

# Engineering Standard

SAES-B-009

15 March 2006

## Fire Protection and Safety Requirements for Offshore Production Facilities

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## Saudi Aramco DeskTop Standards

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## 1 Scope

This Standard provides mandatory requirements for the design and installation of fire protection and safety features of offshore production facilities, including platforms for tie-in, gas-oil separation, gas compression, accommodations, and wellheads.

## 2 Conflicts and Deviations

- 2.1 Any conflicts between this Standard and other applicable Saudi Aramco Engineering Standards (SAESs), Saudi Aramco Materials System Specifications (SAMSSs), Saudi Aramco Standard Drawings (SASDs), or industry standards, codes, and forms shall be resolved in writing by the Company or Buyer Representative through the Manager, Loss Prevention Department of Saudi Aramco, Dhahran.
- 2.2 Direct all requests to deviate from the Standard in writing to the Company or Buyer Representative, who shall follow internal company procedure SAEP-302 and forward such requests to the Manager, Loss Prevention Department of Saudi Aramco, Dhahran.

## 3 References

All referenced Specifications, Standards, Codes, Forms, Drawings, and similar material shall be considered part of this Standard to the extent specified herein and shall be the latest issue (including all revisions, addenda, and supplements) unless stated otherwise.

### 3.1 Saudi Aramco Engineering Standards

#### Saudi Aramco Engineering Procedure

<i>SAEP-302</i>	<i>Instructions for Obtaining a Waiver of a Mandatory Saudi Aramco Engineering Requirement</i>
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#### Saudi Aramco Engineering Standards

<i>SAES-A-105</i>	<i>Noise Control</i>
<i>SAES-B-006</i>	<i>Fireproofing in Onshore Facilities</i>
<i>SAES-B-017</i>	<i>Fire Water System Design</i>
<i>SAES-B-019</i>	<i>Portable, Mobile, Special Fixed Firefighting Equipment</i>
<i>SAES-B-054</i>	<i>Access, Egress, and Materials Handling for Plant Facilities</i>
<i>SAES-B-055</i>	<i>Plant layout</i>

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<i>SAES-B-058</i>	<i>Emergency Isolation, Shutdown, and Depressuring</i>
<i>SAES-B-063</i>	<i>Aviation Obstruction Marking and Lighting</i>
<i>SAES-B-067</i>	<i>Safety Identification and Color-Coding</i>
<i>SAES-B-068</i>	<i>Electrical Area Classification</i>
<i>SAES-H-101</i>	<i>Approved Protective Coating Systems</i>
<i>SAES-J-505</i>	<i>Combustible Gas and Hydrogen Sulfide in Air Detection Systems</i>
<i>SAES-J-601</i>	<i>Emergency Shutdown and Isolation Systems</i>
<i>SAES-K-001</i>	<i>Heating, Ventilating, and Air-Conditioning (HVAC)</i>
<i>SAES-K-002</i>	<i>Air Conditioning Systems for Essential Operating Facilities</i>
<i>SAES-L-005</i>	<i>Limitations on Piping Components</i>
<i>SAES-L-008</i>	<i>Selection of Valves</i>
<i>SAES-L-032</i>	<i>Materials Selection for Piping Systems</i>
<i>SAES-M-005</i>	<i>Design and Construction of Fixed Offshore Platforms</i>
<i>SAES-P-114</i>	<i>Power System and Equipment Protection</i>
<i>SAES-P-116</i>	<i>Switchgear and Control Equipment</i>
<i>SAES-S-020</i>	<i>Industrial Drainage and Sewers</i>
<i>SAES-S-050</i>	<i>Sprinkler and Standpipe System Components in Buildings</i>
<i>SAES-T-481</i>	<i>Powered In-Plant Communications</i>

Saudi Aramco Standard Drawing

<i>AA-036248</i>	<i>Offshore Helidecks Types 1 &amp; 2 Plans and Elevation</i>
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3.2 Industry Standards Codes and Standards

American Society for Testing and Materials

<i>ASTM E119</i>	<i>Standard Test Methods for Fire Tests of Building Construction and Materials</i>
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American Petroleum Institute

*API RP 500 Recommended Practice for Classifications of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2*

National Fire Protection Association

*NFPA 12A Halon 1301 Fire Extinguishing Systems*  
*NFPA 13 Installation of Sprinkler Systems*  
*NFPA 15 Water Spray Fixed Systems for Fire Protection*  
*NFPA 17 Dry Chemical Extinguishing Systems*  
*NFPA 20 Standard for the Installation of Centrifugal Fire Pumps*  
*NFPA 72D Standard for the Installation, Maintenance and Use of Proprietary Protective Signaling Systems*  
*NFPA 72E Standard on Automatic Fire Detectors*

Underwriter Laboratories

*UL 1709 Standard for Safety Rapid Rise Fire Tests of Protection Materials for Structural Steel*

3.3 Definitions

**Hydrocarbon(s):** For purposes of this Standard, the word hydrocarbon(s) shall mean a flammable liquid, a combustible liquid near or above its flash point, or a combustible gas as defined in SAES-B-006.

**Manned Platform:** For purposes of this Standard, "manned platform" shall mean a platform where operating or maintenance personnel are normally found for at least one full shift each working day. Wellhead platforms are not considered to be manned platforms. Tie-in platforms not bridge-connected to other manned platforms are not considered to be manned platforms.

## 4 Design

### 4.1 Layout, Spacing, and Access

Unless otherwise stated herein, requirements in SAES-B-055 shall apply to offshore production facilities. Access and egress for personnel and materials-handling requirements for maintenance shall comply with SAES-B-054 and

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SAES-M-005. In case of requirements in SAES-B-009 which differ from those in SAES-B-054, SAES-B-009 shall govern for offshore facilities.

