	TECHNICAL SPECIFICATION		Nº. I-ET-3010.00-1000-950-P4X-001
	CLIENT:	SRGE	SHEET: 1 of 17
	JOB:		--
	AREA:		
DP&T-SRGE	TITLE: MARINE BIOFOULING		NP-1
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INDEX OF REVISIONS

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0	ORIGINAL ISSUE

PRELIMINARY

	REV. 0	REV. A	REV. B	REV. C	REV. D	REV. E	REV. F	REV. G	REV. H
DATE	APRIL/18/19								
DESIGN	ESUP								
EXECUTION	MMARROIG								
CHECK	FABIANA								
APPROVAL	JUVENTINO								

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FORM OWNED TO PETROBRAS N-0381 REV.L.

1 SCOPE

1.1. Introduce measures to minimize the risk of introduction and spread of exotic species along the Brazilian coast and in the international sea.

1.2. This specification establishes minimum requirements for the prevention and removal of marine biofouling in project implementation plan of offshore units.

1.3. It is scope of this document the specification of antifouling systems, inspection during construction and assembly and commissioning and the cleaning of units.

1.4. It is not aim of this specification the preventing of bioinvasion due to ballast water.

2 REFERENCE AND ADDITIONAL DOCUMENTS

2.1 REFERENCE DOCUMENTS

NORMAN 23 treats the control of harmful antifouling system on ships;

Decreto nº 2.519/98, internalize in national law, the Convention on Biological Diversity (CBD);

Decreto nº 4.339/02, in its Annex, institutes principles and guidelines for implementing the National Biodiversity Policy;

Decreto nº 6.514/08, provides for offenses and administrative penalties to the environment;

Lei nº 9.605/98 Lei de Crimes Ambientais (Law on Environmental Crimes);

ASTM D6990 Standard Practice for Evaluating Biofouling Resistance and Physical Performance of Marine Coating Systems.

2.2 ADDITIONAL DOCUMENTS

Resolution MEPC.207(62) – Guidance for the control and management of ships biofouling to minimize the transfer of invasive aquatic species.

3 DEFINITIONS

In addition to those mentioned at IMO Resolution MEPC.207(62), the following definitions are applicable:

Bioinvasion: undesirable imbalances in the ecosystem caused by invasive species.

Exotic Species: species introduced into as area where they do not occur naturally.

Ballast Water: water to ensure stability and control of structural efforts of the ship while sailing and during loading and unloading operations, increasing or decreasing the draft and trim (difference between the forward and aft drafts) of the ship to ensure its operational safety. The uptake of water on a site and disposal at another bioregion may cause the introduction of species.

4 GENERAL REQUIREMENTS

4.1. Offshore Units comprise the following facilities:

- Special service and support vessels;
- Monobuoys and sustaining buoys;
- Support vessels;
- Oil tanker, gas tanker and offloading vessels;
- Drill Ships and semi-submersible rigs;
- Jack-up platforms, Tension-Leg Platform (TLP) and fixed platforms;
- FPSO;
- Regasification unit.

4.2. The CONTRACTOR shall minimize, as far as possible, the time of ships at anchor before mooring in its final location.

4.3. The CONTRACTOR shall establish the anchoring area to avoid interfaces with marine protected area and its buffer zones.

4.4. The unit shall be designed to minimize areas of stagnation in contact with seawater.

5 ANTIFOULING SYSTEM

5.1 ANTIFOULING COATING

5.1.1. Offshore units shall have antifouling system in addition to the anticorrosive coating on underwater body and boottop surfaces.

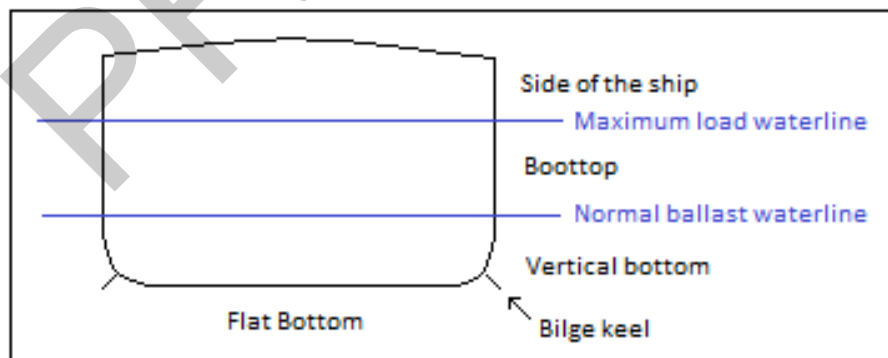


Figure 1: Schematic diagram of a ship.

