, installed and configured, including all equipment, software, licenses and accessories.

5.2 The CCTV system shall be designed to provide the operator with visual subsides that allow him to take on-distance decisions, or further allow the monitoring of hazardous places or a difficult access, thus avoiding or mitigating his physical presence, besides allowing a safe continuity of the process, even at night.

5.3 All materials and equipment, including accessories and installation items shall be appropriated for its operation on offshore environment and in case of external installation appropriated IP grade protection and Ex protection shall be applied.

5.4 The system servers shall be installed in a dedicated CCTV System Rack, installed in the telecommunication lower room. Redundant servers shall be installed in the telecommunication upper room.

5.5 The CCTV Rack System and any required junction boxes shall be powered by the FPSO electrical system power supply from an Uninterruptible Power Supply (UPS). Any PoE cameras shall be powered by switches, and they shall be powered by essential and (-)48VDC power systems.

5.6 Thermal cameras, PTZ cameras without domes and CCTV desktop computers shall be powered by UPS panel by means of AC switchboard (one circuit breaker for each equipment) previously connected to a panel ATS device, which shall be connected to UPS bus A and UPS bus B as indicated represented in Hull Telecommunications Energy System.

5.7 CCTV system shall perform the functions available on the Genetec Security System, such as:

5.7.1. Plant overview, on the monitors installed in CCR located in accommodation module, which is part of the Hull project design, allowing remote area selection and remote commands from the CCTV operation stations.

5.7.2. Remote pan, tilt, zoom setting through CCTV desktop computers for all cameras equipped with these features.

5.7.3. CCTV desktop computer to be used by Radio Operator to access audio and video records shall be on the radio operator table.

5.7.4. Camera selection and positioning in preset positions (pre-positioning or further “preset functions”).

5.7.5. Single or multiple image display selection.

5.7.6. Digital video recording facilities.

5.8 Figure 2 presents a basic architecture of the system.

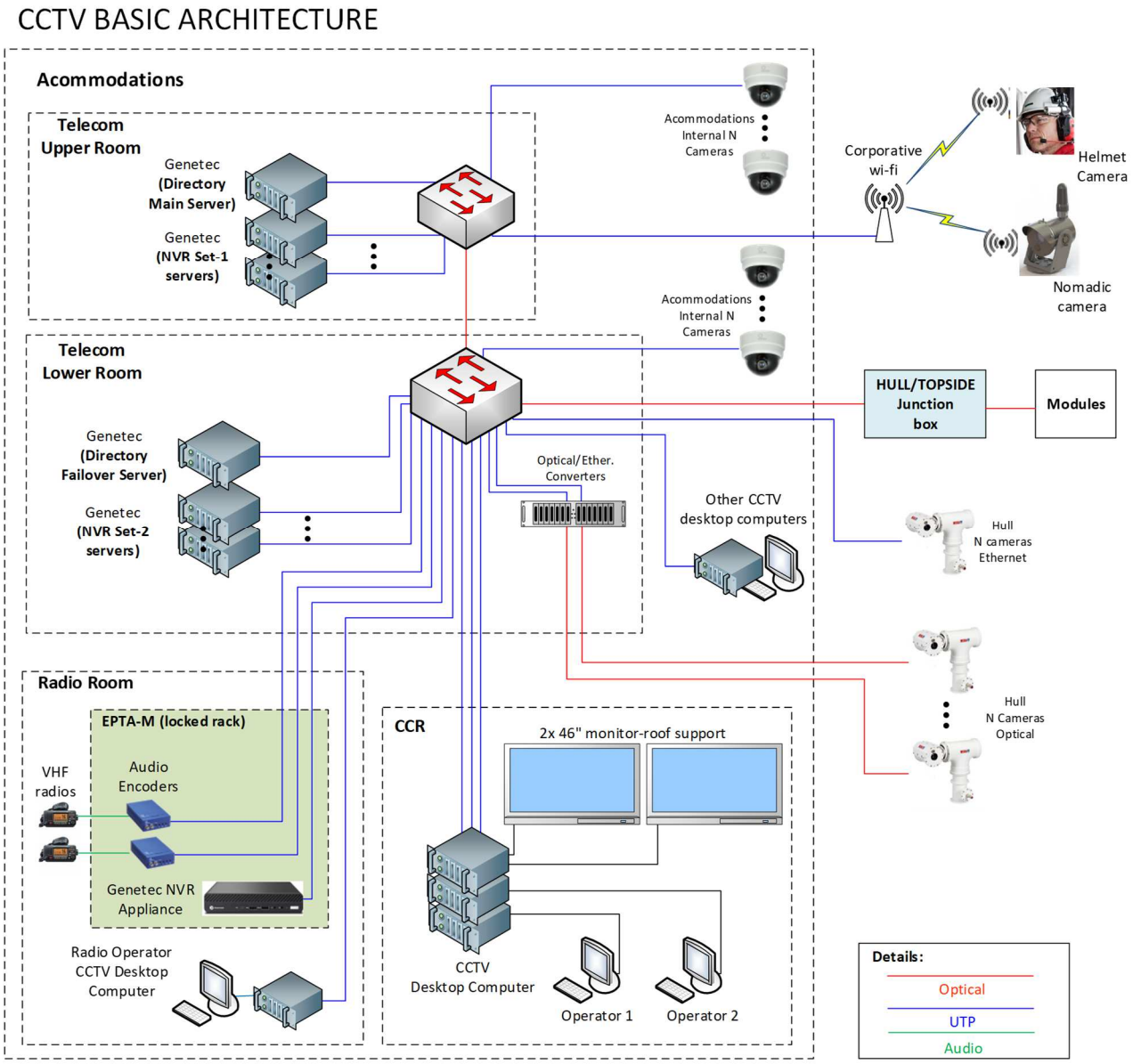

Figure 2 – HULL CCTV basic architecture. This is an illustrative drawing whose quantities and devices can vary.