- 4.1.1 Control buildings or living quarters shall not be located on a platform that has hydrocarbon equipment, piping, or storage in excess of 4 m<sup>3</sup>.
- 4.1.2 Accommodations platforms, tie-in platforms that are bridge-connected to other manned platforms, manned production platforms, auxiliary platforms, and gas compression platforms shall be spaced at least 45 m from each other.
- 4.1.3 Utility equipment such as waste treatment, air compressors, and power distribution equipment shall be separated by a minimum of 15 m horizontally from hydrocarbon equipment or storage. Major power generation or distribution equipment shall be located on an auxiliary or tie-in platform which does not contain accommodations or hydrocarbon process equipment.
- 4.1.4 Maintenance shops shall not be located in electrically classified areas.
- 4.1.5 Diesel engines shall be located at least 7.5 m horizontally from fire-hazardous equipment. In electrically classified areas, diesel engines shall be designed to limit their potential as ignition sources, including provision with the following features: air-start system, water-cooled exhaust manifold, water injection into the exhaust system, and engine auxiliary equipment suitable for the area classification.
- 4.1.6 Diesel and slops tanks shall be constructed independent of tubulars, bulkheads, and decks; i.e., tubulars, bulkheads, and decks shall not be used to form the sides, tops, or bottoms of such tanks.
- 4.1.7 Helidecks shall be located in an electrically nonclassified area (except classification caused by a helicopter refueling hose box).
- 4.1.8 Atmospheric exhausts from steam or combustion gas turbines, internal combustion engines, or incinerators shall be located at least 3 m higher than any platform or access within a horizontal distance of 7.5 m.

*Exception:*

*Atmospheric exhausts from incinerators may be routed to discharge at least 1 m over the side and at least 3 m below main deck of accommodation platform on downwind side of platform, and at least 15 m from stairs, ladders, and cellar deck platforms.*

Exhausts within 15 m horizontally of helidecks shall be reviewed with Aviation Dept.

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- 4.1.9 Vents which can discharge hydrocarbons shall terminate at least 3 m above any platform, access way, pipe rack, or equipment within 7.5 m horizontally of the vent.

*Exception:*

*Slops caisson vents may be routed to a point above the 100-year storm elevation and at least 7.5 m crosswind or downwind of boat landings.*

- 4.1.10 Pump and compressor areas handling hydrocarbons shall not be enclosed.
- 4.1.11 Platforms and flare structures shall not be enclosed.
- 4.1.12 Boat landings shall be arranged and equipped in accordance with SAES-M-005.
- 4.1.13 Handrails shall be provided per SAES-B-054.
- 4.1.13.1 Deck edges with outboard drainage troughs and toe walls shall be provided with handrails but with the kick plate eliminated.
- 4.1.13.2 Front edges of boat landings shall have no permanent handrails (removable handrails are permissible).
- 4.1.14 Helidecks shall be protected by 1.5 m wide chain linkfencing cantilevered beyond the deck perimeter, in accordance with Standard Drawing AA-036248 and SAES-M-005.
- 4.1.15 For offshore GOSPs and gas compression platforms, permanent means such as crane, monorail, or trolley shall be provided for the disassembly and reinstallation of all major equipment, vessels, or valves. Access to such major equipment, vessels, or valves shall be so designed as to permit use of these means.
- Tower cranes shall not be located in fire-hazardous zones (see 4.7.3).
- 4.1.16 Laydown and equipment staging areas shall be provided and shall be identified in the Project Proposal.
- 4.1.17 For purposes of this Standard, stairways, ladders, bridges, boat landings, helidecks, and escape capsules are considered means of egress.
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- 4.1.18 At least four stairways/ladders shall be provided between each platform level, including full-size cellar decks, and the main deck of manned platforms.

*Exceptions:*

- a) *For drilling decks and cellar decks on unmanned platforms, at least one stairway is required between the cellar deck and the main deck. At least one stairway shall be provided between the cellar deck of any platform (manned or unmanned) and the boat landing. At least one stairway shall be provided between the main deck of any platform (manned or unmanned) and the boat landing (may be via the cellar deck).*
  - b) *For helidecks, one stairway and one ladder are required per AA-036248.*
  - c) *For living quarters, at least two stairways to the main deck shall be provided.*
  - d) *Half-decks shall be connected to main decks by at least two stairways, and no point on the half-deck may lie further than 25 m from a means of egress.*
- 4.1.19 For levels requiring four stairways/ladders, at least two of those four must be stairways. It is preferable to have these two stairways at opposite platform edges, with one stair positioned adjacent to the platform bridge if the bridge happens to connect to that level.
- 4.1.20 At least one set of stairways and landings leading from the boat landing and the helideck to the accommodations deck (sick bay deck) on manned platforms shall be designed to permit easy conveyance of an injured or sick man in a stretcher or Stokes litter. For this set of stairways, stair width shall be at least 1.22 m and landings shall be at least 2.44 m wide by 2.44 m long.

If the helideck is on a manned platform other than the accommodations platform, a set of stairs and landings meeting the requirements of paragraph 4.1.20 shall connect the helideck with the main deck (i.e., the deck which is bridge-connected to the accommodations platform).

- 4.1.21 All pathways providing access to equipment platform ladders, controls, emergency isolation valves, fire-fighting equipment, and safety equipment, shall have a minimum clear width of 1.22 m and have minimum head room of 2.03 m. Minimum vertical clearance above stair treads shall be 2.03 m.
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- 4.1.21.1 Minimum effective width of bridge walkways and any connecting stairways shall be 1.22 m.
  - 4.1.21.2 Minimum effective width of stairways shall be 760 mm, except as required by 4.1.20 and 4.1.21.1.
  - 4.1.22 Line-of-sight escape shall be incorporated into platform design and deck layouts to the extent practical.
  - 4.1.23 Escape routes shall be at least 1.22 m wide and clearly marked on decks.
  - 4.1.24 For restrictions on deck penetrations, see section 4.5 of this Standard.
- 4.2 Lighting
- 4.2.1 Process areas, walkways, stairs, and platforms shall be provided with illumination of at least 55 lux (5 footcandles).

*Exception:*

*On unmanned platforms, lighting is recommended. However, final decision shall rest with the Proponent Operating Department, except for mandatory navigation and aviation lighting (see paragraph 4.18).*
  - 4.2.2 Lighting fixture circuit breakers in process areas shall be installed locally.
  - 4.2.3 Local lighting shall be provided for offshore platform walkways and stairways.
  - 4.2.4 Interior emergency lighting of at least 55 (5 footcandles) lux at floor level shall be provided for exits.
  - 4.2.5 Where essential activities are expected to continue during failure of the normal lighting inside buildings, such as inside control rooms and switchgear rooms, emergency illumination of at least 110 lux (10 footcandles) at 760 mm above the floor shall be provided.
  - 4.2.6 Normal and emergency lighting of at least 220 lux (20 footcandles) shall be provided for the following:
    - a) Outside emergency equipment such as emergency telephones, shutdown and emergency isolation stations, firewater pump areas, central foam concentrate mixing area, fire control panels, and standby generators.
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- b) Evacuation assembly areas at escape capsules and boat landings. Lighting at helidecks shall comply with Standard Drawing AA-036248.

