

## ATTACHMENT 01

### SCOPE OF WORK FOR SPM ANNUAL INSPECTION

#### 1. Scope of work

Contractor is responsible for developing “Planning for the SPM annual inspection, including monthly inspections and greasing”, submit to NSRP and Vietnam Register (VR) for approval before starting work.

Contractor shall mobilize equipment, manpower, material to carry out the SPM annual inspection as per the scope below.

Contractor shall mobilize VR’ representative to witness during inspection.

Contractor is responsible for receiving approval from VR for SPM operation license 1 year renew.

Additional requirements shall be determined by Vietnam Register.

#### 2. Program of SPM annual inspection

The program for SPM annual inspection must follow but not limited to the requirement in *QCVN 72:2014/BGTVT – National technique regulation on classification and building of Single point mooring and floating light buoy* – which may be amended or supplemented during the execution of the contract. Contractor must study the mentioned regulation and make the program of SPM annual inspection to match with the regulation, submit to NSRP for corrections and approval and submit to VR and get their approval before carrying out the service.

*This inspection should include all the items for a routine monthly inspection. (detail in 4.2 Table). Same applies to work done for quarterly and 6-monthly inspections. It can all be included in the annual inspection.*

#### 3. Preparation

Permit to Work.

Toolbox meetings

Secure turntable

Ventilate compartments

Team composition supervisor, 4 divers, 2 technicians, deck crew.

Sufficient accommodation for team and VR representatives.

Suitable weather forecast.

Result of survey shall be photographed, and video recorded

All Anomalies shall be photographed

All damages shall be reported and subjected to DVI

The photo in all copies of the report shall be in color

#### 4. Legal requirements for Annual Classification inspection & maintenance for SPM:

##### 4.1 General program of VR Annual Classification Inspection SPM:

Group	Item	Action required	Remark
General Visual	Central pipe double line	<ul style="list-style-type: none"><li>• Check condition of piping, support, flange, bolts and nuts.</li><li>• Inspect flange connection, expansion joints, and valves for sign of leak.</li></ul>	

<b>Inspection (GVI)</b>		<ul style="list-style-type: none"> <li>• Check condition of painting protection.</li> <li>• Perform wall thickness measurement at locations have risk of abrasion, or elbows have high flow rate.</li> </ul>	
	SPM structure	<ul style="list-style-type: none"> <li>• Compartments: Check compartments for physical damage, excessive wear on compartment walls and cover plates. Check condition of gaskets, bolts, nuts, and painting.</li> <li>• Handrail and ladder: check structures for physical damage, excessive wear.</li> <li>• Inspect condition of bracing, supports, walls, compartment for physical damage, crack, excessive wear, and abrasion. Perform wall thickness measurement of compartment containing fuel or corrosion inhibit chemical.</li> <li>• Check condition of coating protection</li> </ul>	
	Main bearing.	<ul style="list-style-type: none"> <li>• Check turntable bearing and swivel bearing for any physical damage, any abnormal condition (Unusual sounds and/or uneven movement are an indication of problems with the bearing)</li> </ul>	
	Other system	<ul style="list-style-type: none"> <li>• Check condition of fire extinguishers.</li> <li>• Check condition of Bilge pump (used for pumping out water inside compartments)</li> <li>• Check condition of chain assembly system including chain support and chain angle/chain tension.</li> <li>• Report and record all damages, anomalies, deformation.</li> <li>• Result of survey shall be photographed and video recorded</li> </ul>	
<b>Detailed Visual Inspection (DVI)</b>	New anomalies survey:	<ul style="list-style-type: none"> <li>• To investigate and record location, dimensions and type of anomalies detected during the survey. Results to include into the list of anomalies</li> <li>• Anomalies shall be photographed</li> </ul>	All Anomalies shall be photographed
<b>Inspection of welding</b>	Welds on PLEM pipe	<ul style="list-style-type: none"> <li>• Alternating Current Field Measurement (ACFM) :</li> <li>• To carry out ACFM of specified welds along all length of weld</li> <li>• Video record of ACFM shall be carried out in large scale along all length of welds</li> </ul>	
<b>Electrical, instrument</b>	Electrical system	<ul style="list-style-type: none"> <li>• Visually inspect electrical system and ensure system working normally and stably.</li> <li>• Check solar system.</li> </ul>	All anomalies

