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0	ORIGINAL (Cancels and substitutes I-ET-3010.00-5400-947-PPC-023_C – FIRE FIGHTING EQUIPMENT)
A	REVIEWED WHERE INDICATED DUE TO CONSISTENCY ANALYSIS
B	REVIEWED WHERE INDICATED
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SUMMARY

SUBJECT **SHEET**

1 SCOPE

This specification defines guidelines and minimum requirements for supplying of Firefighting Equipment to be installed in an offshore unit.

2 ABBREVIATIONS

- DPC – Diretoria de Portos e Costas.

3 APPLICABLE REGULATIONS, CODES AND STANDARDS

Regulations to be followed in the design, installation and testing of the firefighting equipment are stated below. SUPPLIER shall produce evidence of having complied with all regulations, always in their latest editions, as well as with the requirements defined in this specification. In case of items in conflict with this document, PETROBRAS shall be consulted.

3.1 IMO - SOLAS: Convention for the Safety of Life at Sea – 1974 and Amendments in Force.

3.2 Applicable requirements of Brazilian Maritime Authority (DPC) – NORMAM.

3.3 Requirements of the Classification Society of the Unit.

3.4 NFPA 11 – Standard for Low-, Medium-, and High-Expansion Foam.

3.5 NFPA 1961 – Standard on Fire Hose.

3.6 NFPA 1963 – Standard for Fire Hose Connections.

3.7 Astm B 124 – Standard Specification For Copper And Copper Alloy Forging Rod, Bar, And Shapes.

3.8 ABNT NBR 14349:1999 - União para mangueira de incêndio - Requisitos e métodos de ensaio.

4 TECHNICAL REQUIREMENTS

4.1 Fixed Water/Foam Monitor

4.1.1 Fixed Water/Foam Monitors shall be used for fighting fires wherever there is equipment running on liquid fuels.

4.1.1.1 All firefighting equipment, piping and fittings shall be suitable for operating with sea water, in a marine environment. In order to avoid galvanic corrosion, if

different materials are used in equipment, piping and fittings, compatible materials or properly isolation shall be adopted.

4.1.2 Monitors are to be connected directly to the fire water ring main to extinguish hydrocarbons fires within hull hazardous areas and process plant areas.

4.1.3 Monitors shall rotate horizontally through 360º and move upwards vertically through 70º and downwards at least 60º.

4.1.4 Monitor shall be provided with:

4.1.4.1 Flow stabilizer with length that guarantees performance, an internal threaded inlet and an external threaded outlet, both 2 ½" NH 7 ½ t.p.i.

4.1.4.2 Nozzle adjustable for solid jet or mist with an internal threaded inlet 2 ½" NH 7 ½ t.p.i. made of ASTM B 62 bronze.

4.1.4.3 A hand-operated lock made of stainless steel to enable monitor to remain at any position chosen by the user.

4.1.4.4 Lever arm or handle to move it horizontally and vertically.

4.1.4.5 3" flanged inlet connection, according to Petrobras' Piping Specification.

4.1.5 Monitor shall be painted with safety red color (Munsell 5R 4/14), except for discharge pipe and tip which shall be chrome-plated.

4.1.6 Design Data (Monitor Sizing)

4.1.6.1 Minimum discharge flow: as defined in the Purchase Order, according to specific design characteristics of the Unit.

4.1.6.2 Working pressure: as defined in the purchase order, according to specific design characteristics of the Unit.

4.1.6.3 Minimum reach: as defined in the purchase order, according to specific design characteristics of the Unit.

4.1.6.4 Fluid: sea water and foam solution.

4.1.6.5 Fire water ring main design pressure: as defined in the purchase order, according to specific design characteristics of the Unit.

4.1.6.6 Hydrostatic test pressure: 1.5 system design pressure.

4.2 Portable Water Monitor

4.2.1 The portable water monitor shall be fixed to the base by means of claws. The monitor body shall be made of a non-ferrous material. Both monitor inlets shall be provided with 2 ½" STORZ type adapters and check valves.