4.2.7 Emergency lighting of at least 55 lux (5 footcandles) shall be provided for escape routes.

#### 4.3 Emergency Shutdown (ESD) Systems and Isolation Valves

Design of ESD and emergency isolation systems shall meet the requirements of SAES-B-058 and SAES-J-601 except as noted below:

##### 4.3.1 Plot Limits Isolation

For offshore production facilities, the term "plot-limits" isolation (paragraph 5.2.2 of SAES-B-058) shall be construed to mean isolation of the entire platform complex. Thus, for example, all lines entering or leaving a platform complex shall have emergency isolation valves (EIVs) located on the tie-in platform as follows:

- a) EIVs shall be provided on the downstream side of the production header; on the downstream side of the test-trap header (if any); and on outgoing hydrocarbon lines.
- b) For maintenance purposes, any hydrocarbon line which goes from one platform to another shall have a manual block valve on the upstream platform. An EIV may serve as a maintenance valve. Each platform header in blowdown, flare, gravity sewer, or hydrocarbon (pressure) sewer service shall be equipped with a car-sealed-open (CSO) manual block valve, located at platform edge, to permit maintenance isolation from the main header.

*Exception:*

*EIVs are not required for unmanned platforms that are not bridge-connected to manned platforms.*

##### 4.3.2 ESD Manual Activation Devices

At least one manual device for actuation of the ESD system shall be placed on each main access of each hydrocarbon platform as well as at the helideck, at the tops of stairways to boat landings, and at, or along the escape path to, escape capsule assembly areas.

#### 4.3.3 Emergency Blowdown Systems

Process vessels containing flammable or potentially toxic liquids with true vapor pressure equal to or greater than 200 kPa (abs) (29 psia) at 54°C and designed for pressures equal to or greater than 1724 kPa (gauge) (250 psig) shall have provision for emergency vapor blowdown designed to reduce vessel pressure from initial conditions to a pressure equal to or less than 50% of the vessel's design gauge pressure within 15 minutes or less.

#### 4.3.4 Gas Detection Systems

Combustible gas detection systems shall be evaluated on a case-by-case basis. As a minimum, a combustible gas detector shall be installed inside the air intake for any control and pressurized building and inside each combustion gas turbine control cab. Air intakes to buildings which could be exposed to hydrogen sulfide in concentrations of 30 ppm or greater shall be provided with H<sub>2</sub>S detectors. High levels of either combustible gas or H<sub>2</sub>S detected in the intake air shall cause intake air to be shut off. Gas detectors shall not activate plant ESD systems. Specification and installation shall be in accordance with SAES-J-505.

### 4.4 Drainage and Sewer Systems

4.4.1 Drainage and oily water sewer systems shall be designed in accordance with SAES-S-020.

4.4.2 A deck-edge drainage trough shall be installed on (a) at least two edges of plate decks with hydrocarbon equipment or hydrocarbon storage having a capacity of 4 m<sup>3</sup> (1000 gal) or greater, and (b) on all edges of helidecks having refueling capabilities.

If troughs are installed on only two edges of a deck, the trough edges shall be opposite one another, with trough toe walls provided per SAES-S-020, and a minimum 150 mm high toe wall on any troughless edge.

4.4.3 The maximum plate deck travel distance of any liquid shall be 30 m. The subdivision of plate deck areas shall be accomplished through the use of ridge lines and deck-edge troughs. Use of in-deck troughs shall be reviewed and approved by the Chief Fire Prevention Engineer. Sealed in-deck drain points are permissible for local area drainage needs such as at scraper launchers/receivers.

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- 4.4.4 Surfaces shall drain free, with no liquid pooling. For deck slope requirements, refer to SAES-S-020.
- 4.4.5 Utility vessels, day-tanks, and equipment handling combustible liquids such as diesel fuel, lube oils, transformer oils, etc., shall be curbed and separately drained through a catch basin having a liquid seal.
- 4.4.6 Plastic or RTR piping shall not be used for offshore hydrocarbon (pressure) or oily-water (gravity) sewer systems.
- 4.5 Electrical Area Classification
  - 4.5.1 Electrical area classification for unmanned offshore platforms shall be per API RP 500. For manned platforms, area classification shall comply with SAES-B-068 with the following additions and exceptions.
  - 4.5.2 Any release source giving rise to a Class I, Div. 2 area between solid decks shall cause the entire space between the two decks to be classified Class I, Div. 2. In addition, the space within 3 m of any drainage trough shall be Class I, Div. 2.  
  
Any release source giving rise to a Class I, Div. 1 area between solid decks shall cause the entire space between the two decks beyond the Div. 1 area to be classified Class I, Div. 2.  
  
Any hydrocarbon release source or Div. 1 area boundary within 15 m of deck's edge shall require the space within 3 m of that portion of the deck edge lying within a 15 m horizontal radius of the release source or Div. 1 boundary to be classified Class I, Div. 2.
  - 4.5.3 No access hatches, ladders, or other unsealed openings shall penetrate a deck that is above a fire-hazardous zone or a deck which constitutes a physical barrier between different electrical area classifications.

*Exceptions:*

- 1) *An access hatch or opening is permissible if the hatch or opening is sealed at all times during which either of the two decks (i.e., the penetrated deck and the deck below) is in operation, or*
- 2) *An unsealed access hatch or opening is permissible if the area classification of the deck below is extended up through the access or opening to a height of 3 m above the penetrated deck and for 3 m horizontally around the perimeter of the access or opening.*

- 4.5.4 Where electrically classified areas exist above open grating decks, those classified areas shall be projected down through the structure to the next lowest solid deck.

#### 4.6 Building Construction

- 4.6.1 On platforms handling hydrocarbons, buildings shall be of noncombustible material and shall have two-hour fire-rated walls, per UL 1709 or ASTM E119, with steel exterior.
- 4.6.2 On nonhydrocarbon platforms, buildings shall be of noncombustible material and shall have one-hour fire-rated walls, per UL 1709 or ASTM E119, with steel exterior.
- 4.6.3 Interior finish materials shall be limited to materials with the following Underwriters Laboratories, Inc., fire hazard classifications:
  - a) Flame spread rating of 25 or less
  - b) Smoke developed rating of 75 or less
  - c) Flame propagation index of 4.0 or less for flooring materials.
- 4.6.4 Air-conditioning, pressurization, and ventilation shall comply with SAES-K-001 and SAES-K-002. All buildings shall be air-conditioned and, in the absence of more stringent requirements, shall have make-up air in at least the amount required by SAES-K-001. Air shall be drawn from a nonclassified area.