6. TECHNICAL REQUIREMENTS

6.1 VMS (Video Management Software)

6.1.1. It shall be based on Genetec VMS (Security Center) so all equipment used to compose the solution (cameras, recorders, all necessary licenses and others) shall be fully compatible with the VMS and recognized by Genetec support and maintenance. Genetec SDL (Supported Device List) will be utilized to check the offered products. It will not be accepted cameras, or other devices, that are not listed on Genetec Supported Device List.

6.1.2. The Genetec Security Center VMS shall be an Enterprise type system ID, and all necessary licenses shall be provided by CONTRACTOR to perform the functions of system management, integration with the AD (Active Directory) of PETROBRAS, and other licenses that are necessary to connect users for each

visualization desktop computer, view and record the images of the FPSO´s cameras.

6.1.3. The system shall contain 1 (one) Federation license, to integrate the vessel system ID with PETROBRAS onshore system ID.

6.1.4. The system shall have licenses for a capacity of at least 25 (twenty-five) simultaneous user connections.

6.1.5. The management function of Genetec VMS (Directory) shall be provided in a redundancy configuration, so that in the event of a failure of it, another unit can assume the role of this unit, avoiding the CCTV system becomes inoperative. The system management role shall run on a separate server from the NVR (Archiver) role.

6.1.6. CONTRACTOR shall contact PETROBRAS before the licenses acquisition to check the version of Genetec system that is current been used for fully integration with corporate CCTV onshore existent system.

6.2 NVR (Network Video Recorder) Server (Genetec Archiver)

6.2.1. NVR shall be compatible with the respective VMS software in their native protocol.

6.2.2. NVR shall not be a proprietary appliance hardware; it shall be a software type application installed on a Microsoft Windows dedicated server for recording and playing back video. Server shall be equipped in accordance with the VMS vendor System Requirements.

6.2.3. It shall be provided 02 (two) sets of NVR, recording simultaneously all the cameras so, in the event of failure of one set, all the recorded images will be available in the other set and it will keep recording all the images normally, and this will allow enough time to the tech team reestablish the failed unit.

6.2.4. Each set of NVR can be composed by one or more servers, depending on the disks arrangement (disks size, server slots capacity and redundancy) and also considering the Genetec “System Requirements” documentation, for limitation on the number of cameras per server and other server requirements, such as memory, network interface, etc.

6.2.5. One set of NVR equipment shall be installed in the telecommunication lower room, inside CCTV cabinet, and the other NVR set in telecommunication upper room.

6.2.6. NVR disks shall be hot swappable and disk removal shall be easy to perform under emergencies situations.

6.2.7. Each NVR server shall contain 02 (two) types of disks, the “System Disks”: for operational system and Genetec software installation and the other for “Recording Disks”: for cameras images recording.

6.2.7.1. Each NVR server shall contain 2 system disks, in RAID-1 configuration, with at least 300GB size each disk.

6.2.7.2. Each NVR server shall have the recording disks type and they shall have at least RAID-5 configuration (one disk failure resilience) and the disks shall be at least 8TB size each disk.

6.2.8. It shall be included management card for out of band management (ILO, IDRAC, like) and all necessary licenses to operate without restrictions.

6.2.9. All camera´s images shall be recording 24 (twenty-four) hours of continuous streaming per camera per day for a period of 30 (thirty) days without overwriting previous information.

6.2.10. All camera´s images shall be recording at maximum camera resolution at 10 frames per second.

6.2.11. The total amount of useful storage shall be at least of 300 Gbytes per camera, in each NVR set.

6.2.12. To the total amount of useful storage shall be added an amount of 20% for future expansion of the system.

6.2.13. CONTRATACTOR shall present the calculation for each NVR set, in accordance with the following table:

No. of cameras	Space occupied per camera per 30 days	Total Usable Storage necessary, per set (TBytes)	Total Usable Storage necessary, per set, plus 20% for future growth (TBytes)
"n", as per one line diagram *(CONTRACTOR to inform)*	300GB (at least)	"n" x 300 *(CONTRACTOR to calculate)*	"n" x 300 x 1,2 *(CONTRACTOR to calculate)*
Size of each Recording Disk (TBytes) (Minimum 8TB)	Number of Recording Disks per server, including RAID-5 redundancy disk	Total Raw Storage of Recording Disks, per server (TBytes)	Total Usable Storage of Recording Disks, per Server (TBytes)
(CONTRACTOR to inform)	*(CONTRACTOR to calculate)*	*(CONTRACTOR to calculate)*	*(CONTRACTOR to calculate)*
Total number of NVR servers, per set	Total Usable Storage, per set	-	-
(CONTRACTOR to calculate)	*(CONTRACTOR to calculate)*	-	-

Table 1 – NVR Servers Calculation.