4.2.2 Portable water monitor shall rotate 360º and move upwards at least 80º.

4.2.3 Portable water monitor shall be provided with:

4.2.3.1 Flow stabilizer pipe with length that guarantees performance, an internal threaded inlet and an external threaded outlet, both 2 ½" NH 7 ½ t.p.i.

4.2.3.2 Nozzle made of ASTM B 62 bronze, adjustable for solid jet or mist with an internal threaded inlet 2 ½" NH 7 ½ t.p.i.

4.2.3.3 A hand-operated lock made of stainless steel, to enable monitor to remain at any position chosen by the user, and for rotating horizontally.

4.2.3.4 Device to make it operationally flexible and to be kept in continuous movement if required.

4.2.4 Portable water monitor shall be painted with safety red color (Munsell 5R 4/14), except for discharge pipe and tip which shall be chrome-plated.

4.2.5 Design data (monitor Sizing):

4.2.5.1 Minimum discharge flow: 40 m3/h.

4.2.5.2 Working pressure: 570 kPa.

4.2.5.3 Minimum reach of solid discharge: 30 m.

4.2.5.4 Fluid: sea water and foam solution.

4.2.5.5 Fire main design pressure: as defined in the purchase order, according to specific design characteristics of the Unit.

4.2.5.6 Hydrostatic test pressure: 1.5 system design pressure.

4.2.5.7 Maximum weight: 20 kg.

4.3 Firefighting Equipment Locker

4.3.1 The Locker outfits shall be used to help in fighting fires and will be defined according to the type of firefighting system required for each area, as follows:

4.3.1.1 Water firefighting for internal areas.

4.3.1.2 Water firefighting for external areas.

4.3.1.3 Water and foam firefighting for external areas.

4.3.2 For open areas, SUPPLIER shall provide Locker made of fiberglass, with supports (legs). Locker and legs shall be painted in safety red color (Munsell 5R 4/14) and shall have enough resistance to support the weight of the outfits listed

in item 4.4. Otherwise, for enclosed areas, SUPPLIER shall provide Lockers made of steel.

4.3.3 Door hinges and latches shall be made of stainless steel, admiralty brass, or other material with similar mechanical and corrosion resistance, to enable easy opening in emergency situations.

4.3.4 The following legend shall be written on the front of the Locker: “COMBATE A INCÊNDIO COM ÁGUA” (Water Firefighting Equipment) or “COMBATE A INCÊNDIO COM ÁGUA E ESPUMA” (Water and Foam Firefighting Equipment), according to the case. Letters shall be in white and stand 70 mm high, 40 mm in width, 10 mm thick and 5 mm apart.

4.3.5 The internal face of each Locker’s door shall have a list of the stored materials.

4.3.6 Lockers shall have internal metallic supports made of stainless steel, admiralty brass, or similar material (corrosion and resistance) for nozzle and wrenches fixing and arranged for easy access.

4.4 Locker Outfits

4.4.1 Water firefighting Lockers for internal areas (1 x 1 ½” Hydrant outlet) shall contain:

4.4.1.1 2 (two) 1 ½” (38 mm) fire hoses, 15 m in length, with STORZ type coupling.

4.4.1.2 1 (one) 1 ½” (38 mm) nozzle adjustable for full jet or fog with STORZ type coupling.

4.4.1.3 2 (two) joint wrenches 2 ½” x 1 ½” for connections type STORZ, in brass (ASTM B 124).

4.4.2 Water firefighting Lockers for Accommodation external areas and Hull internal areas (2 x 1 ½” Hydrant outlets) shall contain:

4.4.2.1 4 (four) 1 ½” (38 mm) fire hoses, 15 m in length, with STORZ type coupling.

4.4.2.2 2 (two) 1 ½” (38 mm) nozzles adjustable for full jet or fog with STORZ type coupling.

4.4.2.3 4 (four) joint wrenches 2 ½” x 1 ½” for connections type STORZ, in brass (ASTM B 124).