<b>and related equipment</b>		<ul style="list-style-type: none"> <li>• Inspect junction box and panel for water ingress, availability of desiccants.</li> <li>• Check electrical cable for sign of brittle insulation, deterioration.</li> <li>• Check cable connection.</li> <li>• Check electrical insulation.</li> <li>• Check operational condition of flood light.</li> <li>• Check working condition of navigation light.</li> <li>• All anomalies shall be photographed</li> </ul>	shall be photographed
	Instrument and control system.	<ul style="list-style-type: none"> <li>• Visual inspection and ensure system working normally and stably.</li> <li>• Check cable connection.</li> <li>• Check control system.</li> <li>• Check operation panel.</li> <li>• Inspect all control valves.</li> <li>• Check pressure transmitters.</li> <li>• Inspect temperature transmitters.</li> <li>• Check pressure switches.</li> <li>• Inspect pressure gauges.</li> <li>• Check temperature gauges.</li> <li>• Inspect level gauges.</li> <li>• Survey all fire and gas system including fire and gas sensor and operation panel.</li> <li>• Survey emergency shutdown system.</li> <li>• All anomalies shall be photographed</li> </ul>	
<b>Inspection of Pipe Line End Manifold</b>	PLEM	<ul style="list-style-type: none"> <li>• Check quantity of anodes</li> <li>• Check PLEM structure</li> <li>• Measurement of Cathode Potential</li> <li>• Measurement of plating thickness</li> </ul>	All damages shall be reported and subjected to DVI
<b>Anode detailed inspection ( ADI)</b>	100% anodes on piping at PLEM	<ul style="list-style-type: none"> <li>• To execute ADI of condition and wastage of anodes</li> </ul>	
<b>Inspection of submarine hoses</b>	Submarine hose	<ul style="list-style-type: none"> <li>• Swivel flange bolting</li> <li>• 24'' half reinforced / standard submarine double carcass hose</li> <li>• Hose bolting</li> <li>• Float</li> <li>• PLEM flange bolting</li> </ul>	All damages shall be reported and subject to DVI
<b>Inspection of floating hose</b>	floating hose	<ul style="list-style-type: none"> <li>• Sea flex floating</li> <li>• Butterfly valve</li> <li>• Hang-off chain/ pick-up chain</li> <li>• Small marker buoy</li> <li>• Winker light</li> <li>• Stud bolt/nuts</li> </ul>	All damages shall be reported and subject to DVI

<b>Inspection of Anchor chain</b>	06 Chains	<ul style="list-style-type: none"> <li>Chain tension</li> <li>Corrosion of the chain</li> </ul>	
<b>Wall thickness inspection (WTI)</b>	Bottom/ body hull 04 position on the PLEM pipe	<ul style="list-style-type: none"> <li>To carry out 12 WT measurements on hull structure</li> <li>To carry out 04 WT measurement (at 12 O/C, 3 O/C, 6 O/C, 9 O/C around pipe)</li> </ul>	
<b>Cathode Potential Measurement (CP)</b>	02 pipes	<ul style="list-style-type: none"> <li>To carry out 01 measurement on pipe</li> <li>If a reading of CP is more positive than -800mV, further reading shall be repeated at 0.5m distance in 02 direction of pipeline for clarification of abnormally cause, ADI may be required on the point where CP readings are found more position than -800mV</li> </ul>	
<b>Marine growth inspection</b>	02 sub marine hose Buoy hull	<ul style="list-style-type: none"> <li>To determine the percentage of hard and soft marine growth coverage</li> </ul>	
<b>Paint coating condition assessment</b>	Buoy hull Pipeline at PLEM	<ul style="list-style-type: none"> <li>Check paint coating condition ( note : Paint coating is severely destroyed and easily removed together with marine growth )</li> </ul>	All damages shall be reported and subjected to DVI
<b>Debris inspection (DI)</b>	100% of placement	<ul style="list-style-type: none"> <li>To find out DI taking place in contact to the CALM buoy &amp; PLEM</li> <li>Movable DI causing local fretting damage of CALM buoy / PLEM</li> </ul>	
<b>Reporting</b>		<ul style="list-style-type: none"> <li>Surveyor's report shall be made according to the original written approved standard and DVD , in English</li> <li>Survey report shall include general information about CALM buoy &amp; PLEM, all result of the present survey report shall be approved by Viet Nam Register</li> </ul>	The photo in all copies of the report shall be in color