#### 4.7 Fireproofing

The provisions of SAES-B-006 shall be followed except as modified below.

- 4.7.1 Fireproofing is not required for vessel supports that are directly spray-protected by foam/water sprays that are automatically actuated by a fire detection system. Fireproofing is not required for piping supports if the supports or surrounding deck area is spray-protected.
  - 4.7.2 Fireproofing is not required for pile templates, platform jackets, and platform legs. Otherwise, load-bearing steel supporting a deck subject to fire exposure from hydrocarbon spills or hydrocarbon gas releases on a lower deck shall be fireproofed unless spray protection is provided on both the supported deck (either above or below the deck) and the deck below.
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- 4.7.3 The definition of fire-hazardous zone is the same as stated in SAES-B-006 except that, in the case in which a solid deck is over a fire-hazardous zone, the fire-hazardous zone shall extend up to, and include the bottom of, said solid deck.
  - 4.7.4 Structural steel fireproofing shall provide a fire resistance rating of at least two hours per UL 1709 test procedures.
  - 4.7.5 Cementitious types of fireproofing materials shall not be used for fireproofing on new offshore facilities. Use of cementitious fireproofing to repair fireproofing on existing facilities is permissible, in which case top-coating is required to prevent moisture incursion.
  - 4.7.6 Application of intumescent mastics or other proprietary fireproofing shall be performed only by manufacturer-trained and certified applicators.
  - 4.7.7 Application shall be made in strict accordance with the manufacturer's guidelines regarding ambient temperature, storage temperature, materials, proportioning, and mixing.
- 4.8 Firewater Supply and Distribution System
- Where requirements in this section differ from those in SAES-B-017, SAES-B-009 shall govern. Requirements for electrical equipment, electrical power supply feeders, and electrical protection shall be per SAES-P-114 and SAES-P-116.
- 4.8.1 Total installed firewater pumping capacity, not counting standby capacity, shall be no less than that required by the single greatest platform demand, including all fire protection systems on all decks of that platform.
  - 4.8.2 A fixed firewater system shall be provided for each bridge-connected platform of a multiplatform complex. A firewater system is not required for wellhead or tie-in platforms that are not bridge-connected to accommodations or processing platforms. Tie-in platforms bridge-connected only to wellhead platforms do not require firewater systems.
  - 4.8.3 The system shall be supplied by pumps taking suction from the sea.
  - 4.8.4 The firewater system shall be continuously pressurized by means of two jockey pumps (one normally operating and one installed 100-percent spare).
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- 4.8.4.1 Jockey pumps shall be electrically-driven, submersible pumps capable of developing at least 19 L/s at 1035 kPa (300 gpm at 150 psi).
- 4.8.4.2 Where the firewater system supplies water to the utility water system, a third jockey pump shall be provided.
- 4.8.5 Capacity firewater requirement for the platform complex shall be furnished by two or more electric submersible pumps of equal size, except as modified by 4.8.5.2.2.
  - 4.8.5.1 Additionally, standby fire pump capacity shall be provided in accordance with the following:
    - 4.8.5.1.1 If power to the platform complex is supplied by means of two separate cables, standby diesel-driven pumping capacity equal to at least the largest electric fire pump is required.
    - 4.8.5.1.2 If power to the platform complex is supplied by means of a single cable, standby diesel-driven pumping capacity equal to at least the largest fire pump is required and at least 50% of the total (i.e., capacity requirement plus standby requirement) pumping capacity must be diesel-engine driven.
    - 4.8.5.1.3 At least one diesel-driven fire pump must be located on the accommodations platform or on an adjacent nonhydrocarbon (excluding day tanks, paragraph 4.1.1) auxiliary platform.
  - 4.8.5.2 Fire pumps shall meet design flow requirements at rated flow and pressure.
  - 4.8.5.3 Fire pumps and jockey pumps shall have a constantly rising curve and shall furnish not less than 150% of rated capacity at a total head of not less than 65% of the total rated head. The total shutoff head shall not exceed 140% of total rated head for any type of pump.
  - 4.8.5.4 Firewater system connection(s) shall be provided to permit water to be supplied by a fire boat or suitably equipped tug. Connection(s) shall be sized to provide at least half the design firewater requirement for the platform complex,

assuming a boat pump discharge pressure of 1030 kPa (150 psig). Connection(s) shall terminate with check valves(s) and blind flange(s) at an access platform large enough to permit three people to maneuver and connect adapters and five-inch hoses from the fire boat.

- 4.8.5.5 Fire pump installations shall comply with the requirements of NFPA 20 with the following exceptions, additions, and modifications:
- A) Saudi Aramco Engineering Standards and SAMSSs shall be followed in:
    - 1) selecting pressure gauges;
    - 2) materials selection, welding, and hydrotesting of piping;
    - 3) materials selection and hydrotesting of firewater pumps;
    - 4) specification of electric motor enclosures.
  - B) A metering device (Section 2-13.2 of NFPA 20) for testing pump capacity shall be provided in the piping associated with firewater system pressure regulation (see 4.8.5.7 below). If an orifice installation is used, it shall be so located as to permit easy removal of the orifice plate.
  - C) Capacities of pressure maintenance (jockey) pumps (Section 2-18 of NFPA 20) shall be as specified in 4.8.4.1 above.
  - D) A copy of the pump curve (Section 4-1 of NFPA 20) for each firewater pump shall be supplied to the Chief Fire Prevention Engineer.
  - E) Screening, enclosing, or housing of pumps (Sections 4-4.1, 4-4.2 of NFPA 20) is not required.
  - F) A representative of the Chief Fire Prevention Engineer is required to be present to witness field tests (Section 4-6 of NFPA 20), and a record of the field acceptance test shall be provided to the Chief Fire Prevention Engineer.
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- G) The "point of constant attendance" for alarm and signal devices (Paragraphs. 7-4.7 and 9-4.3 of NFPA 20) shall be the platform complex control room.
- H) Paragraph 6-3.5 (Capacity of Lines) of NFPA 20 shall be increased if necessary to ensure that power lines and switchgear equipment have sufficient capacity to satisfy the overload power requirement implied in subparagraph (K) immediately following.
- I) Location of controllers within sight of motors (Section 7-2 of NFPA 20) is not required.
- J) Sections 7-5.2 and 9-5.2 (Automatic Controllers) shall be modified to comply with the following:  

Pumps with electric motor drivers shall start before pumps with diesel engine drivers.
- K) Section 8-4.3 (Fuel Tank Capacity) shall be followed except that, as a minimum, a capacity sufficient for eight hours of continuous operation at full load shall be provided.