4.4.3 Water firefighting Lockers for external areas (2 x 2 ½” Hydrant outlets) shall contain:

4.4.3.1 2 (two) 2 ½" (65 mm) fire hoses, 15 m in length, with STORZ type coupling.

4.4.3.2 3 (three) 1 ½" (38 mm) fire hoses, 15 m in length, with STORZ type.

4.4.3.3 1 (one) 2 ½" (65 mm) nozzles adjustable for full jet or fog with STORZ type coupling.

4.4.3.4 2 (two) 1 ½" (38 mm) nozzles adjustable for full jet or fog with STORZ type coupling.

4.4.3.5 2 (two) 2 ½" x 1 ½" bronze or admiralty brass reductions.

4.4.3.6 1 (one) 2 ½" x (2x) 1 ½" "Y" branch with bronze or admiralty brass ball check valves and with inlets and outlets provided with STORZ type coupling.

4.4.3.7 4 (four) joint wrenches 2 ½" x 1 ½" for connections type STORZ, in brass (ASTM B124).

4.4.4 Water and foam firefighting Lockers for external areas (2 x 2 ½" Hydrant outlets) shall contain, for process areas, the same content required in item 4.4.3, complemented as follows:

4.4.4.1 Canceled.

4.4.4.2 1 (one) in-line eductor of 1 ½" (38 mm) able to supply a rate of 200 liters/minute at 350 kPa at branch tip, with 30 m of 1 ½" (38 mm) hose, a foam solution consisting of 97% water and 3% of type Aqueous Film Forming Foam (A.F.F.F). In-line eductor shall be made of ASTM B 62 bronze, connections 1 ½" (38 mm) STORZ type, and respective pick-up pipes to be coupled thereto. Eductor shall be painted red color (Munsell 5R 4/14).

4.4.4.3 4 (four) AR-AFFF or AFFF (to be defined in Basic Design according to the fluid subject to fire) foam containers (50 liters each).

4.4.4.4 1 (one) 1 ½" (38 mm) hand-line foam nozzle (a rate of 200 liters/minute), with STORZ type coupling for hydrocarbons and/or polar solvent firefighting: AR-AFFF 3% or AFFF 3%.

4.5 Firefighting Hoses

4.5.1 Hoses shall be made of synthetic fiber in layer, double lined with rubber, designed according to NFPA 1961. Connections shall be provided with STORZ type coupling (see item 3.8)

4.6 Nozzles

4.6.1 2 ½" (65 mm) water nozzle:

4.6.1.1 Brass (ASTM B 124) jet and mist nozzle type adjustable up to 120o and 2 ½" STORZ type coupling. The nozzles should be capable to pass directly from full jet to fog (mist) without closing.

4.6.2 1 ½" (38 mm) water nozzle:

4.6.2.1 Brass (ASTM B 124) jet and mist nozzle type, adjustable up to 120º and 1½" STORZ type coupling. The nozzles should be capable to pass directly from full jet to fog (mist) without closing.

4.6.3 Hand-lines Foam Nozzle

4.6.3.1 Brass pipes, basket in cast aluminum, adapter in high resistant cast brass, sealing in neoprene and finishing in chromium-plated, 1 ½" (38 mm) coupling.

4.6.4 Helideck Locker

4.6.4.1 The Locker outfits shall be instaled near the helideck area.

4.6.4.2 SUPPLIER shall provide Locker made of fiberglass, with metallic supports (legs). Locker and legs shall be painted safety red color (Munsell 5R 4/14) and shall have enough resistance to support the weight of the outfits listed in item 4.3.2.

4.6.4.3 Door hinges and latches shall be made of stainless steel, admiralty brass, or other material with similar mechanical and corrosion resistance, to enable easy opening in emergency situations.

4.6.4.4 The following legend shall be written on the front of the Locker: "ARMÁRIO DE EQUIPAMENTO DE HELIPONTO" (Helideck's Outfit Locker). Letters shall be in white and stand 70 mm high, 40 mm in width, 10 mm thick and 5 mm apart.