#### 4.2 Detailed Table of Work including routine maintenance tasks:

Item	Item	Action requires	Remark
<b>Scada system in control room</b>	Check control system	<ul style="list-style-type: none"> <li>Ensure all functions are working properly.</li> <li>Check all alarms</li> <li>Reduce work to be done offshore as much as possible.</li> <li>Check lights, camera, solar arrays, valve controls, power supply etc.</li> </ul>	Check instrumentation from control room as much as possible.

	Turntable Bearing Housing Assembly	<ul style="list-style-type: none"> <li>• Turntable rotation is on smooth, quiet operation, normal sounds and normal movement.</li> <li>• Visually check the hex head cap screws that secure the turntable bearing cover plate for tightness.</li> <li>• Check for the presence of water between the turntable bearing primary and secondary grease seals by removing the four plugs (item 19, drawing VV21M6-001-A-120 of the O&amp;M Manual) and noting any drainage. Replace all four plugs upon completion of maintenance.</li> </ul>	
	Soundings	<ul style="list-style-type: none"> <li>• Check at tanks are empty, no water ingress.</li> </ul>	
	Fluid Swivel System Assembly	<ul style="list-style-type: none"> <li>• Visually check the fasteners of the swivel system for structural integrity and tightness. .</li> <li>• If any fasteners are losing, contact NSRP marine engineer for further action.</li> <li>• Visually inspect the Mounting Brackets</li> <li>• Visually inspect all welds of the Mounting Brackets</li> </ul>	
	Fender	<ul style="list-style-type: none"> <li>• Check and report any damage of the fender.</li> </ul>	
	Leak detection Recovery System	<ul style="list-style-type: none"> <li>• Inspect the leak recovery system.</li> <li>• Determine the level of fluid in the reservoir tank of the Leak Recovery system by looking at the sight gauge mounted to the tank.</li> <li>• Empty the tank if it is over half full. Refer to the O&amp;M Manual for details on emptying the tank</li> <li>• Report any anomaly and agree further action.</li> </ul>	
	Fire Extinguishers	<ul style="list-style-type: none"> <li>• Confirm both fire extinguishers are charged and operational.</li> </ul>	
<b>Lubrication</b>	Turntable bearing	<ul style="list-style-type: none"> <li>• Inject approximately 300 cc of grease into each of the four (4) 1/8-inch (3.175mm) alemite grease fittings (P/N 17, drawing 2379-BH-S1-01;</li> </ul>	

		<p>VV21M6-001-A-120) to lubricate the primary and secondary, upper water seals. Less grease may be injected if an excess amount is observed returning through the primary upper water seal (P/N 5, drawing 2379-BHS1-01; VV21M6-001-A-120) near the grease fitting.</p>	
		<ul style="list-style-type: none"> <li>Inject 40 ccs of grease into each of the forty (40 total) 1/8-inch (3.175mm) calamite grease fittings in the four grease port lubrication manifolds located at 90-degree intervals around the periphery of the turntable bearing cover plate. Suitable grease lubricant for the bearing is EP-1 or equivalent.</li> </ul>	
	Fluid swivel	<ul style="list-style-type: none"> <li>Apply grease to the swivel bearing: (1) Remove protective cap from grease fitting at one of the ports marked “BLA”, (2) Attach manual grease gun to the fitting, (3) Pump approximately 125 grams of EP-1 (or similar) grease into the port, (4) Remove grease gun from the fitting and replace protective cap.</li> <li>Repeat steps 1 through 4 for the remaining eleven (11) ports (marked “BLA”, “BLB,” or “BLC”).</li> <li>During the turntable movement, observe the swivel for smooth and quiet operation without unusual sounds or uneven movement.</li> </ul>	
	Winch and wires	<ul style="list-style-type: none"> <li>Inspect the air winch, lubrication.</li> <li>Lubricate the rigging, tackle components, and return items to storage of air winch.</li> </ul>	
	Load cell/ uni-joints	<ul style="list-style-type: none"> <li>Check &amp; lubricate.</li> </ul>	
	Torque arm	<ul style="list-style-type: none"> <li>Visually check the Torque Arm, particularly at the pin connections. Verify cotter pins are installed and secure.</li> <li>Visually inspect the welds of the Torque Arm.</li> </ul>	