5.1.2. The application of the antifouling system shall be done after due approval of the anticorrosive paint system application.

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5.1.3. The antifouling system comprises:

5.1.3.1. Application of a sealant paint to ensure compatibility between the anti-corrosion system and the anti-fouling system with 100 µm dry film thickness on the anticorrosive paint system by airless spray gun. The definition of sealant paint shall be by the PAINT MANUFACTURER. Typically is a vinyl sealer coat.

5.1.3.2. Subsequent application of, at least, two coats of Antifouling Tin Free (SPC) paint by airless spray gun. paint whose efficiency is guaranteed up to 5 years of immersion under static conditions.

5.1.4. The antifouling coatings system for offshore production units shall have antifouling technology for static condition with proved efficiency.

5.1.5. The following technologies are recognized as acceptable:

- a) Fouling release
- b) Fouling defense
- c) Silyl acrylate static

5.1.6. The antifouling coating systems shall have at least 5 years of track record.

5.1.7. Other antifouling technologies shall be submitted for PETROBRAS approval.

5.1.8. The minimum thickness of the film is 100 µm per coat by means of airless spray gun.

5.1.9. The paint manufacturer shall provide assurance on the performance of the anti-fouling system. The number of coats and the dry film thickness per coat shall be calculated by the paint manufacturer and applied considering scheme for minimum of 5 years of operation, given the current speed provided for the installation and the installation area.

5.1.10. In case of a second dry docking during construction, support blocks shall be alternated so area of hull in contact with block is not the same as area in previous dry docking.

5.1.11. The presence of an antifouling active system does not eliminate the need of the application of the antifouling coating system.

5.1.12. The antifouling coating shall be free of flaws and surface irregularities, as they provide preferred site for biofouling.

5.1.13. Quality control during and after the antifouling coating system application shall be according to contractual requirements applicable to painting and anticorrosive coatings.

5.2. Mechanical Antifouling Methods

5.2.1. While in commissioning and pre-operation, the ship shall keep the pumps aspiring of all sea chests of engine room, to minimize fouling due to the constant flux, as applicable. When operating in locals with low depth and with many sediment in the bottom, the operation shall be done only by high sea-chests.

5.2.2. A plan of alternation in the use of sea chests shall be adopted to prevent the biofouling.

6. COMPLIANCE INSPECTION OF ANTIFOULING SYSTEM

6.1. The compliance inspection of antifouling system is a visual inspection to be performed after exposure of the ship to seawater or riverine water for the purpose of checking the biofouling rating, and the presence of exotic species.

6.2. It is mandatory to perform unit inspection and proper approval within 30 days before its movement between sites and/or transfer to the operator.

6.3. Periodic inspection of the area in contact with seawater or riverine water of the unit shall be performed at the discretion of the CONTRACTOR.

6.4. The CONTRACTOR shall emit a procedure of compliance inspection of antifouling system. The document shall be approved by a biologist, oceanographer or a qualified professional responsible.

6.4.1. The inspection shall be carried out by ROV or divers, comprising the surface in contact with water, including niche areas.