6.3 Server (Genetec Directory):

a. Server equipment shall be installed in the Telecommunication Lower Room inside CTV cabinet and a redundant one in Telecommunication Upper Room inside server cabinet.

b. Servers with CPU and memory capacity in accordance with VMS System requirements, considering the number of cameras been managed and recorded.

c. It shall be included management card for out of band management (ILO, IDRAC, like) and all necessary licenses to operate without restrictions.

d. An exclusive disk unit with 300GB for operational system and VMS installation, with RAID-1 redundancy.

6.4 CAMERAS

6.4.1. General Characteristics

a. They all shall be IP cameras.

b. All cameras shall be fully compatible with the VMS Security Center of Genetec and recognized by their support and maintenance. Genetec SDL (Supported Device List) will be utilized to check the offered products. It will not be accepted cameras, or other devices, that are not listed on Genetec Supported Device List.

c. They shall be compatible with the VMS software through ONVIF Profile S protocol.

d. H.264 or H.265 codification.

e. WDR, white compensation and automatic IR cut filter for day & night operation.

f. Lenses with autofocus and auto iris.

g. They shall allow two configure independent streams profiles (a mainstream profile for Live and Recording view, and a sub stream profile for Remote view, both in the native camera manufacture protocol and via ONVIF Profile S protocol.

h. IP Address Filter function or password protection for Web viewing and configuration.

6.4.2. **Fixed IP Camera with Dome**

a. Full HD resolution (minimum), @30 fps.

b. Suitable for indoor use.

c. PoE powered.

d. Minimum horizontal viewing angle ≥ 90°

e. Infrared LED with minimum range of 10m.

6.4.3. **Fixed Multisensor IP Camera with Dome (360º field of view)**

a. Composed with 4 multidirectional sensors, providing separated images streams, with the set allowing a horizontal viewing angle of 360º coverage.

b. Each sensor shall allow an independent physical positioning.

c. Each sensor shall have full HD resolution (minimum), @30 fps.

d. Suitable for indoor use.

f. PoE powered.

g. Infrared LED with minimum range of 10m.

6.4.4. **Explosion-Proof PTZ IP Camera**

a. Certified for hazardous areas, Zone-1, Ex-d, IIB, T4 and in accordance with INMETRO 115/2022.

b. Full HD resolution (minimum), @30 fps.

c. Input Power: 220 VAC.

d. Varifocal lens with minimum zoom range of 18x.

e. Operating temperature -10°C to + 50°C.

f. Minimum protection: IP 66.

g. Pan - Tilt: 360° and ± 90° or equivalent.

h. Presets: minimum 32.

6.4.5. **Explosion-Proof Fixed IP Camera**

a. Certified for hazardous areas, Zone-1, Ex-d, IIB, T4 and in accordance with INMETRO 115/2022.

b. Additionally, as per CCTV one line diagram, for Battery Room, camera specification shall attend hazardous areas, Zone-1, Ex-d, IIB+H2, T4 and in accordance with INMETRO 115/2022.

c. PoE powered.

d. Varifocal lens.

e. Minimum horizontal viewing angle ≥ 90° for IIB gas category cameras and ≥ 60° for IIB+H2 gas category cameras (Battery Room).

f. Operating temperature -10°C to + 50°C.

g. Minimum protection; IP 66.

6.4.6. **Explosion-Proof Fixed Panoramic IP Camera with Dome (180º field of view)**

a. Certified for hazardous areas, Zone-1, Ex-d, IIB, T4 and in accordance with INMETRO 115/2022.

b. Additionally, as per CCTV one line diagram, for Battery Room, camera specification shall attend hazardous areas, Zone-1, Ex-d, IIB+H2, T4 and in accordance with INMETRO 115/2022.

c. Multisensor camera, with 4 sensors, composing a unique panoramic video stream image, allowing a horizontal viewing angle of 180º coverage (minimum).

d. Minimum vertical viewing angle ≥ 90°, per sensor.

e. 7,3 Mpixel resolution (minimum), @30 fps, for the composed image.

f. PoE powered.

6.4.7. **Explosion-Proof Fixed Thermal IP Camera**

a. Certified for hazardous areas, Zone-1, Ex-d, IIB, T4 and in accordance with INMETRO 115/2022.

b. Thermal image resolution of 640x480 (minimum).

c. PoE powered.

d. It will be accepted the connection only with the Onvif protocol.

e. Minimum vertical viewing angle ≥ 56°.

f. Operating temperature -10°C to + 50°C.

g. Minimum protection: IP 66.

6.4.8. **Explosion-Proof Dual Vision Thermal PTZ IP Camera**

a. Certified for hazardous areas, Zone-1, Ex-d, IIB, T4 and in accordance with INMETRO 115/2022.

b. Dual camera station: optical and thermal imagers (02 two cameras).

c. Optical image Resolution: D1 (minimum).

d. Thermal image Resolution 640x480 (minimum).

e. Varifocal lens with minimum zoom range of 16x or superior. Thermal Horizontal Field of View 25° or superior.

f. Pan – Tilt: 360 ° and ± 90 ° or equivalent.

g. Presets: minimum 32.

h. Operating temperature -10°C to + 50°C.

i. Minimum protection: IP 66.

h. Input Power: 220 VAC.

i. Equipped with wiper and connection for Water Pump Assembly.