4.6.4.5 The internal face of each Locker's door shall have a list of the stored materials.

4.6.4.6 Lockers shall contain, at least, the outfits as required by NORMAM 27, last edition.

4.6.5 Fireman's Outfit Locker

4.6.5.1 The outfit locker shall contain personal protective equipment used to firefighting and rescue.

4.6.5.2 For open areas, SUPPLIER shall provide locker made of fiberglass, with metallic supports (legs). Locker and legs shall be painted in safety red color (Munsell 5R 4/14) and shall have enough resistance to support the weight of

the outfits listed in item 4.6.5.6. Otherwise, for enclosed areas, SUPPLIER shall provide Lockers made of steel.

4.6.5.3 Door hinges and latches shall be made of stainless steel, admiralty brass, or other material with similar mechanical and corrosion resistance, to enable easy opening in emergency situations.

4.6.5.4 The following legend shall be written on the front of the Locker: “ARMÁRIO DE EQUIPAMENTO DE APOIO À BRIGADA” (Fireman’s Outfit Locker). Letters shall be in white and stand 70 mm high, 40 mm in width, 10 mm thick and 5 mm apart.

4.6.5.5 The internal face of each Locker’s door shall have a list of the stored materials.

4.6.5.6 Lockers shall contain, at least, the outfits required by SOLAS, but not less than the following:

- 2 (two) breathing apparatus with 2 spare air cylinders.
- 5 (five) complete sets of protective clothing to approach to the fire, light type, being.
  - 1- size G (large) for coat and pants
  - 2- size GG (large plus) for coat and pants
  - 2- size XG (extra-large) for coat and pants
- 2 (two) portable flashlights suitable for areas classified as Group IIA, Zone 1, T3.
- 2 (two) fireproof safety-belts, with lifeline 30 m long, steel lines or compatible coated with fireproof material.
- 2 (two) fireman’s axe, 3 to 5 kg in weight with side stops.
- 2 (two) 1 m long crowbar.

4.6.6 Protective Clothing

4.6.6.1 Clothing shall allow an approach to the fire, providing protection against the effects of the heat radiation, and shall have sufficient mobility for a comfortable and safe lowering, rising and walking.

4.6.6.2 Clothing shall consist of:

- Helmet for firefighter: rigid, fireproof and impact resistant, suitable for use with breathing apparatus, comprising:
  - Shell in fiberglass with fireproof reflective strips.

- Brim, longer on the helmet back portion to avoid fall of products and water inside firefighter's coat. Protected with rubber on edge to avoid damage or cracking.

- Impact absorption set consisting of expanded foam internal lining, shock absorbing six-point crown strap assembly, adjustable headband size by means of a ratchet on helmet's back.

- Chinstrap with quick release device attached to helmet's shell.

- Articulated face protector, made of polycarbonate or other thermoplastic compatible material, transparent, optically correct, high temperature and impact resistant, 4 mm thickness a 100 mm high.

- Ear / neck protector in aramid fiber textile, fire-retardant.

- Cap, balaclava type, made of aramid fiber textile, fire-retardant, with eye openings, 300 g/m^2, meta-aramid double sewing threads in an overlock sewing machine.

- Coat for firefighter approach, made of several layers, comprising:

  - Coat with ¾ of length, external or first layer in aramid fiber textile, fire-retardant, serge 2 x 1, specifically warp and woof, being 75% of meta-aramid fiber textile, 23% of para-aramid fiber textile and 2% antistatic fiber textile, weighing 200 g/m^2, long sleeves, internal wristband in anti-flame textile with a thumb strip, lapel with Velcro closing, a 17 x 8 x 6 cm pocket at left side sewed at breast level for portable radio, tab with Velcro closing, brand logo "BR" with a 3 mm width white contour, 25 x 20 x 4 cm external pocket type cargo, sewed at right side, tab with total Velcro closing, with a 11 cm high clerical collar completely protecting the nape and neck, double frontal Velcro closing and three clasps with quick coupling in stainless steel.