6.5. The Biofouling Rating (FR) is shown in Table 1.

Table 1 – Biofouling Rating

Type	Biofouling Rating (FR)	Description
Soft	0	Clean surface, free of fouling. Visible red or black antifouling paint.
Soft	10	Light shadows of red and green (incipient slime). Visible red or black antifouling paint under the slime.
Soft	20	Dark green slime with yellow or brown areas. Painting can be obscured by fouling.
Soft	30	Grass filaments up to 3 inches length (76 mm), projections up to ¼ inch height (6,4 mm); or a fixed network of filaments, in green, yellow or brown color; or soft fouling non-calcareous such as sea cucumbers, sea grapes, or sea squirts up to ¼ inch height (6,4 mm). The fouling can not be easily cleaned by hand.
Hard	40	Caucareous fouling in worms form up to ¼ inch of diameter or height.
Hard	50	Calcareous fouling in barnacles form up to ¼ inch of diameter or height.
Hard	60	Combination of tube worms and barnacles, up to ¼ inch (6,4 mm) of diameter or height .
Hard	70	Combination of tube worms and barnacles, greater than ¼ inch of diameter or height.
Hard	80	Tube worms compactly growing vertically from the surface. Layer of barnacles growing top of each other up to ¼ inch height. Calcareous shells appear clean or in white color.
Hard	90	Dense growth of tube worms with barnacles, greater than ¼ inch height; Calcareous shells in brown color (oysters and mussels); or overlaid with slime or grass.
Mixed	100	Present all forms of fouling, soft and hard, particularly animals without calcareous covering, growing along various forms of harsh production.

6.6. The compliance inspection shall evaluate the following criteria:

a) Biofouling Rating. The maximum allowable biofouling is FR30. It is not permissible macrofouling. For photographic reference of biofouling rating, see Annex A, informative.



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b) Presence of exotic species. Shall be confirmed the absence of invasive species.

6.6.1. If items a) and b) are disapproved, the CONTRACTOR shall carry out surface cleaning.

6.7. A report of compliance inspection for movement authorization or transferring to the operator shall be duly approved by biologist, oceanographer or a qualified professional responsible.

6.7.1. The inspection report shall be submitted to supervisor for evaluation and approval of the movement or transfer.

6.7.2. Annex B consists of a model of report with minimum information.

6.8. Concomitantly with the compliance inspection of antifouling system, a visual inspection of the coating integrity shall be performed by a qualified painting inspector according to ABNT NBR 15218.

6.8.1. The integrity of the antifouling coating system shall be confirmed. It is not permissible scratches, blistering, cracking and delamination.

6.9. The CONTRACTOR shall emit a procedure for coating integrity inspection, approved by painting inspection N2.

6.9.1. Annex C consists of a model of report with minimum information.

7. CLEANING

7.1. The cleaning shall be performed up to 30 days before the movement between sites if identified macrofouling (greater than FR30) or the presence of exotic species.

7.2. Periodic cleaning of microfouling as a preventive action from damage to antifouling system may be performed at the discretion of the CONTRACTOR.

7.3. The cleaning procedure shall be developed considering local legislation, with suitable methods for eliminate the biofouling, using cleaning techniques that do not damage the paint system applied.

7.4. Cleaning effectiveness shall be verified by visual inspection in accordance with the compliance inspection procedure of the antifouling system.

7.5. After verifying the cleaning effectiveness, the antifouling coating system shall be visually inspected regarding faults and damages caused by the cleaning process.

7.6. Waste

7.6.1. The waste contention during scraping must be done.

7.6.2. The treatment of waste from the cleaning of the ship or other activity shall meet the Law nº 12.305/12 (National Policy on Solid Waste) or local laws.

ANNEX A**Biofouling Scale
(Informative)¹**

Figure 1: FR10, covering 30% of the surface area.



Figure 2: FR10, covering 100% of the surface area.

¹ Source: S9086-CQ-STM-010. NAVAL SHIPS' TECHNICAL MANUAL. CHAPTER 081. WATERBORNE UNDERWATER HULL CLEANING OF NAVY SHIPS



Figure 3: FR20, covering 80% of the surface area.



Figure 4: FR30, covering 40% of the surface area.



Figure 5: FR40, covering 20% of the surface area.



Figure 6: FR40, covering 30% of the surface area.



Figure 7: FR40, covering 90% of the surface area.



Figure 8: FR50, covering 20% of the surface area.



Figure 9: FR50, covering 40% of the surface area.



Figure 10: FR-50, covering 100% of the surface area.

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Figure 11: FR-60, covering 15% of the surface area.

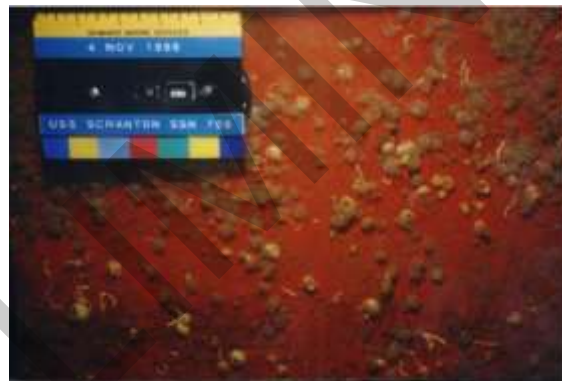


Figure 12: FR-60, covering 20% of the surface area.