6.4.9. **Explosion-Proof Fixed Wi-Fi Nomadic IP Camera**

a. Certified for hazardous areas, Zone-1, Ex-d, IIB, T4 and in accordance with INMETRO 115/2022.

b. Wi-fi frequency of 5Ghz or 2.4 Ghz.

c. It can be assembled in only a module or in several modules, for example, a camera, a wi-fi / Ethernet adapter and a junction box with an outlet for the power supply. In the last case, a support for assembly all the modules together shall be provided. This support shall be able to be fixed in a tubular support of 1”. All the components shall be explosion-proof. The final assembly shall be approved by PETROBRAS during the executive project phase.

d. Manual adjustment of Pan, tilt.

e. The AC explosion-proof outlet shall be the same type used in the modules.

f. Input Power: 220V AC, certificate for hazardous area outlet.

g. Varifocal lens with minimum zoom range of 15x optical.

h. Operating temperature -10°C to + 50°C.

i. Minimum protection IP 66.

6.5 Camera Dome Cleaner

a. Indoor/outdoor camera lens cleaner.

b. It shall clean the lens of dome cameras, as well as flat lenses cameras.

c. It shall be constructed as a no longer than two meters carbon fiber or aluminum extension pole that extends to 08 (eight) meters.

d. At the end of the pole, a head shall be assembled, and it shall be covered with a soft microfiber mitt that involve the camera dome and clean it.

e. The head of the pole must be made up of reinforced fins, so that they exert a force to the center, so that there is a pressure of the microfiber mitt on a dome of a camera.

f. The microfiber mitt shall be removable, allowing washing it.

g. It shall be delivered with 03 (three) microfiber mitts and two bottle of lens cleaning solution.

6.6 EPTA-M Video/Audio Encoder:

a. Video Input Connector BNC type.

b. NTSC composite video format.

c. Minimal resolution 4SIF (704 x 576) or VGA (640x480) @ 30 FPS.

d. H.264 codification.

e. At least two simultaneous resolutions with guaranteed 25 fps frame rate.

f. ONVIF Profile S compatible.

g. They shall allow two configurable independent streams profiles (a mainstream profile for live and recorded view, and a sub stream profile for remote view) in the native camera manufacture protocol and via ONVIF Profile S protocol.

h. Audio line input to encode the audio from the EPTA-M VHF radios.

i. Audio nominal voltage 1Vp-p.

j. Audio resolution Full Duplex 16 Bit, 16kHz sample rate Mono Input, Mono Output.

k. Audio bit rate user-configurable bit rates from 32Kbps to 64Kbps per channel.

l. PoE powered.

6.7 EPTA-M NVR

a. The NVR shall be an Genetec SV-300E-4Tbytes (or better).

b. The NVR shall be accommodated inside de EPTA-M rack.

c. This NVR shall record helideck camera image and EPTA-M VHF radios audios for 90 days, recording continuously, 24 hours a day, 7 days a week.

6.8 Explosion-Proof Camera Junction Box

a. Certified for hazardous areas, Zone-1, Ex-d, IIB and in accordance with INMETRO 115/2022.

b. The interconnection between the Telecommunication room and the junction box shall be done by means of cables containing power supply wires and fiber optic or Ethernet twisted pairs cables.

c. If CONTRACTOR has a camera solution in compliance with all the specifications without the need of a junction box, it shall be submitted to PETROBRAS approval before installation.

d. The junction box shall be suitable for explosive atmosphere use in offshore environment.

e. Material: 316 stainless steel.

f. The cover shall be fixed with 316 stainless steel screws.

g. Electrostatic powder coating in polyester.

h. The Junction Box shall be certified according to equipment to be installed inside it. It will be not acceptable the certification for the empty Junction Box.

6.9 Ethernet/Optical Multimode Converter - Standalone

a. Electrical Interface – 100/1000BASE-TX 8P8C (RJ-45) with IEEE 802.3bt PoE (with power injector that shall be able to be enabled or disabled by a switch).

b. Optical interface - Multimode G.651.

c. Core diameter - 50µm.

d. Standard –1000BASE-FX SC-PC.

e. Number of fibers - 2 fibers.

f. Installation – Standalone box.

g. Connector – SC.

h. Operating temperature -10°C to + 50°C.

i. Link failure pass-through.

j. Auto MDI / MDI-X for TX port.

6.10 Ethernet/Optical Converter Sub-Rack

a. Assemble type – 19” rack.

b. Power Source: up to 220VAC.

c. Number of channels: minimum 10.

d. Network Interface: RJ-45 1000Base T compatible.

6.11 Ethernet/Optical Multimode Converter – Sub-rack Card

a. The card-type module shall be "hot swappable", so its insertion or withdrawal shall not interfere with the other modules installed in the same sub-rack. This model is allowed only in the Telecommunication Rooms.

b. Electrical Interface – 100/1000BASE-TX 8P8C (RJ-45).

c. Optical Interface - Multimode G.651.

d. Core Diameter - 50µm.

e. Standard – 100/1000BASE-FX SC-PC.
f. Number of fibers - 2 fibers.
g. Installations – sub-rack 19” slot.
h. Connector – SC.

