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DATE	Jun/27/2025								
DESIGN	PROJ-US								
EXECUTION	RICARDO								
VERIFICATION	ROBSON								
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1. OBJECTIVE

1.1. To present the Telecommunications Systems requirements demanded by BUYER for the Santos Basin Malha Optica Project Equipment to be supplied, installed, configured and commissioning by SELLER at BOT unit.

2. REFERENCE

2.1. All equipment in this specifications shall be used by BUYER's exclusive use.

2.2. SELLER shall be responsible for filling all necessary documents for licenses for operation in Brazil.

2.3. At the time of the purchase order for equipment of this specification, the CONTRACTOR shall only supply equipment without an End of Life (EOL) announcement by the manufacturer.

2.4. If the End of Support (EOS) of any data equipment occurs before the end of the operating contract, the SELLER shall:

2.4.1. Submit the new model (and its documentation) for approval by PETROBRAS.

2.4.2. Replace the equipment before the EOS date or before the transfer of the platform to Petrobras operation (whichever occurs first).

2.5. If any equipment in operation has an irremediable safety failure recognized by the market, the SELLER shall replace the equipment with the safety failure immediately.

3. DEFINITIONS

AC	Alternating Current
AHTS	Anchor Handling Tug Supply
AM	Amplitude Modulation
ANATEL	Agencia Nacional de Telecomunicações (Brazilian Telecommunication Authority)
ANSI	American National Standards Institute
EIA	Electronic Industries Alliance
TIA	Telecommunications Industry Association
ART	Anotação De Responsabilidade Técnica (Technical Responsibility Note)
AWG	American Wire Gauge
BUC	Block up Converter
CAB	Cable
CAT	Category
CATV	Community Antenna Television
CCR	Central Control Room
CCTV	Closed Circuit Television
CODEC	Codifier & Decodifier
CREA	Conselho Regional de Arquitetura e Urbanismo (Brazilian Engineering Counsel)
DC	Direct Current
DIO	Dispositivo Intrmediário Óptico (Optical Distribution Drawer)
DSV	Diving Support Vessel
DVD	Digital Versatile Disc
EEX	European Energy Exchange
EOL	End Of Life
EOS	End Of Support
ENV	Environmental
ETEX	Estações de Telecomunicações Exclusivas (Air Traffic Controller)
ETH	Ethernet
FM	Frequency Modulation
FO	Fiber Optic
GMDSS	Global Miritime Distress Safety System
GPS	Global Positioning System
HDPE	High Density Polyethylene
HDX	High Definition "X" Experience
ICA	Instruções do Comando da Aeronáutica (Aeronautical Brazilian Authority)
IDU	Indoor Data Unit
IMO	International Maritime Organization
IP	Internet Protocol
IS	Intrinsec Safe
ITU	International Telecommunication Union
KVA	Kilo Volt Ampere
LAN	Local Area Network
LED	Light Emitting Diode
LNB	Low Noise Block Converter
LSZH	Low Smoke Zero Halogen
MODU	Mobile Offshore Drilling Unit
MOSCAD	Motorola Supervisory Control And Data Acquisition
NDB	Non Directional Beacon
NOC	Network Operation Center
NTSC	National Television Systems Committee
ODU	Outdoor Data Unit
OMTS	Offloading Monitoring Telemetry System
PAGA	Public Address And General Alarm
PAL-M	Phase Alternate Line Type M
PI	Plant Information
PLL	Phase Locked Loop
PoE	Power Over Ethernet
PP	Patch Panel
PSV	Platform Supply Vessel
ROIP	Radio over IP
SC	Subscription Channel Connector
SFP	Small Form-Factor Pluggable
MM	Multi Mode
SMA	Serviço Móvel Aeronáutico (Aeronautical Mobile Service)
SMM	Serviço Móvel Maritimo (Maritime Mobile Service)
SOLAS	Safety Of Life At Sea
SPL	Sound Pressure Level
TVRO	Television Read Only
UHF	Ultra Highband Frequency

UPS	Uninterruptible Power Supply	VSAT	Very Small Aperture Terminal
FTP	Unshielded Twisted Pair	WAN	Wide Area Network
VAC	Volts Alternating Current		
VDC	Volts Direct Current		
VMS	Visual Monitoring System		
VHF	Very High Frequency		

4. SUBMARINE FIBER OPTIC NETWORK

4.1. It shall be provided all **equipment** in order to connect the FPSO to the BUYER submarine fiber optic network.

4.2. DWDM – Hardware and license

4.2.1. CONTRACTOR shall supply and install 02 (two) DWDM HUAWEI 9800 according to the table below:

Item	Model	Quantity	Description
1	OptiX OSN 9800 M24(V100R021) rack&subrack	1	
1.1	TNGK1AFB01	2	Assembly Subrack (OSN 9800M24)
2	Electrical Board		
2.1	TNG3CXP01	4	Universal Cross Connect, System Control and Clock Processing Board
2.2	TNU3N602S33	2	2*200G/400G high performance programable Line Service Processing Board (SLH+, SDFEC2@ 200G E16QAM-400G 16QAM/etc, Flex rate, Coherent, Tunable, Super C, Flex grid) (2*100G Line Capacity Included, RTU Extension Supported)
2.3	TNG1T212S06	2	12*10G Tributary Service Processing Board
2.4	OSX010N01	20	Optical Transceiver, SFP+, 1310nm, 8.5 Gb/s - 11.1 Gb/s, with CDR, -6.0 ~-1 dBm, -14.4 dBm, LC, SM, 10km
3	Optical Board	1	
3.1	TNG2DWSS2001	2	Dual 20 ports flexible wavelength selective multiplexing and demultiplexing board (Supr C_band, 190.65 THz ~ 196.675 THz, 37.5 GHz ~ 40 GHz (10 dimensions included, RTU Extension Supported)
3.2	TNG3DAPXF	6	Extended C-band OA base board with 2 pluggable ports, with XFIU
3.3	TNG3OACE101	8	Pluggable Optical Amplifier, Extended C-band Gain 20~31 dB, Max 21.5 dBm Out
3.4	TNG3OACE105	4	Pluggable Optical Amplifier, Extended C-band Gain 23~32 dB, Max 23.8 dBm Out