4.8.5.7 Firewater system pressure regulation shall be provided by two pressure regulating valves, discharging to the sea. One valve shall be sized for full flow of one jockey pump. The other valve shall be sized for full flow of one main firewater pump. The piping for the larger pressure regulating valve shall have provision for a temporary flow measuring device for testing the main firewater pumps.

*Exception:*

*If the pressure regulating valve for the main firewater pumps is capable of satisfactorily controlling firewater pressure with only a jockey pump in operation, a separate pressure regulating valve for the jockey pumps is not required.*

4.8.6 The firewater system piping shall be sized to supply the largest single risk area while maintaining 690 kPa (100 psi) at the hydraulically most remote monitor nozzle or hydrant in that risk area. Also see paragraph 4.11.4.



- 4.8.6.1 Firewater piping shall be cement-lined steel, 90-10 copper-nickel, or 254 SMO stainless steel, per SAES-L-005 and SAES-L-032. RTR pipe shall not be used for offshore firewater systems.
- 4.8.6.2 Valve materials shall be compatible with piping materials and shall comply with SAES-L-008.
- 4.8.6.3 A looped main shall be provided for each platform having an edge length of over 45 m. The looped main shall be located at or below the lowest solid deck level. Each looped main shall be supplied by firewater in a manner such that isolation of a single-component failure will result in loss of no more than 50% of the required flow to the looped main.

*Exception:*

*The automatically-actuated deluge valve of each deluge-type water spray system shall be supplied from two ring main sections, each of which can, after isolation of one section from the other, deliver 100% of the firewater requirement of that water spray system.*

- 4.8.6.4 Firewater to fire protection devices (hose reels, deluge systems, monitors, etc.) on upper decks may be provided through risers.
  - 4.8.6.5 A riser may supply more than one deck.
  - 4.8.6.6 Sectionalizing valves shall be provided such that not more than five fire protection devices connected to the firewater system, excluding spray deluge valves, are put out of service when isolating a single break.
  - 4.8.6.7 Sectionalizing valve handwheels shall be accessible from deck level and located at a convenient operating height. Handwheels or their extensions shall not obstruct walkways or equipment access ways. Chain handwheels are prohibited.
  - 4.8.6.8 Flanged valves shall be provided at the ends of firewater loops to allow for sectionalized flushing at twice the normal service flow upon completion of construction and at periodic intervals thereafter.
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- 4.8.7 A chlorination, hypochlorination, or other system shall be provided to prevent the growth of marine organisms in pump suctions (or in pump caissons) and piping systems susceptible to their growth.

Where chlorination of piping systems is required, a continuous discharge overboard shall be maintained from a remote portion of the firewater loop.

#### 4.9 Fixed Fire Protection Systems: General Requirements

Fixed fire protection systems shall be provided as specified except that they are not required for those wellhead or tie-in platforms exempted in paragraph 4.8.2.

- 4.9.1 At least one Type 509E hydrant (see SAES-B-017, Figure 1) or other valved outlet acceptable to the Proponent Operating Department shall be installed near each bridge of a bridge-connected deck, for hydrotest water and emergency firewater back-up.

- 4.9.2 Hose reel protection shall be provided for all areas. Hose reels protecting areas subject to hydrocarbon spills, including all helidecks, shall be capable of discharging either water or foam, with a push button mounted by each hose reel to start the foam concentrate pump.

- 4.9.3 Fixed fire protection is required for rotating equipment handling flammable materials and for deck areas subject to a hydrocarbon spill.

4.9.3.1 For pumps handling hydrocarbons, this protection shall be provided by AFFF foam solution discharged by pre-aimed monitors or fixed overhead spray systems (see paragraph 4.10).

4.9.3.2 For compressors handling hydrocarbons, protection shall be by pre-aimed monitors or fixed overhead spray systems discharging water per 4.11.5.4 unless foam is necessitated by paragraph 4.9.6.

- 4.9.4 For deck spray protection requirements, see paragraph 4.10.

- 4.9.5 For vessels (see paragraph 4.11), fixed fire protection in the form of deluge-type water spray systems is required if both the conditions in 4.9.5.1 and 4.9.5.2 exist:

4.9.5.1 Vessel is subject to an exposure fire which would, if not spray-protected, require fireproofing of supports per paragraph 4.7.