6.12 Electrical Surge Protector

a. Category - IEC II / C.
b. Nominal voltage Phase / ground - 127 VAC ~ 220 VAC.
c. Reference voltage at 1 mAcc - 430 Vcc.
d. Imax. – Max. current - 40 kA.
e. Max. Residual voltage at 300 A - 710V.
f. Response time /Varistor - < 25 ns.
g. Response Time - < 30 ns.
h. Fail alarm – LED.
i. Standard compliance: IEC 61643-21.

6.13 Ethernet PoE Surge Protection

a. Interface: 100/1000BASE-TX 802.3at.
b. Connector (in/ out): ethernet RJ45, Cat6.
c. Response time < 10ns.
d. Standard compliance: IEC 61643-21.

6.14 Multimode Optical Fiber Cable

a. The network point where there is a technical non viability of service for cable FTP due to the access characteristics (distance), it shall be assisted by multimode optical fiber cable type OM-4 of 50 µm x 125 µm, according to ANSI/TIA-568.3-D, ISO/IEC 11801 and ITU-T G651.
b. The employed optical cables shall be of TIGHT Buffered type, fully waterproof, longitudinally and radially, constituted by fiber optic with primary covering in acrylic and secondary covering in material colored polymer, gathered and covered by dielectric synthetic fibers for mechanical support (resistance to the traction).
c. Covered by an external layer of special polymeric for external use with protection UV and fire-retardant type LSZH.
d. The optical cables coming from the operational area will be finished in DIO pattern 19 inches of 24 positions with SC-PC connectors on the Structured Network Racks.

e. Whenever a single Junction Box is due to be assisted by single fiber optic cable, this cable shall have at least 04 (four) extra fibers (02 pairs), for future use, fully ended on DIO position with SC-PC interfaces at both ends with the adequate characteristics for the area to be applied, beyond the fibers used by the active cameras connected to the junction box.

f. At the DIO shall be used an optical extending multimode (MM) of 50µm x 125µm with SC-PC / SC-PC connectors in OM-4 standard color.

g. The interconnection of DIO with the active elements of network, shall be used optical multimode patch cords (MM) of 50µm x 125µm in the OM-4 standard color and SC-PC / LC-PC connectors. It shall be foreseen by the Contracted the supply of an excess of 30% for this item for future expansion and spare.

6.15 External Cat.6 Twisted Pair Cable

a. Cable shall be LSZH class compliance, according to ABNT NBR 14705.

b. The cable shall be suitable for industrial saline environment, being resistant to UV radiation.

c. It shall be compliance with Cat 6 standard.

d. Cable shall have an electromagnetic protection (shielded or foiled).

6.16 DIO for Cameras

a. DIO to 24 (twenty-four) fibers. Articulated drawer type, steel frame, 19 "rack mounting standard, epoxy paint.

b. Equipped with optical cable assembling kit, fusion splice protectors, 1.5 m internal optical pigtails and protectors, and organizer for all DIO fibers.

c. All pig tails and adapters shall be terminated in a SC-PC connector.

6.17 Fiber Optic Patch Cord

a. Optical cable composed of an optical fiber, with a primary coating of acrylate and secondary of PVC, and over them a non-flame propagating PVC cover.

b. The connectors shall be compatible with equipment and DIOs.

c. The polishing of the connectors shall be PC type.

d. The optical cords shall have ANATEL certification and meet the ABNT standards NBR 14433 e ABNT NBR 14106.

e. The fiber optic patch cord shall be in OM-4 standard color.

6.18 Operator CCTV Desktop Computer

a. CPU and memory capacity in accordance with Genetec system requirements, considering at least six (06) full HD images, @ H.264 / H.265 (according to the encoding format of the provided cameras).

b. Shall have a dedicated graphics card with at least 2 Gigabytes of memory and at least 02 (two) video monitor output option.

c. CCTV Desktop computer shall have Windows 10 Professional (64 bits).

6.19 Desktop computer Monitor:

a. Shall have at least 24" size with 1920 x 1080 pixels minimal resolution.

6.20 Professional Monitor:

a. Shall have at least 46" size with 1920 x 1080 pixels minimal resolution.

b. Thin borders and symmetrical, maximum 5.5 mm bezel-to-bezel.

c. Video inputs: HDMI, DVI and DisplayPort.

d. VESA support.

e. At CCR, all monitors shall be installed by means of ceiling supports.

6.21 CCTV Electrical Switch

a. The CCTV switch shall comply with the Technical Specification: I-ET-3010.00-5517-768-PPT-001 – HULL DATA NETWORK.

b. The CCTV switch shall be connected to a corporative switch in the telecommunication rack at the telecommunication lower room. This connection shall be made using an optical interface.

6.22 Category 6 Twisted Pair Cabling

a. Cable of Cat.6 twisted pair shall attend the Standards and composed for 04 (four) equal, 24 AWG, 100 Ohms, rigid copper drivers with isolation in high density polyethylene, with electric and mechanics characteristics compatible with the established patterns and tested up to 250MHz so that throughput can reach up to 1 Gbps. It shall have protection against electromagnetic interferences (shielded or foiled). It shall have a cover fire retardant type LSZH.

b. The Cat. 6 cables shall possess the UL Register and Certification via Laboratory of international recognition for parameters that attend the Standards.