Table 01 – DWDM technical specification

4.2.2. The quantities related on the table above are the total need to 02 (two) DWDM and must be equally divided by 02 (two) sub rack.

4.2.3. The typical power consumption to be considered for both DWDMs together is 2,454 W (51.1 A) and the maximum power consumption is 3,592 W (74.8 A), at -48 VDC.

4.2.4. CONTRACTOR shall supply the licenses to both DWDM according to the table below:

Hardware RTU Group			
SKU	**PN**	**Description**	**Quantity**
82601308	RTU-LNSDRTUM01	OSN 9800/8800 Line Capacity RTU for 200G+ MSA Port (Per 100G)	2
82601503	RTU-LNSDRTUC08	OSN 9800/8800 Client Port Enable RTU for 10G Port	20
88036BUU	RTU-TNGRTUDWSS20D01	DWSS20 Dimensions RTU (Right for more than 10 dimensions)	2
Basic Software Package & Software Update Fee			
88037CWP	TNGS0000SW21	OptiX OSN 9800 M24-Basic Software Package, V100R021 (Per Subrack)	2
NCE-T,Self-made Software-Enterprise			
Function Software			
88036CFU	NSSSTTPOTNS01	Basic Function Package for Optical Domain OTN Device Management (Per 5 equivalent NEs), Perpetual License	3
Subscription and Support Fee,1 year			
88060VAM	NSSSTENTPOTNS02	Basic Function Package for Optical Domain OTN Device Management (Per 5 equivalent Nes),1 Year Subscription and Support (Annual fee validity period: 1 year from " PO signed plus 90 days ")	6
Subscription and Support Fee,3 year			
88060VAS	NSSSTENTPOTNS03	Basic Function Package for Optical Domain OTN Device Management (Per 5 equivalent Nes),3 Year Subscription and Support (Annual fee validity period : 3 years from " PO signed plus 90 days ")	3

Table 02 – Licenses of DWDM equipment

4.2.5. The Subscription and Support shall be transferred associated with to PETROBRAS account, preferably after the commissioning of both DWDM.

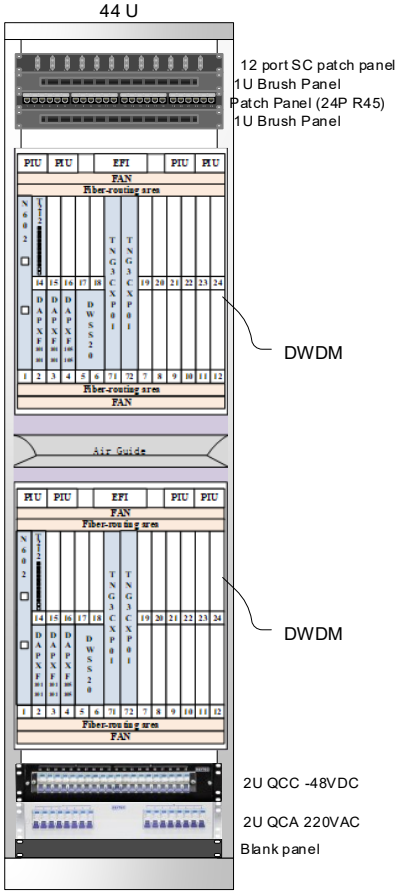
4.2.6. In case of a listed part number (hardware or license) announced by the VENDOR as out of support or end of life, the CONTRATACTOR shall contact PETROBRAS and propose a replacement part or license prior to acquisition.

4.2.7. CONTRACTOR shall be responsible for firmware/software upgrades if required during commissioning due to manufacturer suggestion (bugs and better performance detected) under PETROBRAS request.

4.2.8. CONTRACTOR shall supply and install the electrical power connections and data connections (electrical or optical patch cords) of the equipment.

4.2.9. Following the typical internal bay face of dedicated rack for submarine network system.

BAS-5512502
SUBMARINE NETWORK



4.3 OPTIC DISTRIBUTION FRAME - ODF

4.3.1. The mechanical system shall consist in a sub-rack with 3UR x 19 ”, with splice modules and optic distribution frame (ODF).

4.3.2. It shall be properly equipped with SM micro loose internal optic pigtails, pre-tested and micro loose connectors stripped, ready to fusion splices.

4.3.3. The ODF shall provide front and rear access for maintenance and testing.

4.3.4. The ODF shall have optic connectors on the front, in order to allow the connection of single mode cords.

4.3.5. It shall be provided with drawers for storing cord.

4.3.6. The system of fusion splicing trays shall allow the separation of the storage of the spliced fibers of the fibers to be spliced in the future.

4.3.7. There shall be a system for fixing the interfaces of adapters and locking the access tray, which facilitates the entire operation of coupling and decoupling the units.

4.3.8. Following a typical 19in optic distribution frame.

Figure 02 - typical 19in optic distribution frame