		<ul style="list-style-type: none"> <li>Lubricate all torque arm pins with grease: Remove Cotter Pin from the bottom end of the Torque Arm Pin, Pull out Torque Arm Pin and apply grease thoroughly, Replace Torque Arm Pin, Install Cotter Pin back into Torque Arm Pin and secure.</li> </ul>	
	Valve gearboxes	<ul style="list-style-type: none"> <li>Lubrication in accordance with the manufacture's guidance and schedule.</li> </ul>	
	Mooring Hawser Bridle Plate	<ul style="list-style-type: none"> <li>Inject grease into each of the 1/8 inch (3.175mm) calamite grease fittings located on the sides of the bridle plate until the shackle pin/tri-plate annulus is filled. (Suitable grease lubricants are SHELL ALVANIA EP 2 or equivalent.).</li> </ul>	
<b>Mooring legs and anchor point inspection</b> <i>(06 Chains)</i>	In-service inspection of anchor chains	<ul style="list-style-type: none"> <li>Measure chain angles.</li> <li>Report any anomaly if over specification of each anchor chains.</li> <li>Agree adjustments with NSRP marine engineer.</li> <li>Wear measurement of interlink connection in top and bottom of chain in accordance with API RP 21</li> </ul>	
	External leakage	<ul style="list-style-type: none"> <li>Inspect external for signs of leakage.</li> </ul>	
<b>Cargo transfer system inspection</b>	Manually Operated Valves	<ul style="list-style-type: none"> <li>All manually operated valves are to be cycled (open/close or close/open) to ensure proper performance.</li> <li>2 Ball Valve 2" for connection PT-1109, PT-1110.</li> <li>2 Ball valve 2" for the vent.</li> <li>2 Ball valve 4" for flushing connection.</li> <li>1 Butterfly valve 24 for connection of 2 lines.</li> <li>2 Butterfly valve 24" for inlet of Swivel.</li> <li>2 Butterfly valve 24" for the outlet of Swivel.</li> <li>2x Ball valve 2" for connection of FT-1151 and FT-1152.</li> <li>2 x Ball Valve 2" for flushing connection @ outlet of the swivel.</li> </ul>	

	PLEM Valve Inspection (Actuated Valves)	<ul style="list-style-type: none"> <li>Inspect the position indicator on each actuator.</li> <li>Operate the valve from the surface and observe the movement of the indicator on each of the PLEM actuators</li> <li>Confirm that the actuator moves to the fully open and closed position</li> <li>Confirm that the position indicator on the actuators corresponds with the indications of the Hydraulic and Telemetry Systems.</li> <li>Set in accordance with the terminal procedure.</li> </ul>	Diving Requirement
	Marine growth inspections	<ul style="list-style-type: none"> <li>Inspect marine growth on submarine hoses, hydraulic umbilical, ball valves/.</li> <li>Propose cleaning interval.</li> </ul>	Diving required
	Hydraulic System	<ul style="list-style-type: none"> <li>Enter the buoy compartment which contains the hydraulic system and inspect the hydraulic system for the security of the mounting and signs of leakage.</li> <li>To perform functional of HPU system locally, report abnormal finding of system to NSRP marine maintenance engineer.</li> </ul>	
	Expansion joint	<ul style="list-style-type: none"> <li>Visually Inspect the expansion joints.</li> </ul>	
	Inspection of Floating hoses (100% of placements)	<p>Contractor is requested to perform inspection of floating hose which including here below items,</p> <ul style="list-style-type: none"> <li>Sea flex floating</li> <li>Butterfly valve</li> <li>Hang-off chain/pick-up chain</li> <li>Small marker buoy</li> <li>Winker light</li> <li>Stud Bolt/Nuts</li> </ul>	
	Mooring hawser, Chafe chain, Shackles, chain support buoy.	<ul style="list-style-type: none"> <li>Pick up mooring Hawser and inspect the end connections (thimbles and shackle 200 tons) visually.</li> <li>Check chafe chains and connecting shackles,</li> <li>Check pick-up rope connections and check for any chafing damage.</li> </ul>	