Figure 13: FR-60, covering 90% of the surface area.

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Figure 14: FR-70, covering 20% of the surface area.



Figure 15: FR-70, covering 80% of the surface area.



Figure 16: FR-80, covering 80% of the surface area.



Figure 17: FR-80, covering 60% of the surface area.



Figure 18: FR-80, covering 90% of the surface area.

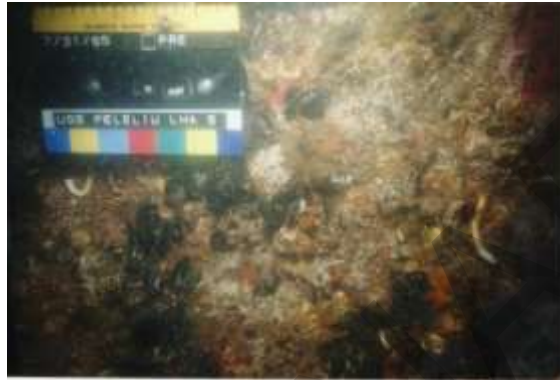


Figure 19: FR-90, covering 90% of the surface area.

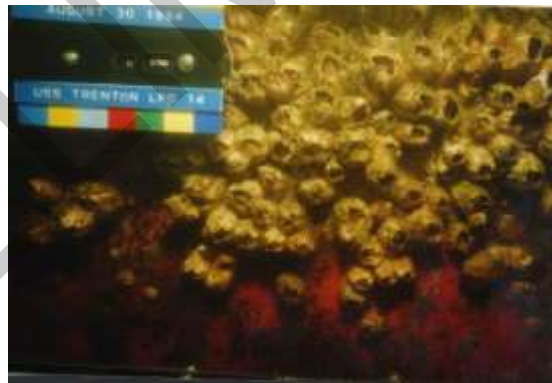



Figure 20: FR-90, covering 90% of the surface area.



Figure 21: FR-100, covering 50% of the surface area.



Figure 22: FR-100, covering 50% of the surface area.

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ANNEX B

**Model of Report of Compliance Inspection of Antifouling System
(Model)**

	REPORT OF COMPLIANCE INSPECTION OF ANTIFOULING SYSTEM	Nº: SHEET: 01 / 01
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PROJECT:

CLIENT: _____ **LOCAL:** _____

REFERENCE DOCUMENTS (Procedures, Reference Standards, Drawings etc.) **REV.**

INSPECTION EQUIPMENT/MEASUREMENT (Description / Code / Number)

INSPECTION RESULT

SHIP AREA	PHOTO	BIOFOULING RATING:
		EXOTIC SPECIES:
		BIOFOULING RATING:
		EXOTIC SPECIES:
		BIOFOULING RATING:
		EXOTIC SPECIES:
		BIOFOULING RATING:
		EXOTIC SPECIES:

OBSERVATION:

RESULT: [] DISAPPROVED [] APPROVED **NCR Nº:**

INSPECTOR / DATE	RESPONSIBLE / DATE	SUPERVISOR / DATE

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ANNEX C**Model of Integrity Inspection Report of Antifouling Coating System
(Model)**

	INTEGRITY INSPECTION REPORT OF ANTIFOULING COATING SYSTEM	Nº: SHEET: 01 / 01
PROJECT:		
CLIENT:		LOCAL:
REFERENCE DOCUMENTS (Procedures, Reference Standards, Drawings etc.)		REV.
INSPECTION EQUIPMENT/MEASUREMENT (Description / Code / Number)		
INSPECTION RESULT		
SHIP AREA	PHOTO	COATING CONDITION:
SHIP AREA	PHOTO	COATING CONDITION:
SHIP AREA	PHOTO	COATING CONDITION:
SHIP AREA	PHOTO	COATING CONDITION:
OBSERVATION:		
RESULT: [] APPROVED [] DISAPPROVED		NCR Nº:
INSPECTOR / DATE	RESPONSIBLE / DATE	SUPERVISOR / DATE