6.23 Patch Cord RJ-45 Cat 6

a. Patch Cords category 6/Class E shall be finished in factory with connector RJ-45 male, with plastic layer (boot) inserted in the connector to relieve the tensions and to avoid the accidental disconnection. They shall be built with

flexible UTP 24 AWG cable. Each patch cord shall have its whole performance 100% tested in factory regarding the Cat. 6 of the standard ANSI/TIA/EIA 568-C-2.

b. The outer sheath owes being of fire retardant type and LSZH, with demarcation of indelible length.

c. Patch Cord shall present acting values in the center of the strip of the values (center tuned) certain for the norm ANSI/TIA/EIA-568B2-1 for NEXT.

6.24 Patch Panel Cat 6

a. Patch Panel shall be metallic with width of 19 inches according to norm ANSI/TIA/EIA-310D, with 24 connectors type RJ-45 female and 1 U of height.

b. It shall have a cables guide (bar) in back for supporting and fastening of cables.

c. It shall still execute the specifications of components Category 6 /Class E ANSI/TIA/EIA 568-C.2 (component compliance).

d. The modules shall have structure built in plastic of high impact, fire retardant type called UL 94V-0. The circuits printed papers shall totally be contained inside the patch panel, in other words, the panel shall contain protection for the circuits printed, avoiding damages to the same ones during the connectors installing process.

6.25 Closed Rack for CCTV

a. It shall be closed, 19 inches standard, 44U height, minimum depth of 1000 mm (internal dimensions) and 800 mm of useful width (internal dimensions).

b. Glazed door at the front: Single-pane safety glass, 3 mm, including 130° hinge, and security key lock.

c. It shall possess four vertical organizing columns, two in the front access and two in the back access, with objective to organize the cables from the outlets points and interconnection cables, and still to possess two movable plans of assembly.

d. Sheet steel bi-parting rear door, including 130° hinge and security key lock;

e. A cooling system shall be installed for each cabinet and it shall be composed by 02 (two) fans on the bottom to inflate cold air inside and 02 (two) fans on the top to exhaust heated air to be collected by exhausters on ceiling. Additional clarifications for HVAC at I-MD-3010.00-5510-760-PPT-001 GENERAL CRITERIA FOR TELECOMMUNICATIONS DESIGN.

f. All the fixing supports of the organizing columns of cables and other fixations in foil shall be of at least #2,75 mm of thickness.

g. It shall still be equipped with 02 (two) AC strip-line 19 inches standard of 10 sockets 2P+T with individual capacity of 25 Amperes. The total current of each ruler shall be of at least 30 A. The power cord of each ruler shall be of at least

2 meters. The rulers shall be fastened vertically, internally, in the back part of rack.

h. It shall still possess 01 (one) slippery tray with front and back fixation.

i. It shall be supplied cage nuts (M5) and screws (at least 15 mm) for all of the positions.

j. Internal light only on the rear access.

k. Complete earthing Kit.

l. Color: RAL 7035.

m. The number of racks that shall be installed at the Telecommunications Upper and Lower Room to accommodate the whole demand of network points and equipment of the structured local network, in accordance with distribution requirements and the Detailed Design Arrangement Document.

6.26 Other construction and configuration requirements

6.26.1. All EX cameras must be industry standard models. Cameras mounted by CONTRACTOR (common camera + generic EX enclosure) will not be accepted, even if certified.

6.26.2. All cameras shall have manufacturer warranty of at least 3 years.

6.26.3. All equipment installed in the Telecommunication Rooms shall be installed in 19” rack space.

6.26.4. IP ADDRESS – All devices: cameras, NVR´s, CCTV desktop computers, will be addressed at VLAN IP address range provided by PETROBRAS during the Commissioning phase.

6.26.5. SYSTEM CONFIGURATION - The whole system: VMS, NVR, encoders, servers, desktop computers, network devices, access points and cameras shall be configured according to CCTV Technical Instruction, to be provided by PETROBRAS at the time of the system configuration.

6.26.6. Professional 46” monitors that will be installed at Central Control Room (CCR) will be connected to a desktop computer and its keyboard and mouse shall extended to the operator console.

6.26.7. SERVERS AND DESKTOP COMPUTER CONFIGURATION – before the CCTV applications installations, PETROBRAS shall be contacted to inform its standard corporate version of operational system and other package of applications to be installed.

6.26.8. The CCTV rack shall have its casing grounded. Grounding by simply supporting the casing on the steel structure of the UNIT shall not be deemed adequate.

6.26.9. Cameras Power supply:

a. For distances up to 90m, cameras shall be powered from the telecommunication lower room, when using PoE.

b. For distances longer than 90m, when fiber optics is used to transmit the image, or for Ex PTZ cameras, power supply for the cameras shall start from the Telecommunication Lower Room deck toward the camera or junction boxes, when the last is used. The cameras circuit breakers shall be installed in this room. Surge protection shall be installed in the power supply.