<b>Under-buoy</b>	Umbilical/FOC:	<ul style="list-style-type: none"> <li>• Check the umbilical is secured in each of the umbilical mounting blocks.</li> <li>• Check the overall umbilical and individual hydraulic hoses at the PLEM side end for visible signs of nicks, cuts, and abrasion.</li> <li>• Check the individual hydraulic hose ends at the PLEM termination plate to ensure each is sound.</li> </ul>	
	Under-buoy Hose Assembly	<ul style="list-style-type: none"> <li>• Inspection of submarine hoses is carried out to determine the overall condition of submarine hoses: <ul style="list-style-type: none"> <li>- Check leakage of flange</li> <li>- Loose mechanical connections</li> <li>- Anodes attached, damaged and/or misaligned.</li> <li>- Marine growth condition</li> </ul> </li> </ul> <p>The diver-inspector will examine each component as required by the work lists:</p> <ul style="list-style-type: none"> <li>- flange bolting</li> <li>- 24" half reinforced/standard submarine double carcass hose</li> <li>- Hose bolting</li> <li>- Collar (Float) condition</li> <li>- PLEM flange bolting</li> </ul>	
	Cathode Potential Measurement (CP)	<ul style="list-style-type: none"> <li>• To carry out per 01 CP measurement on pipe.</li> </ul> <p>If a reading of CP is more positive than -800mV, further readings shall be repeated at 0.5m distance in 02 directions of pipeline</p> <p>For clarification of anomaly cause, ADI may be required on the point where CP readings are found more position than -800mV.</p>	
	Anode Detailed Inspection (ADI)	<ul style="list-style-type: none"> <li>• To execute ADI of condition and wastage of anodes. Detail report dimensions and anomalies of each Anode.</li> </ul> <p><i>(100% anodes on pipeline)</i></p>	
	Debris Inspection (DI)	<ul style="list-style-type: none"> <li>• To find the debris caused by impact between the Calm Buoy and PLEM</li> </ul> <p>Movable debris causing local fretting damage of pipeline</p>	

		100% of placements (0-30m from waterline)	
	Inspection of Welding's joint	<ul style="list-style-type: none"> <li>• Alternating Current Field Measurement (ACFM):</li> <li>- To carry out ACFM of specified welds along all length of weld</li> <li>- Video recording of ACFM shall be carried out in large scale long all length of welds.</li> </ul> <p>Place of measurement all Welds on PLEM pipe</p>	
<b>Electrical, Instrument, Telemetry</b> <i>(100% of all equipment)</i>	Batteries and Battery Box	<ul style="list-style-type: none"> <li>• Check the battery box mountings and the cover; clean, inspect and test each battery, fuse holder and associated electrical cable connectors to confirm proper system operation.</li> <li>• Check the turntable RTU battery voltage (must be greater than 24V during the day).</li> <li>• Check the hull RTU battery voltage at the battery terminals (equipment tag 150-BAT-001) or the charge socket on the hull battery isolator box (equipment tag 150- BAT-801-SW) with the battery selector switch set to "CHARGE" (must be greater than 23V).</li> <li>• Recharge the hull battery either by connecting a charger to the socket or using the solar recharge system. If the latter set the Solar Supply Isolator to "ON" and the Battery Selector to "NORMAL", and leave them this way until the next maintenance. When not charging the hull batteries, leave the Solar Supply Isolator "OFF" and set the Battery Selector to "ISOLATED".</li> </ul>	
	Electrical Wiring	<ul style="list-style-type: none"> <li>• Inspect the electrical cables and cable glands for chafing and deterioration.</li> <li>• Check the electrical cable routings and verify the proper support of the cables by their respective conduit/brackets.</li> </ul>	
	Instrument	<ul style="list-style-type: none"> <li>• Check instrument &amp; calibration if required.</li> </ul>	