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- 4.9.5.2 Vessel can not be depressurized to a pressure less than 50% of design pressure within two minutes of actuation of the plant ESD system.
  - 4.9.5.3 Fixed protection of vessels by pre-aimed monitors fed through automatically actuated valves in the manner described for deluge-type water spray systems is acceptable in lieu of water spray systems.
  - 4.9.5.4 Vessels subject to fire exposure which do not require fixed fire protection must, as a minimum, have protection from ordinary (SAMS 21-161-350) monitors (need not be pre-aimed or automatically fed).
  - 4.9.6 Where rundown from deluge-type pre-aimed monitors or water spray systems will merge with foam protection for deck areas subject to hydrocarbon spills, discharge from the monitor/water spray system shall be AFFF foam solution.
  - 4.9.7 Closed-head automatic sprinkler systems shall be provided for accommodations buildings (see paragraph 4.12).
  - 4.9.8 Heat and/or smoke detection systems shall be provided for all buildings or sections of buildings.
  - 4.9.9 Actuation of individual fixed foam/water spray systems shall be by heat or flame detectors. Actuation of fixed foam/water spray systems for an entire platform shall be by manual push buttons.
    - 4.9.9.1 Detection shall be by ultraviolet (UV), fusible-plug, or thermistor wire detection systems. Fusible plug pneumatic systems are acceptable for compressor skids only. Simple pneumatic (plastic) tube systems are not acceptable.
    - 4.9.9.2 Automatic actuation of individual fixed foam/water spray systems shall be by signals from two detectors which are in the same area but which are wired into separate detection circuits. Sprays so actuated shall cover a radius of at least 15 m from the actuating detectors.
  - 4.9.10 Foam spray (preferred) or dry-chemical fixed protection systems shall be provided for the protection of hoods, ducts, and cooking surfaces in galley areas.
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- 4.9.11 Fixed fire protection shall be provided for under floor areas of control rooms and computer rooms where massed cables are present. All new applications of Halon 1301 shall be reviewed and approved by the Chief Fire Prevention Engineer. See paragraph 4.13 of this Standard.
  - 4.9.12 Pre-engineered fire protection systems provided by the manufacturers of combustion gas turbines and power generators must comply with referenced SAESs and SAMSSs and shall be subject to Saudi Aramco acceptance tests.
  - 4.9.13 Operating instructions shall be posted at the control station for each automatic system. All instructions shall be in Arabic and English.
  - 4.9.14 Written instructions, in English and preferably also in Arabic, for maintaining and periodically checking each automatic system shall be provided to the Manager, Fire Protection Dept., and the proponent's Maintenance Manager.
  - 4.9.15 Major projects shall provide, at Project Proposal stage, an isometric diagram for each platform showing firewater and foam piping, sectionalizing and branch valves, foam tanks and proportioners, hydrants, monitors, deluge and sprinkler systems, hose reels, fire boat connections, and firewater and jockey pumps. Diagrams shall be to scale and shall identify major structures and major pieces of process equipment.
- 4.10 Fixed Foam Protection: Design Details
- 4.10.1 A central AFFF foam concentrate storage and distribution system shall be provided for each offshore complex. This system shall be sized to provide foam concentrate for a period of at least 30 minutes to all users on the platform of greatest demand.
    - 4.10.1.1 AFFF foam concentrate shall be stored in one or more tanks. Each tank shall be equipped with an expansion dome, pressure-vacuum vent, drain valve, bulk fill connection, and all necessary supply and return pipe connections to make a working system. Tanks larger than 1900L (500 gal) shall have a manway so that the tank can be entered for cleaning. Foam tanks shall be constructed of Type 316L stainless steel or carbon steel with APCS-2A (See SAES-H-101), except for fiberglass tanks specified below for helidecks.
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- 4.10.1.2 Foam concentrate pumps shall be rotary gear pumps capable of injecting the specified concentrate quantities up to full flow at the operating pressures of the main fire pumps at those respective flows.
- 4.10.1.3 An installed spare concentrate pump capable of delivering 100% of required flow shall be provided.
- 4.10.1.4 Foam concentrate pumps shall be sized to deliver foam concentrate through the dry distribution piping system to the most remote user within two minutes.
- 4.10.1.5 A pressure-regulating valve shall be provided on the foam concentrate pump discharge manifold with return to the foam concentrate storage tank. The function of this valve shall be to maintain a constant supply pressure in the foam concentrate distribution piping system.
- 4.10.2 Foam concentrate shall be provided to all users via a normally dry foam concentrate distribution piping system.
  - 4.10.2.1 The foam concentrate distribution piping system shall consist of a single pipe header routed from the foam concentrate pump discharge manifold to each platform having a foam user requirement (except helideck as described below).
  - 4.10.2.2 An automatic valve shall be provided near the take-off from the foam concentrate header to each platform using foam concentrate.
    - 4.10.2.2.1 The actuation of this automatic valve shall be by means of the detection system for fixed protection on that platform.
    - 4.10.2.2.2 In addition, each automatic valve shall be operable by means of a local push button at each valve.
    - 4.10.2.2.3 Buttons to activate all the foam/water spray systems on a platform shall be provided in the control room and on a panel located on an adjacent platform at a spot having a clear view of the protected platform.

- 4.10.2.3 The foam concentrate distribution piping system shall be designed to allow draining of the piping. Provision shall be made to allow flushing with fresh water following use or testing.
  - 4.10.3 Foam concentrate shall be injected into firewater flow at each user or group of users through an in-line balanced pressure proportioner.
  - 4.10.4 Design details for fixed foam/water spray systems, monitors, and hose reels are as follows:
    - 4.10.4.1 Spray protection for deck areas subject to hydrocarbon spills shall be designed to apply foam solution at a rate of at least 0.10 L/(m<sup>2</sup>s) (0.15 gpm/ft<sup>2</sup>).

*Exception:*

*Where fixed foam monitors/spray systems provide coverage to vessels above a deck area subject to hydrocarbon spills, 50% of the vessel coverage rate may be used to satisfy deck foam rate requirements.*
    - 4.10.4.2 Protection for pumps handling flammable liquids shall be applied at a foam solution rate of at least 0.34 L/(m<sup>2</sup>s) (0.50 gpm/ft<sup>2</sup>) over an envelope extending 0.6 m from the periphery of the casing, seals, and pump suction and discharge flanges.
    - 4.10.4.3 Monitors shall be equal to SAMS 21-161-350.
    - 4.10.4.4 Water-motor-powered oscillating nozzles shall not be utilized.
    - 4.10.4.5 In addition, foam/water spray systems shall be designed and installed as noted in paragraph 4.11 below.
  - 4.10.5 Where the helideck constitutes the only foam user on a platform, a dedicated fiberglass foam concentrate tank, proportioner, and hose reel may be provided in lieu of a piped connection to the platform complex foam distribution system. The dedicated foam concentrate tank shall be sized to hold at least a ten-minute supply, based on a foam water solution delivery rate of at least 13 L/s (200 gpm).
  - 4.11 Deluge Type Water Spray Systems: Design Details