6.26.10. Video Transmission:

a. For distances up to 90m from the rack, video and power (PoE) shall be transmitted using metallic twisted pair cable, cat.6 LSZH with UV protection and also protection against electromagnetic interferences (shielded or foiled), according with item 6.15.

b. For external PoE cameras, a grounded surge protector shall be installed preferably in the CCTV rack at telecommunication lower and upper room in series with the cable, according with item 6.13.

c. For distances over 90m, data shall be transmitted using optical multimode cable, LSZH with UV protection.

d. In the case of fiber optics, it shall be necessary to install a junction box to house the optical converter. As an alternative to avoid the installation of the junction box, a camera with built-in optical interface can be provided, for direct interconnection with the optical port of the switch. CONTRACTOR shall guarantee the compatibility of this optical interface of the camera with the switch (2 fibers / gigabit / multimode).

6.26.11. Junction boxes shall not be installed in areas where they would be exposed to the weather. If that installation is necessary, junction boxes suitable for the purpose and built with necessary Ingress Protection degree shall be used.

6.26.12. All grounding bus bars shall be of thin-plated copper and painted with green strips. Connections to the grounding network for equipment and boxes shall be made by means of bolted terminals.

6.26.13. All external cameras shall be grounded.

6.26.14. For cameras installed in places that are difficult to access, especially in cases where it is projected over the sea or out of the hull, an adaptation shall be created in the camera support, making it retractable in a way that makes safer to perform the maintenance of the camera.

6.26.15. All the cat.6 twisted pair cables shall be identified in its both extremities, using polyester labels printed mechanically in an indelible way. In the same way shall be identified all the other components of the network as: patch panel, fiber optic cables, patch cords and sockets.

6.26.16. The organization of the cables inside the racks shall use only velcro. On cable trays the cabling shall be tied with black plastic tie wraps.

7. SCOPE OF SUPPLY

7.1 CONTRACTOR shall be responsible for the entire CCTV package covering: design, engineering, manufacturing, equipment supply, install, testing, commissioning and all documentation according with this technical specification.

7.2 All material, equipment and installation services shall be concerning the following activities.

a. Project for the CCTV system to be installed.

b. Supply of installation materials and equipment.

c. Materials and Installations of all equipment.

d. Materials and Installation of cabling and connectors.

e. Tests and certification of the whole installed CCTV network and fiber cabling.

f. Physical identification of all components of system.

g. Technical documentation of the system.

7.3 It shall be supplied 02 (two) set of Camera Dome Cleaner.

7.4 All cameras that shall be supplied and installed according to HULL CCTV ONE LINE DIAGRAM and item 6.3.

7.5 The location of the cameras in each area are described in each respective arrangement drawings.

7.6 Final position of the cameras shall be defined and approved by PETROBRAS team during the executive project phase.

7.7 Cameras installed in the Topsides are not included in the scope of delivery of this document, but these cameras will be connected to the HULL CCTV System. Therefore, the system shall be configured to receive the images from these cameras, with all necessary licenses.

7.8 The system shall be dimensioned considering all the cameras in the HULL plus all cameras in the Topside, according to HULL CCTV ONE LINE DIAGRAM and TOPSIDES CCTV ONE LINE DIAGRAM.

7.9 01 (one) desktop computer shall be installed and configured to use the CCTV system in each location described below.

Location	Monitor	Monitor quantity
CCR – Operator-1	Monitor 24”	1
CCR – Operator-2	Monitor 24”	1
CCR – 46” monitors control PC	Professional 46”	2
Radio Room (EPTA-M)	Monitor 24”	1
Coordination Office	Professional 46”	1
GEPLAT office	Professional 46”	1
Safety office	Professional 46”	1

Table 2 – Workstation installation place with the quantity of monitors.

7.10 EPTA-M Record System

7.10.1. An audio and video record system for the EPTA-M system shall be installed in an exclusive compact rack in the Radio Room.

7.10.2. The EPTA-M camera shall be compliant with NORMAM-27/DPC annex 6A, covering the full helicopter approximation, landing, and takeoff. The CONTRACTOR shall demonstrate the trigonometrical calculation that shows the compliance to this requirement with the camera model to be used.

7.10.3. The rack shall be locked with a key.

7.10.4. The rack shall have an exhausting fan.

7.10.5. Complete earthing kit.

7.10.6. 02 (two) encoders shall be installed to digitize the audio from the 02 (two) fixed VHF radios. CONTRACTOR shall interconnect the radios with the encoders.

7.10.7. Each VHF radio shall be connected to separated encoder. It will not be allowed to connect both VHF radios with only one multi-channel encoder.

7.10.8. It shall be provided 01 (one) NVR compact appliance, recording the helideck cameras and VHF audio channels.

7.10.9. Simultaneously this information from helideck camera and the 02 (two) VHF radios also shall be recording on 02 (two) NVR sets from CCTV system. Figure-3 bellow illustrates this recording streams for EPTA Record System.