	Fog Detector	<ul style="list-style-type: none"> <li>• Check the security of the mounting.</li> <li>• Clean the lenses.</li> <li>• Inspect and test the system to confirm proper operation (activated from the foghorn control enclosure front panel switch).</li> </ul>	
	Foghorn	<ul style="list-style-type: none"> <li>• Check the security of the mounting, inspect and test the system to confirm proper operation.</li> <li>• Activate the foghorn from the Foghorn Control Enclosure front panel switch.</li> </ul>	
	Radar Reflector	<ul style="list-style-type: none"> <li>• Check the security of the mounting</li> </ul>	
	Navigation Lamp	<ul style="list-style-type: none"> <li>• Check the security of the mounting and focus alignment, clean the lens, replace defective bulbs, inspect and test the system for proper operation (by covering its photocell).</li> </ul>	
	Speakers	<ul style="list-style-type: none"> <li>• Check the security of the mounting,</li> </ul>	
	Floodlights	<ul style="list-style-type: none"> <li>• Check the security of the mounting,</li> </ul>	
	RACON	<ul style="list-style-type: none"> <li>• Check the security of the mounting,</li> </ul>	
	CCTV	<ul style="list-style-type: none"> <li>• Check the security of the mounting</li> </ul>	
	Solar Panels	<ul style="list-style-type: none"> <li>• Check the security of the mounting.</li> <li>• Clean the panels with fresh water, mild soap, and a non-abrasive cloth.</li> <li>• Inspect and test the battery, solar panel and the system to confirm proper operation.</li> </ul>	
	Remote Telemetry Monitoring & Control System	<ul style="list-style-type: none"> <li>• Enter the buoy RTU system compartment and inspect the RTU / PLC for the security of the mounting.</li> <li>• Check cable glands for chafing and deterioration.</li> <li>• Clean, inspect and test components inside the junction box.</li> <li>• Check and test fuses to ensure satisfactory performance.</li> <li>• Check the desiccants in the turntable RTU enclosures and replace them as needed.</li> </ul>	

		<ul style="list-style-type: none"> <li>Confirm the PLC from MTU PLC can connections via Fiber optic cable to SPM PLC (Hull PLC &amp; TT PLC).</li> </ul>	
<p><b>Other Inspection</b> <i>All damages shall be reported and subjected to DVI</i></p>	<p><b>Wall Thickness Inspection (WT)</b></p>	<p>To carry out per 12 WT measurements on hull structure.</p> <p>Places of measurement</p> <ul style="list-style-type: none"> <li>Bottom/body hull</li> <li>04 positions on PLEM pipe</li> </ul>	
	<p><b>Paint Coating Condition Assessment</b></p>	<p>Paint coating is severely destroyed and easily removed together with MG.</p> <p>Places of inspection:</p> <ul style="list-style-type: none"> <li>Buoy hull</li> <li>Pipeline at PLEM</li> </ul>	

### 5. Requirement for manpower

Contractor 's personal required for the performance of the services shall be proposed by the contractor and approved by NSRP which shall include at least the followings, unless otherwise decided by NSRP

<b>Position</b>	<b>Quantity</b>
Project manager	01
<b>Diving team</b>	
Diving supervisor	01
Inspection diver	04
Diving technician	01
<b>Topside team</b>	
Mechanical engineer	01
Electrical & instruments engineer	01