Deluge-type water spray systems shall be designed and installed per NFPA 15 with the following exceptions and additions:
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- 4.11.1 (Addition) Piping materials shall be per SAES-L-005 and SAES-L-032 except that for piping 100 mm and smaller only 90-10 Copper Nickel Alloy C70600 or 254 SMO stainless steel shall be used. RTR pipe shall not be used for offshore water spray systems.
  - 4.11.2 (Exception) Individual water spray systems shall be limited in capacity 158 L/s (2500 gpm).
  - 4.11.3 (Exception) Nozzles shall have a minimum orifice size of 10 mm.
  - 4.11.4 (Addition) Minimum design pressure for the hydraulically most remote head shall be not less than 138 kPa (20 psig). This requirement is subordinate to the requirement in 4.8.6.
  - 4.11.5 (Addition) Water spray systems shall be hydraulically balanced to maintain a water distribution rate within 15% of design density. Calculation procedures shall be per NFPA 15.
    - 4.11.5.1 For horizontal vessels, spray protection of at least 0.17 L/(m<sup>2</sup>s) (0.25 gpm/ft<sup>2</sup>) shall be provided for the upper half of the vessel surface area, normally with one row of sprays running horizontally along each side of the upper part of the vessel in order to provide good vapor space coverage. Water rundown of more than 3.7 m shall not be assumed; hence, additional rows of spray nozzles must be installed to protect any vessel vapor space that is below 3.7 m, measured circumferentially from the top of the vessel.
    - 4.11.5.2 For vertical vessels, spray protection of at least 0.17 L/(m<sup>2</sup>s) (0.25 gpm/ft<sup>2</sup>) shall be provided, with sprays arranged in rings to provide coverage to the top head and upper shell. Water rundown of more than 3.7 m shall not be assumed; hence, additional rings of spray nozzles must be installed to protect any vessel vapor space that is more than 3.7 m below the top of the vessel. Vessel skirts shall be either fireproofed or spray-protected.
    - 4.11.5.3 Production manifolds and scraper launchers/receivers located above deck shall have spray protection of at least 0.34 L/(m<sup>2</sup>s) (0.5 gpm/ft<sup>2</sup>), based on projected area.
    - 4.11.5.4 Compressor skids shall have spray protection of at least 0.34 L/(m<sup>2</sup>s) (0.5 gpm/ft<sup>2</sup>).
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- 4.11.5.5 Spray nozzle connections shall branch from the upper part of the supply header between the ten o'clock and two o'clock position in order to avoid plugging of nozzles.
  - 4.11.5.6 The distance between a spray nozzle and the protected surface shall not exceed 1 m.
  - 4.11.6 (Exception) Detection systems for outdoor water spray systems shall be per paragraph 4.9.9.1.
  - 4.11.7 (Addition) Deluge-type water spray systems shall be capable of remote manual actuation from the control room as well as from platform manual actuation devices. Remote shut-off capability is prohibited: only local shut-off of a water spray system is allowed.
- 4.12 Automatic Sprinkler Protection: Design Details
- 4.12.1 Automatic sprinkler protection for interiors of accommodations buildings and enclosures shall be designed and installed per NFPA 13, with the following additions and exceptions.
    - 4.12.1.1 (Addition) Instruction charts describing operation and proper maintenance of sprinkler devices per Section 1-5 and working plans per Section 1-9 of NFPA 13 shall be provided to the Manager, Fire Protection Dept., and the proponent's Maintenance Manager.
    - 4.12.1.2 (Addition) Piping shall be per SAES-L-005, SAES-L-032, and SAES-S-050, except that only 90-10 Copper Nickel Alloy C70600 or 254 SMO stainless steel may be used.
    - 4.12.1.3 (Exception) Sprinklers shall have a temperature rating of at least 100°C.
    - 4.12.1.4 (Exception) Systems for protection of quarters areas shall be based on a Light Hazard Pipe Schedule per NFPA 13 or hydraulically designed to deliver a minimum density of 0.068 L/(m<sup>2</sup>s) (0.1 gpm/ft<sup>2</sup>) over a 140 m<sup>2</sup> area.
    - 4.12.1.5 (Exception) Systems for the protection of all other buildings or enclosures shall be designed on the basis of an Ordinary Hazard Pipe Schedule Group 2 or hydraulically designed to deliver a minimum density of 0.129 L/(m<sup>2</sup>s) (0.19 gpm/ft<sup>2</sup>) over a maximum 280 m<sup>2</sup> area.
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- 4.12.1.6 (Addition) The sprinkler system alarm check valve shall be tied electrically to the building fire alarm system and to the master fire alarm panel (MFAP) in the main control room.
- 4.12.2 For additional protection of building interiors, a live hose reel with 32 mm hose shall be provided outside each entrance.
- 4.12.3 Operational acceptance tests shall be witnessed by the Chief Fire Prevention Engineer or his representative.
- 4.13 Halon 1301 Protection Systems: Design Details

The design and installation of Halon 1301 systems approved by the Chief Fire Prevention Engineer for protection of underfloor spaces containing massed cables shall comply with NFPA 12A with the following exceptions and additions:

- 4.13.1 (Exception) Detection shall be by smoke detectors arranged on cross-zoned or voting-type circuitry.
    - 4.13.1.1 (Addition) Detection circuits shall be arranged such that, upon actuation of a single detector, a prealarm will sound. Upon actuation of a second detector, a second and different tone alarm shall sound, and a thirty-second timer shall start. During this timed period, an operator can investigate the cause of the alarm. In event the alarm is spurious or the fire is within the control of portable extinguishers, the operator shall be able to abort the discharge of Halon 1301 by pressing and holding an abort button. Release of this button before the alarm is reset shall cause the timer to restart its 30-second countdown.
    - 4.13.1.2 (Addition) The abort button shall be clearly labeled as to its function, in both Arabic and English.
  - 4.13.2 (Exception) Agent cylinders shall be equipped with valve-type actuation heads. Actuation by cutter head against a frangible disc or by explosive squib is prohibited.
  - 4.13.3 (Exception) All systems shall be provided with a piped-in-place 100% reserve Halon supply.
  - 4.13.4 (Addition) The agent cylinder storage rack shall be arranged to allow the use of a beam-type weighing scale. A suitable scale shall be provided with each system. Equivalent agent verification methods may be provided if acceptable to the Proponent Operating Department.
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- 4.13.5 (Exception) All systems shall be designed to provide a minimum 7% Halon concentration for a minimum of 10 minutes following discharge, with agent discharge substantially completed within ten seconds.
- 4.13.6 (Exception) Halon shall be supplied from cylinders connected to a supply piping manifold. Modular units are not acceptable.
- 4.13.7 (Exception) The nominal capacity of a Halon cylinder shall not exceed 85 kg of Halon.
- 4.13.8 A Halon release signal shall cause automatic shutdown of any local air-handling system. Restart of the air-handling system shall be manual only.
- 4.13.9 (Addition) Operational acceptance tests shall be witnessed by the Chief Fire Prevention Engineer or his representative.

#### 4.14 Dry Chemical Protection Systems: Design Details

Dry chemical systems shall be designed and installed per NFPA 17 with the following exceptions and additions:

- 4.14.1 (Addition) Pre-engineered systems shall be installed in strict compliance with the manufacturer's instructions
- 4.14.2 (Addition) Agent storage cylinders having gross weights of more than 68 kg shall be capable of being recharged in the field.