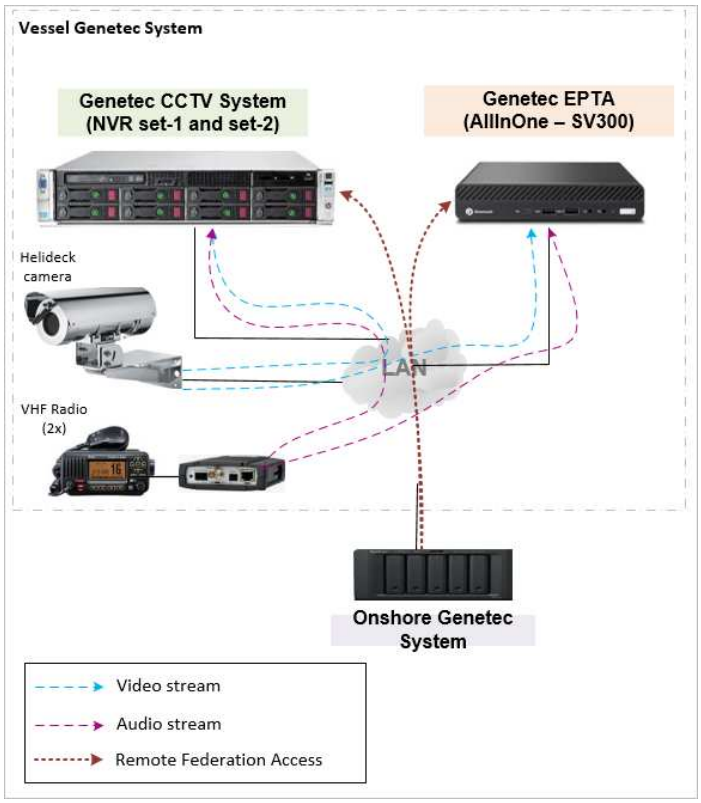

Figure-3 – EPTA recording system streams

7.10.10. In the event of failure of EPTA NVR, all the recording tasks will be available in the 2 (two) NVR sets and it will keep recording all the video and audio normally, and this will allow enough time to the tech team reestablish the failed unit.

7.10.11. Each encoder shall be connected to a different switch at the Telecommunication Upper and Lower Rooms.

7.10.12. It shall be provided 01 (one) desktop computer with mouse, keyboard and monitor available for Radio Operator.

7.10.13. For the whole EPTA-M specification, the I-ET-3010.00-5515-762-PPT-001 Aeronautical Communication System shall be consulted.

7.11 All licenses, NVR devices, cameras, desktop computers, monitors, professional monitors, servers, closed racks and other miscellaneous listed on item 6. Special attention for the following items:

a. Genetec Directory servers, according to item 6.3.

b. Genetec NVR servers, according to item 6.2

c. Genetec licenses, according to item 6.1

8. DIMENSIONING CRITERIA

8.1 The number of cameras and their types have already been defined in the Basic Project.

8.2 Basic CCTV one line diagram and basic CCTV overall arrangement of cameras shall be used which local shall be confirmed by PETROBRAS during Detail Design.

8.3 PETROBRAS Operational and Engineering Team shall approve the final camera's location according to 3D viewed screen to be presented.

8.4 The amount and size of NVR HD´s shall consider the definitions on item 6.2.

8.5 The amount and size of NVR HD´s for EPTA-M recording system shall consider the definition on item 7.10

9. COMMISSIONING

9.1 Tests and Certification of the CCTV network shall comply with the Technical Specification I-ET-3010.00-5510-760-PPT-002 BASIC CRITERIA FOR TELECOM DESIGN which is summarized below.

9.2 The horizontal network of Cat. 6 twisted pair cables shall be certified according to Standard ANSI/EIA/TIA requirements 568-C2 CAT 6 /Class E.

9.3 Preferentially, Fluke certification instrument DTX Cable Analyzer model 1800 or more recent and better model shall be used.

9.4 The network of optical cables shall be certified according to Standard ANSI/EIA/TIA'S requirements 568-3D CAT 6/Class E for optical backbones.

9.5 Preferentially, the instrument of certification of Fluke DTX Cable shall be used Analyzer model 1800 or more recent model.

9.6 It can be used the OTDR network analyzer to ensure the network connectivity and test network configuration.

9.7 CONTRACTOR shall present certification tests CAT 6 report for all the installed points, in digital media, compatible with the Software of Fluke Link Ware.

9.8 All the instruments to be used shall be accompanied by the Certificate of Calibration that shall be inside its period of validity. The Certificate shall be presented to the PETROBRAS representative before the beginning of the tests and an authenticated copy of the original shall proceed enclosed the documentation to be given at the end of the work.

9.9 Generally, to be accept, it shall be performed a successful test with all cameras presenting real images at display monitors (including mobile ones) and desk computers and mobile devices working with VMS software.

9.10 Audio from aeronautical base stations and portable radios and CCTV helideck camera locally recorded and retrieved to external media to be presented synchronized; records protected by password; HMS system displayed and locally recorded.

9.11 Aeronautical base stations and portable radios configured with the final frequency homologated to operate in Brazil site operation.

10. CRANE CAMERA INTEGRATION WITH THE HULL CCTV SYSTEM

10.1 Crane camera presented on I-ET-3010.00-5266-631-P4X-001 and its Data Sheet Basic Project document shall be integrated to the Hull CCTV System using the available Wi-Fi system.

10.2 The crane CCTV system shall connect with Hull CCTV system by Wi-Fi.

10.3 The crane CCTV system shall be standalone and operate separated from the Hull CCTV system. Only the image from the camera shall be shared between the systems.

11. HELMET CAMERA

11.1 Helmet camera present in Figure-2 is specified in I-ET-3010.00-5511-768-PPT-001 TELECOMMUNICATION SPECIALIZED, item 4.7.5.