  - Para-aramid double sewing threads, flame resistant, in an overlock sewing machine.

  - Sizes according to Correspondence Table (Table 1).

  - Textile preferably in sea contrasting colors.

  - Parallel strips in gray and lemon yellow, each with 50 mm width, reflective, sewed on placket, front and back, wrist and hem, separated by a distance of 100 mm.

  - Second layer, internal, in polyurethane, 120 g/m^2, actuating as steam barrier.

  - Third layer, internal, in meta-aramid textile, 300 g/m^2, actuating as heat barrier.

  - Fourth layer, internal, in viscose of meta-aramid textile, to provide user comfort.

  - Pants for firefighter approach, made of several layers, comprising:

- Pants of external or first layer in aramid fiber textile, fire-retardant, sarge 2 x 1, specifically warp and woof, being 75% of meta-aramid fiber textile, 23% of para-aramid fiber textile and 2% antistatic fiber textile, weighing 200 g/m^2, with elastic band on waist and adjustable suspenders.

- Meta-aramid double sewing threads, flame resistant, in an overlock sewing machine.

- Sizes according to Correspondence Table (Table 2).

- Textile preferably in sea contrasting colors.

Table1 – Size correspondence for Coats - (Brazilian sizes).

SIZE CORRESPONDENCE TABLE – COVER				
SIZE	48	50	52	54
LENGTH (A)	86	89	92	95
SHOULDERS (B)	17	18	19	20
SLEEVES (C)	60	62	64	66
TORAX (D)	60	62	64	66

Table 2 – Size correspondence for Pants (Trousers) - (Brazilian sizes).

SIZE CORRESPONDENCE TABLE - PANTS				
SIZE	42-44	46-48	50-52	54-56
	M	G	GG	XG
LENGTH	103	105	107	109
WAIST	52	54	56	58
BETWEEN LEGS	74	75	76	77
HIP	52-54	56-58	60-62	64-66
LEG OPENING	27	27	27	27

- Boots for firefighter, comprising:

  - Boot made of special rubber, totally seamless and impermeable, tall type up to 38 cm high protecting up to the ankle, loops for easy put-on.

  - Shall be furnished with anti-slipping open profile sole, thermal and dielectrical insulation, toe lined with anti-flame material, combining meta-aramid and para-aramid.

  - Model shall cover sizes 35 up to 46 (Brazilian sizes).

  - Reflective on heel of 170 candles.

- Leather gloves, comprising:
  - Shall have several layers, cutting and abrasion resistant.
  - Internal layers of flame-resistant fibers, weighing 300 g/m^2, providing a heat barrier.
  - Minimum length of 25 cm, wrist of fiber textile flame resistant, weighing 300 g/m^2.
  - Sewing with para-aramid threads.
- Sizes medium and large.

4.6.7 Safety Belt with Lifeline

4.6.7.1 Safety belt shall be made of fireproof material and shall be adjustable in a way that the buckle that takes the lifeline can be safely fixed or withdrawn by the user.

4.6.7.2 Belt-hook shall be made of bronze or other material with similar mechanical and corrosion resistance, and able to withstand a one-meter fall under a load of 7.5 N.

4.6.7.3 Lifeline shall be made of stainless steel or galvanized steel or of a compatible material (corrosion and resistance). It shall be fireproof with at least 30 m long and able to withstand a pull of 3.5 kN for 5 min without failure.

4.7 Hydrant

Hydrants shall be used in firefighting to provide fire water to hoses and accessories.

4.7.1 Hydrant for External Areas

4.7.1.1 The hydrant for external area consists in two outlets with angular valves connected to a pipe pillar.

4.7.1.2 Hose coupling shall comply with Brazilian standards ABNT NBR 14349:1999.

4.7.1.3 The valves shall be of the angular type (65 mm (2 ½") or 38 mm (1 ½"), according to bellow:

- Working pressure - 1370 kPa (14.0 kgf/cm^2).
- Sealing test pressure (closed valve) - 1724 kPa (17.5 kgf/cm^2).
- Body hydrostatic test pressure - 2800 kPa (29 kgf/cm^2).
- Body and internal sides of bronze ASTM B 62.