#### 4.15 Fire Detection and Alarm Systems: Design Details

Fire detection and alarm systems for manned platform complexes shall be designed and installed in compliance with NFPA 72D and NFPA 72E with the following additions and exceptions:

- 4.15.1 (Addition) Written instructions for periodic maintenance and testing of alarm systems shall be provided to the Manager, Fire Protection Dept., and the proponent's Maintenance Manager.
- 4.15.2 (Addition) Each platform shall be provided with a Master Fire Alarm Panel (MFAP) in the main control room. The MFAP shall house all heat, fire, and smoke detector controllers for the platform complex and shall include a conventional fire alarm panel to perform all necessary logic functions required to operate automatic systems. Fire detection and alarm systems shall sound an alarm locally and on the MFAP.

- 4.15.3 (Addition) Each fire detection and alarm system shall have either a tie to the UPS or an independent battery power supply capable of maintaining the system in operation for at least 8 hours, with battery chargers backed up by an emergency generator.
- 4.15.4 (Addition) Fire detection and alarm systems shall be installed in all buildings and enclosures, per 4.9.8.
  - 4.15.4.1 (Addition) Each building/enclosure fire detection and alarm system shall consist of a Local Fire Control Panel (LFCP) to which one or more zones of heat or smoke detectors, manual pull stations, and alarm bells or horns are connected.
  - 4.15.4.2 (Addition) Multistory buildings shall be subdivided to provide a zone of detection per floor.
  - 4.15.4.3 (Addition) A trouble alarm shall be provided on each LFCP and remotely on the main control room MFAP.
  - 4.15.4.4 (Addition) A graphic panel showing zone and detector locations shall be provided, or this information shall be shown on the DCS.

#### 4.16 Portable Fire Extinguishers: Design Details

Requirements in this Section apply only to manned platforms. Work parties visiting unmanned platforms shall provide their own portable fire-fighting apparatus.

- 4.16.1 Portable extinguishers shall be provided in compliance with SAES-B-019 and in accordance with requirements identified at the Project Proposal Meeting.
- 4.16.2 At least one wheeled 68 kg dry chemical extinguisher shall be located within 23 m of major pumps and compressors handling hydrocarbon materials.
- 4.16.3 At least four 30 lb dry chemical extinguishers shall be installed on the first landing down from the helideck. Additionally, one wheeled 68 kg dry chemical extinguisher shall be provided on the landing of refueling helidecks.

#### 4.17 Public Address Systems and Alarm Stations

The following alarm and public address systems shall be provided for all manned offshore platform complexes, with detailed design subject to approval by the Proponent Operating Department.

- 4.17.1 A public address system complying with the requirements of SAES-T-481 shall be provided.
- 4.17.2 Audible and visible alarms to communicate the "abandon platform" order shall be provided, and shall be activated by a single button in the main control room.
- 4.17.3 Special alarm stations housed in weatherproof (NEMA 4X) boxes made of 316L stainless steel shall be installed at stairways and bridges. Each box shall contain colored pull buttons to give the alarm for fire (red button), ESD (red button), and man overboard (black button). Each box shall contain colored lights to indicate LEL (blue), abandon platform (red), fire (amber), man overboard (green), and, where applicable, H<sub>2</sub>S (blue).
- 4.17.4 Flares shall be equipped with ignitor systems featuring pilots, thermocouples, and flame-out detection devices. Flame-out detection devices shall use 2-out-of-3 voting to sound a flame-out alarm in the control room.

#### 4.18 Marine Aids to Navigation and Aviation Obstruction Marking

- 4.18.1 Marine navigation lights and horns shall be provided in accordance with the requirements of SAES-M-005.
- 4.18.2 Offshore structures shall be provided with obstruction lighting in compliance with SAES-B-063.

#### 4.19 Lifesaving Appliances

- 4.19.1 Each manned platform shall be provided with at least two USCG (or equal) approved life rafts holding at least six men. On the accommodations platform, life rafts (minimum of two) shall be provided in sufficient number to handle the difference between the maximum manpower complement (bed capacity) and the seating capacity of accommodations platform escape capsules.

Each life raft shall be equipped with a painter of a length not less than three times the distance from the deck where the life raft is stowed to the low water line. This painter shall not be less than 13 mm in diameter and equivalent in strength to manila rope not less than 70 mm in diameter.

- 4.19.2 Each manned platform shall be provided with an approved life jacket for each person on the platform, plus 20% extra.
- 4.19.2.1 Each life jacket shall have a light securely attached to the front shoulder area.
- 4.19.2.2 Each life jacket shall have at least 200 cm<sup>2</sup> of reflective material on each of its reversible sides as close to the shoulder area as possible.
- 4.19.2.3 Life jackets stored outside shall be housed in fiberglass or 316L stainless steel storage cabinets. Each cabinet shall be sized to hold at least six life jackets, shall be furnished with legs to raise it above deck level, and shall have a quick-opening door of sufficient size to allow easy access to the life jackets.
- 4.19.2.4 Life jacket cabinets shall be painted orange and labeled LIFE JACKETS in both Arabic and English.
- 4.19.3 Each manned platform shall have at least four approved ring life buoys. One ring life buoy shall be installed on each side of a manned platform in an accessible place, and one ring life buoy shall be installed at the midway point of each bridge.

Each ring life buoy shall be equipped with an approved automatic electric water light. The water light shall be attached to the ring life buoy with a 1 to 2 m lanyard. The water light shall be mounted on a bracket adjacent to the ring life buoy such that when the ring life buoy is cast loose, the water light will pull free of the bracket.

- 4.19.4 On each manned platform where escape to a safe area of refuge is not possible, escape capsules shall be provided. These shall be of sufficient capacity to evacuate 120% of the normal personnel on that platform. Locations of escape capsules shall be identified at Project Proposal stage.

- 4.19.5 On each manned platform a Stokes litter, or other suitable safety litter capable of being safely hoisted with an injured person, shall be provided and kept in an accessible place.
  - 4.19.6 On each manned platform an industrial-type first aid kit shall be provided. It shall be maintained in the custody of the person in charge of the platform.
  - 4.19.7 One ordinary fire blanket (SAMS 21-035-135) shall be provided for each control building and switchgear building on manned platforms.
  - 4.19.8 For major projects, a list of all life safety equipment and locations thereof shall be provided, to be agreed upon at Project Proposal stage.
- 4.20 Noise Control
- Requirements of SAES-A-105 shall be met.
- 4.21 Color-Coding
- Requirements of SAES-B-067 shall be met.

**Revision Summary**

15 March 2006 Revised the "Next Planned Update". Reaffirmed the contents of the document and reissued with no other changes.