- Inlet with internal screw thread 2 ½" – 8 NPT (ASME B1.20.1) or 1 ½" – 8 NPT (ASME B1.20.1) and outlet with external screw thread 2.5 – 7.5 NH (NFPA 1963).

- Spindle with center of 19.0 mm (3/4") diameter and external screw thread ACME (ASME B1.5) with 6 wires per inch.

- Socket valve handle with square section with 12.7 mm (1/2") side; non-fixed sealing disc to the spindle with neoprene ring and vertical displacement until a position above the discharge mouth.

- Valve handle with 152.4 mm (6") diameter in nodular iron ASTM A 536, brass ASTM B 36 or aluminum alloy SAE 323, (v.SAE J 453c) in a manner that the valve handle is capable to resist a 90 N.m (918 kgf.cm) torque applied to the hoop or radius without present a visible deformation, cracks or any type of failure; the spindle fastening shall be by a 6.3 mm (1/4") washer and bolt.

4.7.1.4 Outlets**:**

- Nominal diameter (Hose side): 1 ½" (38 mm); or

- Nominal diameter (Hose side): 2 ½" (65 mm).

- Two outlets per hydrant.

4.7.1.5 Material specification:

- Cu / Ni (90/10) - Pipe Spec B7 or B7R, according to Petrobras' Piping Specification.

- Hydrant piping (1 ½", 2 ½" and 4") shall be supplied with flanged end, according to Pipe Spec B7 or B7R, Petrobras' Piping Specification.

4.7.1.6 Hydrants and angular valves shall be painted with safety red color (Munsell 5r 4/14).

4.7.2 Hydrant for Internal Areas

4.7.2.1 The hydrant for internal area consists in a single angular valve connected to a 1 ½" pipe pillar.

4.7.2.2 Hose adapter and plug shall be according to NFPA-1963 standard.

4.7.2.3 The valve shall be of the angular type 38 mm (1 ½"), according to bellow:

- working pressure - 1400 kPa (14.5 kgf/cm^2).

- sealing test pressure (closed valve) - 1724 kPa (17.5 kgf/cm^2).

- body hydrostatic test pressure - 2800 kPa (29 kgf/cm^2).

- body and internal sides of bronze ASTM B 62.

- inlet with internal screw thread 1 ½" – 8 NPT (ASME B1.20.1) and outlet with external screw thread 2.5 - 7.5 NH (NFPA 1963).

- spindle with center of 19.0 mm (3/4") diameter and external screw thread ACME (ASME B1.5) with 6 wires per inch.

- socket valve handle with square section with 12.7 mm (1/2") side; non-fixed sealing disc to the spindle with neoprene ring and vertical displacement until a position above the discharge mouth.

- valve handle with 152.4 mm (6") diameter in nodular iron ASTM A 536, brass ASTM B 36 or aluminum alloy SAE 323, (v.SAE J 453c) in a manner that the valve handle is capable to resist a 90 N.m (918 kgf.cm) torque applied to the hoop or radius without present a visible deformation, cracks or any type of failure; the spindle fastening shall be by a 6.3 mm (1/4") washer and bolt.

4.7.2.4 Outlets:

- Nominal diameter (Hose side): 1 ½" (38 mm).

- One outlet per hydrant.

4.7.2.5 Material specification:

- Cu / Ni (90/10) - Pipe Spec B7 or B7R, according to Petrobras' Piping Specification.

- Hydrant piping (1 ½") shall be supplied with flanged end, according to Pipe Spec B7 or B7R, Petrobras' Piping Specification.

4.7.2.6 Hydrant and angular valve shall be painted with safety red color (Munsell 5r 4/14).